Current Clinical Strategies

Family Medicine

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INTERNAL MEDICINE

Medical Documentation

History and Physical Examination

Identifying Data: Patient's name; age, race, sex. List the patient's significant medical problems. Name of informant (patient, relative).
Chief Compliant: Reason given by patient for seeking medical care and the duration of the symptom. List all of the patients medical problems.
History of Present Illness (HPI): Describe the course of the patient's illness, including when it began, character of the symptoms, location where the symptoms began; aggravating or alleviating factors; pertinent positives and negatives. Describe past illnesses or surgeries, and past diagnostic testing.
Past Medical History (PMH): Past diseases, surgeries, hospitalizations; medical problems; history of diabetes, hypertension, peptic ulcer disease, asthma, myocardial infarction, cancer. In children include birth history, prenatal history, immunizations, and type of feedings.
Medications:
Allergies: Penicillin, codeine?
Family History: Medical problems in family, including the patient's disorder. Asthma, coronary artery disease, heart failure, cancer, tuberculosis.
Social History: Alcohol, smoking, drug usage. Marital status, employment situation. Level of education.
Review of Systems (ROS):
General: Weight gain or loss, loss of appetite, fever, chills, fatigue, night sweats.
Skin: Rashes, skin discolorations.
Head: Headaches, dizziness, masses, seizures.
Eyes: Visual changes, eye pain.
Ears: Tinnitus, vertigo, hearing loss.
Nose: Nose bleeds, discharge, sinus diseases.
Mouth and Throat: Dental disease, hoarseness, throat pain.
Respiratory: Cough, shortness of breath, sputum (color).
Cardiovascular: Chest pain, orthopnea, paroxysmal nocturnal dyspnea; dyspnea on exertion, claudication, edema, valvular disease.
Gastrointestinal: Dysphagia, abdominal pain, nausea, vomiting, hematemesis, diarrhea, constipation, melena (black tarry stools), hematochezia (bright red blood per rectum).
Genitourinary: Dysuria, frequency, hesitancy, hematuria, discharge.
Gynecological: Gravida/para, abortions, last menstrual period (frequency, duration), age of menarche, menopause; dysmenorrhea, contraception, vaginal bleeding, breast masses.
Endocrine: Polyuria, polydipsia, skin or hair changes, heat intolerance.
Musculoskeletal: Joint pain or swelling, arthritis, myalgias.
Skin and Lymphatics: Easy bruising, lymphadenopathy.
Neuropsychiatric: Weakness, seizures, memory changes, depression.

Physical Examination
General appearance: Note whether the patient appears ill, well, or malnourished.
Vital Signs: Temperature, heart rate, respirations, blood pressure.
Skin: Rashes, scars, moles, capillary refill (in seconds).
Lymph Nodes: Cervical, supraclavicular, axillary, inguinal nodes; size, tenderness.
Head: Bruising, masses. Check fontanels in pediatric patients.
Eyes: Pupils equal round and react to light and accommodation (PERRLA); extra ocular movements intact (EOMI), and visual fields. Funduscopy (papilledema, arteriovenous nicking, hemorrhages, exudates); scleral icterus, ptosis.
Ears: Acuity, tympanic membranes (dull, shiny, intact, injected, bulging).
Mouth and Throat: Mucus membrane color and moisture; oral lesions, dentition, pharynx, tonsils.
Neck: Jugulovenous distention (JVD) at a 45 degree incline, thyromegaly, lymphadenopathy, masses, bruits, abdominojugular reflux.
Chest: Equal expansion, tactile fremitus, percussion, auscultation, rhonchi, crackles, rubs, breath sounds, egophony, whispered pectoriloquy.
Heart: Point of maximal impulse (PMI), thrills (palpable turbulence); regular rate and rhythm (RRR), first and second heart sounds (S1, S2); gallops (S3, S4), murmurs (grade 1-6), pulses (graded 0-2+).
Breast: Dimpling, tenderness, masses, nipple discharge; axillary masses.
Abdomen: Contour (flat, scaphoid, obese, distended); scars, bowel sounds, bruits, tenderness, masses, liver span by percussion; hepatomegaly, splenomegaly; guarding, rebound, percussion note (tympanic), costovertebral angle tenderness (CVAT), suprapubic tenderness.
Genitourinary: Inguinal masses, hernias, scrotum, testicles, varicoceles.
Pelvic Examination: Vaginal mucosa, cervical discharge, uterine size, masses, adnexal masses, ovaries.
Extremities: Joint swelling, range of motion, edema (grade 1-4+); cyanosis, clubbing, edema (CCE); pulses (radial, ulnar, femoral, popliteal, posterior tibial, dorsalis pedis; simultaneous palpation of radial and femoral pulses).
Rectal Examination: Sphincter tone, masses, fissures; test for occult blood, prostate (nodules, tenderness, size).
Neurological: Mental status and affect; gait, strength (graded 0-5); touch sensation, pressure, pain, position and vibration; deep tendon reflexes (biceps, triceps, patellar, ankle; graded 0-4+); Romberg test (ability to stand erect with arms outstretched and eyes closed).
Cranial Nerve Examination:
I: Smell
II: Vision and visual fields
III, IV, VI: Pupil responses to light, extraocular eye movements, ptosis
V: Facial sensation, ability to open jaw against resistance, corneal reflex.

VII: Close eyes tightly, smile, show teeth
VIII: Hears watch tic; Weber test (lateralization of sound when tuning fork is placed on top of head); Rinne test (air conduction last longer than bone conduction when tuning fork is placed on mastoid process)
IX, X: Palette moves in midline when patient says "ah," speech
XI: Shoulder shrug and turns head against resistance
XII: Stick out tongue in midline

Labs: Electrolytes (sodium, potassium, bicarbonate, chloride, BUN, creatinine), CBC (hemoglobin, hematocrit, WBC count, platelets, differential); X-rays, ECG, urine analysis (UA), liver function tests (LFTs).

Assessment (Impression): Assign a number to each problem and discuss separately. Discuss differential diagnosis and give reasons that support the working diagnosis; give reasons for excluding other diagnoses.

Plan: Describe therapeutic plan for each numbered problem, including testing, laboratory studies, medications, and antibiotics.

Admission Check List

1. **Call and request** old chart, ECG, and X-rays.
2. **Stat labs:** CBC, Chem 7, cardiac enzymes (myoglobin, troponin, CPK), INR, PTT, C&S, ABG, UA.
3. **Labs:** Toxicology screens and drug levels.
4. **Cultures:** Blood culture x 2, urine and sputum culture (before initiating antibiotics), sputum Gram stain, urinalysis.
5. **CXR, ECG**, diagnostic studies.
6. **Discuss case** with resident, attending, and family.

Progress Notes

Daily progress notes should summarize developments in a patient's hospital course, problems that remain active, plans to treat those problems, and arrangements for discharge. Progress notes should address every element of the problem list.

Progress Note

Date/time:
Subjective: Any problems and symptoms of the patient should be charted. Appetite, pain, headaches or insomnia may be included.
Objective:
General appearance.
Vitals, including highest temperature over past 24 hours.
Fluid I/O (inputs and outputs), including oral, parenteral, urine, and stool volumes.
Physical exam, including chest and abdomen, with particular attention to active problems. Emphasize changes from previous physical exams.
Labs: Include new test results and circle abnormal values.
Current medications: List all medications and dosages.
Assessment and Plan: This section should be organized by problem. A separate assessment and plan should be written for each problem.

Procedure Note

A procedure note should be written in the chart when a procedure is performed. Procedure notes are brief operative notes.

Procedure Note

Date and time:
Procedure:
Indications:
Patient Consent: Document that the indications and risks were explained to the patient and that the patient consented: "The patient understands the risks of the procedure and consents in writing."
Lab tests: Relevant labs, such as the INR and CBC, chemistry.
Anesthesia: Local with 2% lidocaine.
Description of Procedure: Briefly describe the procedure, including sterile prep, anesthesia method, patient position, devices used, anatomic location of procedure, and outcome.
Complications and Estimated Blood Loss (EBL):
Disposition: Describe how the patient tolerated the procedure.
Specimens: Describe any specimens obtained and labs tests which were ordered.

Discharge Note

The discharge note should be written in the patient's chart prior to discharge.

Discharge Note
Date/time: **Diagnoses:** **Treatment:** Briefly describe treatment provided during hospitalization, including surgical procedures and antibiotic therapy. **Studies Performed:** Electrocardiograms, CT scans. **Discharge Medications:** **Follow-up Arrangements:**

Discharge Summary

Patient's Name and Medical Record Number:
Date of Admission:
Date of Discharge:
Admitting Diagnosis:
Discharge Diagnosis:
Attending or Ward Team Responsible for Patient:
Surgical Procedures, Diagnostic Tests, Invasive Procedures:
Brief History, Pertinent Physical Examination, and Laboratory Data: Describe the course of the patient's disease up until the time that the patient came to the hospital, including physical exam and laboratory data.
Hospital Course: Describe the course of the patient's illness while in the hospital, including evaluation, treatment, medications, and outcome of treatment.
Discharged Condition: Describe improvement or deterioration in the patient's condition, and describe present status of the patient.
Disposition: Describe the situation to which the patient will be discharged (home, nursing home), and indicate who will take care of patient.
Discharged Medications: List medications and instructions for patient on taking the medications.
Discharged Instructions and Follow-up Care: Date of return for follow-up care at clinic; diet, exercise.
Problem List: List all active and past problems.
Copies: Send copies to attending, clinic, consultants.

Prescription Writing

- Patient's name:
- Date:
- Drug name, dosage form, dose, route, frequency (include concentration for oral liquids or mg strength for oral solids): Amoxicillin 125mg/5mL 5 mL PO tid
- Quantity to dispense: mL for oral liquids, # of oral solids
- Refills: If appropriate
- Signature

Cardiovascular Disorders

ST-Segment Elevation Myocardial Infarction

1. **Admit to:** Coronary care unit
2. **Diagnosis:** Rule out myocardial infarction
3 **Condition:**
4. **Vital Signs:** q1h. Call physician if pulse >90,<60; BP >150/90, <90/60; R>25, <12; T >38.5˚C.
5. **Activity:** Bed rest with bedside commode.
7. **Nursing:** Guaiac stools. If patient has chest pain, obtain 12-lead ECG and call physician.
8. **Diet:** Cardiac diet, 1-2 gm sodium, low-fat, low-cholesterol diet. No caffeine or temperature extremes.
9. **IV Fluids:** D5W at TKO
10. **Special Medications:**
    - -Oxygen 2-4 L/min by NC.
    - -Aspirin 325 mg PO, chew and swallow immediately, then aspirin EC 162 mg PO qd **OR** Clopidogrel (Plavix) 75 mg PO qd (if allergic to aspirin).
    - -Nitroglycerin 10 mcg/min infusion (50 mg in 250-500 mL D5W, 100-200 mcg/mL). Titrate to control symptoms in 5-10 mcg/min steps, up to 1-3 mcg/kg/min; maintain systolic BP >90 **OR**
    - -Nitroglycerin SL, 0.4 mg (0.15-0.6 mg) SL q5min until pain free (up to 3 tabs) **OR**
    - -Nitroglycerin spray (0.4 mg/aerosol spray) 1-2 sprays under the tongue q 5min; may repeat x 2.
    - -Heparin 60 U/kg IV (max 4000 U) push, then 12 U/kg/hr (max 1000 U/hr) by continuous IV infusion for 48 hours to maintain aPTT of 50-70 seconds. Check aPTTq6h x 4, then qd. Repeat aPTT 6 hours after each heparin dosage change.

Thrombolytic Therapy (within first 6 hours of onset of chest pain)

Absolute Contraindications to Thrombolytics: Active internal bleeding, suspected aortic dissection, known intracranial neoplasm, previous intracranial hemorrhagic stroke at any time, other strokes or cerebrovascular events within 1 year, head trauma, pregnancy, recent non-compressible vascular puncture, uncontrolled hypertension (>180/110 mm Hg).

Relative Contraindications to Thrombolytics: Severe hypertension, cerebrovascular disease, recent surgery (within 2 weeks), cardiopulmonary resuscitation.

A. Alteplase (tPA, tissue plasminogen activator, Activase):

1. 15 mg IV push over 2 min, followed by 0.75 mg/kg (max 50 mg) IV infusion over 30 min, followed by 0.5 mg/kg (max 35 mg) IV infusion over 60 min (max total dose 100 mg).
2. **Labs:** INR/PTT, CBC, fibrinogen.

B. Reteplase (Retavase):

1. 10 U IV push over 2 min; repeat second 10 U IV push after 30 min.
2. **Labs:** INR, aPTT, CBC, fibrinogen.

C. Tenecteplase (TNKase):

<60 kg	30 mg IVP
60-69 kg	35 mg IVP
70-79 kg	40 mg IVP
80-89 kg	45 mg IVP
≥90 kg	50 mg IVP

C. Streptokinase (Streptase):

1. 1.5 million IU in 100 mL NS IV over 60 min. Pretreat with diphenhydramine (Benadryl) 50 mg IV push **AND** Methylprednisolone (Soln-Medrol) 250 mg IV push.
2. Check baseline fibrinogen level and q6h for 24h until level >100 mg/dL.
3. No IM or arterial punctures, watch IV for bleeding.

Beta-Blockers (within the first 12 hours of onset of chest pain):
Contraindicated in cardiogenic shock.

- -Metoprolol (Lopressor) 5 mg IV q2-5min x 3 doses; then 25 mg PO q6h for 48h, then 100 mg PO q12h; hold if heart rate <60/min or systolic BP <100 mm Hg **OR**
- -Atenolol (Tenormin), 5 mg IV, repeated in 5 minutes, followed by 50-100 mg PO qd **OR**
- -Esmolol (Brevibloc) 500 mcg/kg IV over 1 min, then 50 mcg/kg/min IV infusion, titrated to heart rate >60 bpm (max 300 mcg/kg/min).

Angiotensin Converting Enzyme Inhibitor (within the first 24 hours of onset of chest pain):

- -Lisinopril (Zestril, Prinivil) 2.5-5 mg PO qd; titrate to 10-20 mg qd.

Long-Acting Nitrates:

- -Nitroglycerin patch 0.2 mg/hr qd. Allow for nitrate-free period to prevent tachyphylaxis.
- -Isosorbide dinitrate (Isordil) 10-60 mg PO tid [5,10,20, 30,40 mg] **OR**
- -Isosorbide mononitrate (Imdur) 30-60 mg PO qd.

Aldosterone Receptor Blocker if EF <40%:

- -Eplerenone (Inspra) 24 mg PO qd
- -Spironolactone (Aldactone) 25 mg PO qd

Statins:

- -Rosuvastatin (Crestor) 10 mg PO qhs **OR**
- -Atorvastatin (Lipitor) 10 mg PO qhs **OR**
- -Pravastatin (Pravachol) 40 mg PO qhs **OR**
- -Simvastatin (Zocor) 40 mg PO qhs **OR**
- -Lovastatin (Mevacor) 20 mg PO qhs **OR**
- -Fluvastatin (Lescol)10-20 mg PO qhs.

11. **Symptomatic Medications:**
    - -Morphine sulfate 2-4 mg IV push prn chest pain.
    - -Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn headache.
    - -Lorazepam (Ativan) 1-2 mg PO tid-qid prn anxiety
    - -Zolpidem (Ambien) 5-10 mg qhs prn insomnia.
    - -Docusate (Colace) 100 mg PO bid.
    - -Ondansetron (Zofran) 2-4 mg IV q4h prn nausea or vomiting.
    - -Famotidine (Pepcid) 20 mg IV/PO bid **OR**
    - -Lansoprazole (Prevacid) 30 mg qd.
12. **Extras:** ECG stat and in 12h and in AM, portable CXR, impedance cardiography, echocardiogram. Cardiology consult.

13. **Labs:** SMA7 and 12, magnesium. Cardiac enzymes: CPK, CPK-MB, troponin T, myoglobin STAT and q8h x 3. CBC, INR/PTT, UA.

Non-ST Segment Elevation Myocardial Infarction (NSTEMI) and Unstable Angina

1. **Admit to:** Coronary care unit
2. **Diagnosis:** Acute coronary syndrome
3 **Condition:**
4. **Vital Signs:** q1h. Call physician if pulse >90,<60; BP >150/90, <90/60; R>25, <12; T >38.5˚C.
5. **Activity:** Bed rest with bedside commode.
7. **Nursing:** Guaiac stools. If patient has chest pain, obtain 12-lead ECG and call physician.
8. **Diet:** Cardiac diet, 1-2 gm sodium, low fat, low cholesterol. No caffeine or temperature extremes.
9. **IV Fluids:** D5W at TKO
10. **Special Medications:**
    -Oxygen 2-4 L/min by NC.
    -Aspirin 325 mg PO, chew and swallow immediately, then aspirin EC 162 mg PO qd **OR**
    -Clopidogrel (Plavix) 75 mg PO qd (if allergic to aspirin) **OR**
    -Aspirin 325 mg to chew and swallow, then 81-162 mg PO qd **PLUS** clopidogrel 300 mg PO x 1, then 75 mg PO qd.
    -Nitroglycerin infusion 10 mcg/min infusion (50 mg in 250-500 mL D5W, 100-200 mcg/mL). Titrate to control symptoms in 5-10 mcg/min steps, up to 1-3 mcg/kg/min; maintain systolic BP >90 **OR**
    -Nitroglycerin SL, 0.4 mg mg SL q5min until pain-free (up to 3 tabs) **OR**
    -Nitroglycerin spray (0.4 mg/aerosol spray) 1-2 sprays under the tongue q 5min; may repeat 2 times.
    -Heparin 60 U/kg IV push, then 15 U/kg/hr by continuous IV infusion for 48 hours to maintain aPTT of 50-70 seconds. Check aPTTq6h x 4, then qd. Repeat aPTT 6 hours after each dosage change.

Glycoprotein $IIb_p/IIIa$ Blockers in High-Risk Patients and Those with Planned Percutaneous Coronary Intervention (PCI):
    -**Eptifibatide (Integrilin)** 180 mcg/kg IVP, then 2 mcg/kg/min for 48-72 hours **OR**
    -**Tirofiban (Aggrastat)** 0.4 mcg/kg/min for 30 min, then 0.1 mcg/kg/min for 48-108 hours.

Glycoprotein IIb/IIIa Blockers for Use During PCI:
    -**Abciximab (ReoPro)** 0.25 mg/kg IVP, then 0.125 mcg/kg/min IV infusion for 12 hours **OR**
    -**Eptifibatide (Integrilin)** 180 mcg/kg IVP, then 2 mcg/kg/min for 18-24 hours.

Beta-Blockers: Contraindicated in cardiogenic shock.
    -Metoprolol (Lopressor) 5 mg IV q2-5min x 3 doses; then 25 mg PO q6h for 48h, then 100 mg PO q12h; keep HR <60/min, hold if systolic BP <100 mm Hg **OR**
    -Atenolol (Tenormin), 5 mg IV, repeated in 5 minutes, followed by 50-100 mg PO qd **OR**
    -Esmolol (Brevibloc) 500 mcg/kg IV over 1 min, then 50 mcg/kg/min IV infusion, titrated to heart rate >60 bpm (max 300 mcg/kg/min).

Angiotensin Converting Enzyme Inhibitors:
    -Lisinopril (Zestril, Prinivil) 2.5-5 mg PO qd; titrate to 10-20 mg qd.
    -Benazepril (Lotensin) 10 mg qd **OR**
    -Rampril (Altace) 5-10 mg qd **OR**
    -Perindopril (Aceon) 4-8 mg qd.

Long-Acting Nitrates:
    -Nitroglycerin patch 0.2 mg/hr qd. Allow for nitrate-free period to prevent tachyphylaxis.
    -Isosorbide dinitrate (Isordil) 10-60 mg PO tid [5,10,20, 30,40 mg] **OR**
    -Isosorbide mononitrate (Imdur) 30-60 mg PO qd.

Statins:
    -Rosuvastatin (Crestor) 10 mg PO qd **OR**
    -Atorvastatin (Lipitor) 10 mg PO qhs **OR**
    -Pravastatin (Pravachol) 40 mg PO qhs **OR**
    -Simvastatin (Zocor) 40 mg PO qhs **OR**
    -Lovastatin (Mevacor) 20 mg PO qhs **OR**
    -Fluvastatin (Lescol)10-20 mg PO qhs.

11. **Symptomatic Medications:**
    -Morphine sulfate 2-4 mg IV push prn chest pain.
    -Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn headache.
    -Lorazepam (Ativan) 1-2 mg PO tid-qid prn anxiety.
    -Zolpidem (Ambien) 5-10 mg qhs prn insomnia.
    -Docusate (Colace) 100 mg PO bid.
    -Ondansetron (Zofran) 2-4 mg IV q4h prn N/V.
    -Famotidine (Pepcid) 20 mg IV/PO bid **OR**
    -Lansoprazole (Prevacid) 30 mg qd.
12. **Extras:** ECG stat and in 12h and in AM, portable CXR, impedance cardiography, echocardiogram. Cardiology consult.
13. **Labs:** SMA7 and 12, magnesium. Cardiac enzymes: CPK, CPK-MB, troponin T, myoglobin STAT and q6h for 24h. CBC, INR/PTT, UA.

Congestive Heart Failure

1. **Admit to:**
2. **Diagnosis:** Congestive Heart Failure
3. **Condition:**
4. **Vital Signs:** q1h. Call physician if P >120; BP >150/100 <80/60; T >38.5°C; R >25, <10.
5. **Activity:** Bed rest with bedside commode.
6. **Nursing:** Daily weights, measure inputs and outputs. Head-of-bed at 45 degrees, legs elevated.
7. **Diet:** 1-2 gm salt, cardiac diet.
8. **IV Fluids:** Heparin lock with flush q shift.
9. **Special Medications:**
   -Oxygen 2-4 L/min by NC.

Diuretics:
- -Furosemide (Lasix) 10-160 mg IV qd-bid or 20-80 mg PO qAM-bid [20, 40, 80 mg] or 10-40 mg/hr IV infusion **OR**
- -Torsemide (Demadex) 10-40 mg IV or PO qd; max 200 mg/day [5, 10, 20, 100 mg] **OR**
- -Bumetanide (Bumex) 0.5-1 mg IV q2-3h until response; then 0.5-1.0 mg IV q8-24h (max 10 mg/d); or 0.5-2.0 mg PO qAM.
- -Metolazone (Zaroxolyn) 2.5-10 mg PO qd, max 20 mg/d; 30 min before loop diuretic [2.5, 5, 10 mg].

ACE Inhibitors:
- -Quinapril (Accupril) 5-10 mg PO qd x 1 dose, then 20-80 mg PO qd in 1 to 2 divided doses [5, 10, 20, 40 mg] **OR**
- -Lisinopril (Zestril, Prinivil) 5-40 mg PO qd [5, 10, 20, 40 mg] **OR**
- -Benazepril (Lotensin) 10-20 mg PO qd-bid, max 80 mg/d [5, 10, 20, 40 mg] **OR**
- -Fosinopril (Monopril) 10-40 mg PO qd, max 80 mg/d [10, 20 mg] **OR**
- -Ramipril (Altace) 2.5-10 mg PO qd, max 20 mg/d [1.25, 2.5, 5, 10 mg].
- -Captopril (Capoten) 6.25-50 mg PO q8h [12.5, 25,50,100 mg] **OR**
- -Enalapril (Vasotec) 1.25-5 mg slow IV push q6h or 2.5-20 mg PO bid [5,10,20 mg] **OR**
- -Moexipril (Univasc) 7.5 mg PO qd x 1 dose, then 7.5-15 mg PO qd-bid [7.5, 15 mg tabs] **OR**
- -Trandolapril (Mavik) 1 mg qd x 1 dose, then 2-4 mg qd [1, 2, 4 mg tabs].

Angiotensin-II Receptor Blockers:
- -Irbesartan (Avapro) 150 mg qd, max 300 mg qd [75, 150, 300 mg].
- -Losartan (Cozaar) 25-50 mg bid [25, 50 mg].
- -Valsartan (Diovan) 80 mg qd; max 320 mg qd [80, 160 mg].
- -Candesartan (Atacand) 8-16 mg qd-bid [4, 8, 16, 32 mg].
- -Telmisartan (Micardis) 40-80 mg qd [40, 80 mg].

Adosterone Receptor Blockers:
- -Spironolactose (Aldactone) 25 mg PO qd
- -Eplerenone (Inspra) 25 mg PO qd.

Beta-Blockers:
- -Carvedilol (Coreg) 1.625-3.125 mg PO bid, then slowly increase the dose every 2 weeks to target dose of 25-50 mg bid [tab 3.125, 6.25, 12.5, 25 mg] **OR**
- -Metoprolol (Lopressor) start at 12.5 mg bid, then slowly increase to target dose of 100 mg bid [50, 100 mg] **OR**
- -Bisoprolol (Zebeta) start at 1.25 mg qd, then slowly increase to target of 10 mg qd [5,10 mg] **OR**
- -Metoprolol XL (Toprol XL) 50-100 mg PO qd.

Digoxin (Lanoxin) 0.125-0.25 mg PO or IV qd [0.125, 0.25, 0.5 mg].

Inotropic Agents:
- -Dobutamine (Dobutrex) 2.5-10 mcg/kg/min IV, max of 14 mcg/kg/min (500 mg in 250 mL D5W, 2 mcg/mL) **OR**
- -Dopamine (Intropin) 3-15 mcg/kg/min IV (400 mg in 250 cc D5W, 1600 mcg/mL), titrate to CO >4, CI >2; systolic >90 **OR**
- -Milrinone (Primacor) 0.375 mcg/kg/min IV infusion (40 mg in 200 mL NS, 0.2 mg/mL); titrate to 0.75 mgc/kg/min; arrhythmogenic; may cause hypotension.

Vasodilators:
- -Nitroglycerin 5 mcg/min IV infusion (50 mg in 250 mL D5W). Titrate in increments of 5 mcg/min to control symptoms and maintain systolic BP >90 mmHg.
- -Nesiritide (Natrecor) 2 mcg/kg IV load over 1 min, then 0.010 mcg/kg/min IV infusion. Titrate in increments of 0.005 mcg/kg/min q3h to max 0.03 mcg/kg/min IV infusion.

Potassium:
- -KCL (Micro-K) 20-60 mEq PO qd if the patient is taking loop diuretics.

Pacing:
- -Synchronized biventricular pacing if ejection fraction <40% and QRS duration >135 msec.

10. **Symptomatic Medications:**
    - -Morphine sulfate 2-4 mg IV push prn dyspnea or anxiety.
    - -Heparin 5000 U SQ q12h or enoxaparin (Lovenox) 1 mg/kg SC q12h.
    - -Docusate (Colace) 100-200 mg PO qhs.
    - -Famotidine (Pepcid) 20 mg IV/PO q12h **OR**
    - -Lansoprazole (Prevacid) 30 mg qd.
11. **Extras:** CXR PA and LAT, ECG now and repeat if chest pain or palpitations, impedance cardiography, echocardiogram.
12. **Labs:** SMA 7&12, CBC; B-type natriuretic peptide (BNP), cardiac enzymes: CPK, CPK-MB, troponin T, myoglobin STAT and q6h for 24h. Repeat SMA 7 in AM. UA.

Supraventricular Tachycardia

1. **Admit to:**
2. **Diagnosis:** PSVT
3. **Condition:**
4. **Vital Signs:** q1h. Call physician if BP >160/90, <90/60; apical pulse >130, <50; R >25, <10; T >38.5°C
5. **Activity:** Bedrest with bedside commode.
6. **Nursing:**
7. **Diet:** Low fat, low cholesterol, no caffeine.
8. **IV Fluids:** D5W at TKO.

9. Special Medications:
Attempt vagal maneuvers (Valsalva maneuver) before drug therapy.

Cardioversion (if unstable or refractory to drug therapy):
1. NPO for 6h, digoxin level must be less than 2.4 and potassium and magnesium must be normal.
2. Midazolam (Versed) 2-5 mg IV push.
3. If stable, cardiovert with synchronized 10-50 J, and increase by 50 J increments if necessary. If unstable, start with 100 J, then increase to 200 J and 360 J.

Pharmacologic Therapy of Supraventricular Tachycardia:
-Adenosine (Adenocard) 6 mg rapid IV over 1-2 sec, followed by saline flush, may repeat 12 mg IV after 2-3 min, up to max of 30 mg total **OR**
-Verapamil (Isoptin) 2.5-5 mg IV over 2-3 min (may give calcium gluconate 1 gm IV over 3-6 min prior to verapamil); then 40-120 mg PO q8h [40, 80, 120 mg] or verapamil SR 120-240 mg PO qd [120, 180, 240 mg] **OR**
-Esmolol(Brevibloc) 500 mcg/kg IV over 1 min, then 50 mcg/kg/min IV infusion, titrated to HR of <80 (max of 300 mcg/kg/min) **OR**
-Diltiazem (Cardizem) 0.25 mg/kg IV over 2-5 minutes, followed by 5 mg/h IV infusion. Titrate to max 15 mg/h; then diltiazem-CD (Cardizem-CD) 120-240 mg PO qd **OR**
-Metoprolol (Lopressor) 5 mg IVP q4-6h; then 50-100 mg PO bid, or metoprolol XL (Toprol-XL) 50-100 mg PO qd **OR**
-Digoxin (Lanoxin) 0.25 mg q4h as needed; up to 1.0-1.5 mg; then 0.125-0.25 mg PO qd.

10.Symptomatic Medications:
-Lorazepam (Ativan) 1-2 mg PO tid prn anxiety.

11.Extras: Portable CXR, ECG; repeat if chest pain. Cardiology consult.

12.Labs: CBC, SMA 7 & 12, Mg, thyroid panel. UA.

Ventricular Arrhythmias

1. Ventricular Fibrillation and Tachycardia:
-**If unstable (see ACLS protocol):** Defibrillate with unsynchronized 200 J, then 300 J.
-Oxygen 100% by mask.
-Lidocaine (Xylocaine) loading dose 75-100 mg IV, then 2-4 mg/min IV **OR**
-Amiodarone (Cordarone) 300 mg in 100 mL of D5W, IV infusion over 10 min, then 900 mg in 500 mL of D5W, at 1 mg/min for 6 hrs, then at 0.5 mg/min thereafter; or 400 mg PO q8h x 14 days, then 200-400 mg qd.
-**Also see "other antiarrhythmics" below**.

2. Torsades de Pointes Ventricular Tachycardia:
-Correct underlying causes, including hypomagnesemia, and hypokalemia, and consider discontinuing quinidine, procainamide, disopyramide, moricizine, amiodarone, sotalol, ibutilide, phenothiazine, haloperidol, tricyclic and tetracyclic antidepressants, ketoconazole, itraconazole, bepridil.
-Magnesium sulfate 1-4 gm in IV bolus over 5-15 min, or infuse 3-20 mg/min for 7-48h until QTc interval <440 msec.
-Isoproterenol (Isuprel), 2-20 mcg/min (2 mg in 500 mL D5W, 4 mcg/mL).
-Consider ventricular pacing and/or cardioversion.

3. Other Antiarrhythmics:

Class I:
-Moricizine (Ethmozine) 200-300 mg PO q8h, max 900 mg/d [200, 250, 300 mg].

Class Ia:
-Quinidine gluconate (Quinaglute) 324-648 mg PO q8-12h [324 mg].
-Procainamide (Procan, Procanbid)
IV: 15 mg/kg IV loading dose at 20 mg/min, followed by 2-4 mg/min continuous IV infusion.
PO: 500 mg (nonsustained release) PO q2h x 2 doses, then Procanbid 1-2 gm PO q12h [500, 1000 mg].
-Disopyramide (Norpace, Norpace CR) 100-300 mg PO q6-8h [100, 150, mg] or disopyramide CR 100-150 mg PO bid [100, 150 mg].

Class Ib:
-Lidocaine (Xylocaine) 75-100 mg IV, then 2-4 mg/min IV
-Mexiletine (Mexitil) 100-200 mg PO q8h, max 1200 mg/d [150, 200, 250 mg].
-Tocainide (Tonocard) loading 400-600 mg PO, then 400-600 mg PO q8-12h (1200-1800 mg/d) PO in divided doses q8-12h [400, 600 mg].
-Phenytoin (Dilantin), loading dose 100-300 mg IV given as 50 mg in NS over 10 min IV q5min, then 100 mg IV q5min prn.

Class Ic:
-Flecainide (Tambocor) 50-100 mg PO q12h, max 400 mg/d [50, 100, 150 mg].
-Propafenone (Rythmol) 150-300 mg PO q8h, max 1200 mg/d [150, 225, 300 mg].

Class II:
-Propranolol (Inderal) 1-3 mg IV in NS (max 0.15 mg/kg) or 20-80 mg PO tid-qid [10, 20, 40, 60, 80 mg]; propranolol-LA (Inderal-LA), 80-120 mg PO qd [60, 80, 120, 160 mg]
-Esmolol (Brevibloc) loading dose 500 mcg/kg over 1 min, then 50-200 mcg/kg/min IV infusion
-Atenolol (Tenormin) 50-100 mg/d PO [25, 50, 100 mg].
-Nadolol (Corgard) 40-100 mg PO qd-bid [20, 40, 80, 120, 160 mg].
-Metoprolol (Lopressor) 50-100 mg PO bid-tid [50, 100 mg], or metoprolol XL (Toprol-XL) 50-200 mg PO qd [50, 100, 200 mg].

Class III:
-Amiodarone (Cordarone), PO loading 400-1200 mg/d in divided doses for 2-4 weeks, then 200-400 mg PO qd (5-10 mg/kg) [200 mg] or amiodarone (Cordarone) 300 mg in 100 mL of D5W, IV infusion over 10-20 min, then 900 mg in 500 mL of D5W, at 1 mg/min for 6 hrs, then at 0.5 mg/min thereafter.
-Sotalol (Betapace) 40-80 mg PO bid, max 320 mg/d in 2-3 divided doses [80, 160 mg].

4. **Extras:** CXR, ECG, Holter monitor, signal averaged ECG, cardiology consult.
5. **Labs:** SMA 7&12, Mg, calcium, CBC, drug levels. UA.

Hypertensive Emergencies

1. **Admit to:**
2. **Diagnosis:** Hypertensive emergencies
3. **Condition:**
4. **Vital Signs:** q30min until BP controlled, then q4h.
5. **Activity:** Bed rest
6. **Nursing:** Intra-arterial BP monitoring, daily weights, inputs and outputs.
7. **Diet:** Clear liquids.
8. **IV Fluids:** D5W at TKO.
9. **Special Medications:**
   - -Nitroprusside sodium 0.25-10 mcg/kg/min IV (50 mg in 250 mL of D5W), titrate to desired BP
   - -Labetalol (Trandate, Normodyne) 20 mg IV bolus (0.25 mg/kg), then 20-80 mg boluses IV q10-15min, titrate to desired BP or continuous IV infusion of 1.0-2.0 mg/min, titrate to desired BP. Ideal in patients with thoracic or aortic abdominal aneurysm.
   - -Fenoldopam (Corlopam) 0.01mcg/kg/min IV infusion. Adjust dose by 0.025-0.05 mcg/kg/min q15min to max 0.3 mcg/kg/min. [10 mg in 250 mL D5W].
   - -Nicardipine (Cardene IV) 5 mg/hr IV infusion, increase rate by 2.5 mg/hr every 15 min up to 15 mg/hr (25 mg in D5W 250 mL).
   - -Enalaprilat (Vasotec IV) 1.25- 5.0 mg IV q6h. Do not use in presence of acute myocardial infarction or bilateral renal stenosis.
   - -Esmolol (Brevibloc) 500 mcg/kg/min IV infusion for 1 minute, then 50 mcg/kg/min; titrate by 50 mcg/kg/min increments to 300 mcg/kg/min (2.5 gm in D5W 250 mL).
   - -Clonidine (Catapres), initial 0.1-0.2 mg PO followed by 0.1 mg per hour until DBP <115 (max total dose of 0.8 mg).
   - -Phentolamine (pheochromocytoma), 5-10 mg IV, repeated as needed up to 20 mg.
   - -Trimethaphan (Arfonad [dissecting aneurysm]) 2-4 mg/min IV infusion (500 mg in 500 mL of D5W).
10. **Symptomatic Medications:**
    - -Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn headache.
    - -Zolpidem (Ambien) 5-10 mg qhs prn insomnia.
    - -Docusate sodium (Colace) 100-200 mg PO qhs.
11. **Extras:** Portable CXR, ECG, impedance cardiography, echocardiogram.
12. **Labs:** CBC, SMA 7, UA with micro. TSH, free T4, 24h urine for metanephrine. Plasma catecholamines, urine drug screen.

Hypertension

I. Initial Diagnostic Evaluation of Hypertension
- **A. 15-Lead electrocardiography** may document evidence of ischemic heart disease, rhythm and conduction disturbances, or left ventricular hypertrophy.
- **B. Screening labs.** Complete blood count, glucose, potassium, calcium, creatinine, BUN, uric acid, and fasting lipid panel.
- **C. Urinalysis.** Glucose, protein, and hemoglobin.
- **D.** Selected patients may require plasma renin activity, 24 hour urine catecholamines.

II. Antihypertensive Drugs
- **A. Thiazide Diuretics**
  1. **Hydrochlorothiazide (HCTZ, HydroDiuril)**, 12.5-25 mg qd [25 mg].
  2. **Chlorothiazide (Diuril)** 250 mg qd [250, 500 mg].
  3. **Thiazide/Potassium Sparing Diuretic Combinations**
     - **a. Maxzide** (hydrochlorothiazide 50/triamterene 75 mg) 1 tab qd.
     - **b. Moduretic** (hydrochlorothiazide 50 mg/amiloride 5 mg) 1 tab qd.
     - **c. Dyazide** (hydrochlorothiazide 25 mg/triamterene 37.5) 1 cap qd.
- **B. Beta-Adrenergic Blockers**
  1. **Cardioselective Beta-Blockers**
     - **a. Atenolol (Tenormin)** initial dose 50 mg qd, then 50-100 mg qd, max 200 mg/d [25, 50, 100 mg].
     - **b. Metoprolol XL (Toprol XL)** 100-200 mg qd [50, 100, 200 mg tab ER].
     - **c. Bisoprolol (Zebeta)** 2.5-10 mg qd; max 20 mg qd [5,10 mg].
  2. **Non-Cardioselective Beta-Blockers**
     - **a. Propranolol LA (Inderal LA)**, 80-160 mg qd [60, 80, 120, 160 mg].
     - **b. Nadolol (Corgard)** 40-80 mg qd, max 320 mg/d [20, 40, 80, 120, 160 mg].
     - **c. Pindolol (Visken)** 5-20 mg qd, max 60 mg/d [5, 10 mg].
     - **d. Carteolol (Cartrol)** 2.5-10 mg qd [2.5, 5 mg].
- **C. Angiotensin-Converting Enzyme (ACE) Inhibitors**
  1. **Ramipril (Altace)** 2.5-10 mg qd, max 20 mg/day [1.25, 2.5, 5, 10 mg].
  2. **Quinapril (Accupril)** 20-80 mg qd [5, 10, 20, 40 mg].
  3. **Lisinopril (Zestril, Prinivil)** 10-40 mg qd [2.5, 5, 10, 20, 40 mg].
  4. **Benazepril (Lotensin)** 10-40 mg qd, max 80 mg/day [5, 10, 20, 40 mg].
  5. **Fosinopril (Monopril)** 10-40 mg qd [10, 20 mg].
  6. **Enalapril (Vasotec)** 5-40 mg qd, max 40 mg/day [2.5, 5, 10, 20 mg].
  7. **Moexipril (Univasc)** 7.5-15 mg qd [7.5 mg].
- **D. Angiotensin Receptor Blockers**
  1. **Losartan (Cozaar)** 25-50 mg bid [25, 50 mg].
  2. **Valsartan (Diovan)** 80-160 mg qd; max 320 mg qd [80, 160 mg].
  3. **Irbesartan (Avapro)** 150 mg qd; max 300 mg qd [75, 150, 300 mg].

4. **Candesartan (Atacand)** 8-16 mg qd-bid [4, 8, 16, 32 mg].
5. **Telmisartan (Micardis)** 40-80 mg qd [40, 80 mg].

E. Calcium Entry Blockers

1. **Diltiazem SR (Cardizem SR)** 60-120 mg bid [60, 90, 120 mg] or **Cardizem CD** 180-360 mg qd [120, 180, 240, 300 mg].
2. **Nifedipine XL (Procardia-XL, Adalat-CC)** 30-90 mg qd [30, 60, 90 mg].
3. **Verapamil SR (Calan SR, Covera-HS)** 120-240 mg qd [120, 180, 240 mg].
4. **Amlodipine (Norvasc)** 2.5-10 mg qd [2.5, 5, 10 mg].
5. **Felodipine (Plendil)** 5-10 mg qd [2.5, 5, 10 mg].

Syncope

1. **Admit to:** Monitored ward
2. **Diagnosis:** Syncope
3. **Condition:**
4. **Vital Signs:** q1h, postural BP and pulse q12h. Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10
5. **Activity:** Bed rest.
6. **Nursing:** Fingerstick glucose.
7. **Diet:** Regular
8. **IV Fluids:** Normal saline at TKO.
9. **Special medications:**

High-Grade AV Block with Syncope:

-Atropine 1 mg IV x 2.
-Isoproterenol 0.5-1 mcg/min initially, then slowly titrate to 10 mcg/min IV infusion (1 mg in 250 mL NS).
-Transthoracic pacing**.**

Drug-Induced Syncope:

-Discontinue vasodilators, centrally acting hypotensive agents, tranquilizers, antidepressants, and alcohol use.

Vasovagal Syncope:

-Scopolamine 1.5 mg transdermal patch q3 days.

Postural Syncope:

-Midodrine (ProAmatine) 2.5 mg PO tid, then increase to 5-10 mg PO tid [2.5, 5 mg]; contraindicated in coronary artery disease.
-Fludrocortisone 0.1-1.0 mg PO qd.

10. **Symptomatic Medications:**

-Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn headache.
-Docusate sodium (Colace) 100-200 mg PO qhs.

11. **Extras:** CXR, ECG, 24h Holter monitor, electrophysiologic study, tilt test, CT/MRI, EEG, impedance cardiography, echocardiogram.
12. **Labs:** CBC, SMA 7&12, CPK, CK-MB, troponin T, myoglobin, Mg, calcium, drug levels. UA, urine drug screen.

Pulmonary Disorders

Asthma

1. **Admit to:**
2. **Diagnosis:** Exacerbation of asthma
3. **Condition:**
4. **Vital Signs:** q6h. Call physician if P >140; R >30, <10; T >38.5°C; pulse oximeter <90%
5. **Activity:** Up as tolerated.
6. **Nursing:** Pulse oximeter, bedside peak flow rate before and after bronchodilator treatments.
7. **Diet:** Regular, no caffeine.
8. **IV Fluids:** D5 ½ NS at 125 cc/h.
9. **Special Medications:**
   -Oxygen 2 L/min by NC. Keep O_2 sat >90%.

Beta-Agonists, Acute Treatment:
- -Albuterol (Ventolin) 0.5 mg and ipratropium (Atrovent) 0.5 mg in 2.5 mL NS q1-2h until peak flow meter ≥200-250 L/min and sat ≥90%, then q4h **OR**
- -Levalbuterol (Xopenex) 0.63-1.25 mg by nebulization q6-8h prn.
- -Albuterol (Ventolin) MDI 3-8 puffs, then 2 puffs q3-6h prn, or powder 200 mcg/capsule inhaled qid.
- -Albuterol/Ipratropium (Combivent) 2-4 puffs qid.

Systemic Corticosteroids:
- -Methylprednisolone (Solu-Medrol) 60-125 mg IV q6h; then 30-60 mg PO qd. **OR**
- -Prednisone 20-60 mg PO qAM.

Aminophylline and Theophylline (second-line therapy):
- -Aminophylline load dose: 5.6 mg/kg **total** body weight in 100 mL D5W IV over 20 min. Maintenance of 0.5-0.6 mg/kg **ideal** body weight/h (500 mg in 250 mL D5W); reduce if elderly, heart/liver failure (0.2-0.4 mg/kg/hr). Reduce load 50-75% if taking theophylline (1 mg/kg of aminophylline will raise levels 2 mcg/mL) **OR**
- -Theophylline IV solution loading dose 4.5 mg/kg **total** body weight, then 0.4-0.5 mg/kg **ideal** body weight/hr.
- -Theophylline (Theo-Dur) 100-400 mg PO bid (3 mg/kg q8h); 80% of total daily IV aminophylline in 2-3 doses.

Maintenance Inhaled Corticosteroids (adjunct therapy):
- -Advair Diskus (fluticasone/salmeterol) one puff bid [doses of 100/50 mcg, 250/50 mcg, and 500/50 mcg]. Not appropriate for acute attacks.
- -Beclomethasone (Beclovent) MDI 4-8 puffs bid, with spacer 5 min after bronchodilator, followed by gargling with water.
- -Triamcinolone (Azmacort) MDI 2 puffs tid-qid or 4 puffs bid.
- -Flunisolide (AeroBid) MDI 2-4 puffs bid.
- -Fluticasone (Flovent) 2-4 puffs bid (44 or 110 mcg/puff).

Maintenance Treatment:
- -Salmeterol (Serevent) 2 puffs bid; not effective for acute asthma because of delayed onset of action.
- -Pirbuterol (Maxair) MDI 2 puffs q4-6h prn.
- -Bitolterol (Tornalate) MDI 2-3 puffs q1-3min, then 2-3 puffs q4-8h prn.
- -Fenoterol (Berotec) MDI 3 puffs, then 2 bid-qid.
- -Ipratropium (Atrovent) MDI 2-3 puffs tid-qid.

Prevention and Prophylaxis:
- -Cromolyn (Intal) 2-4 puffs tid-qid.
- -Nedocromil (Tilade) 2-4 puffs bid-qid.
- -Montelukast (Singulair) 10 mg PO qd.
- -Zafirlukast (Accolate) 20 mg PO bid.
- -Zileuton (Zyflo) 600 mg PO qid.

Acute Bronchitis
- -Ampicillin/sulbactam (Unasyn) 1.5 gm IV q6h **OR**
- -Cefuroxime (Zinacef) 750 mg IV q8h **OR**
- -Cefuroxime axetil (Ceftin) 250-500 mg PO bid **OR**
- -Trimethoprim/sulfamethoxazole (Bactrim DS), 1 tab PO bid **OR**
- -Levofloxacin (Levaquin) 500 mg PO/IV PO qd [250, 500 mg].
- -Amoxicillin 875 mg/clavulanate 125 mg (Augmentin 875) 1 tab PO bid.

10. **Symptomatic Medications:**
    - -Docusate sodium (Colace) 100 mg PO qhs.
    - -Famotidine (Pepcid) 20 mg IV/PO q12h **OR**
    - -Lansoprazole (Prevacid) 30 mg qd.
    - -Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn headache.
    - -Zolpidem (Ambien) 5-10 mg qhs prn insomnia.
11. **Extras:** Portable CXR, ECG, pulmonary function tests before and after bronchodilators; pulmonary rehabilitation; impedance cardiography, echocardiogram.
12. **Labs:** ABG, CBC with eosinophil count, SMA7, B-type natriuretic peptide (BNP). Theophylline level stat and after 24h of infusion. Sputum Gram stain, C&S.

Chronic Obstructive Pulmonary Disease

1. **Admit to:**
2. **Diagnosis:** Exacerbation of COPD
3. **Condition:**
4. **Vital Signs:** q4h. Call physician if P >130; R >30, <10; T >38.5°C; O_2 saturation <90%.
5. **Activity:** Up as tolerated; bedside commode.
6. **Nursing:** Pulse oximeter. Measure peak flow with portable peak flow meter bid and chart with vital signs. No sedatives.
7. **Diet:** No added salt, no caffeine. Push fluids.
8. **IV Fluids:** D5 1/2 NS with 20 mEq KCL/L at 125 cc/h.
9. **Special Medications:**
   -Oxygen 1-2 L/min by NC or 24-35% by Venturi mask, keep O_2 saturation 90-91%.

Beta-Agonists, Acute Treatment:
- -Albuterol (Ventolin) 0.5 mg and ipratropium (Atrovent) 0.5 mg in 2.5 mL NS q1-2h until peak flow meter ≥200-250 L/min, then q4h prn **OR**
- -Levalbuterol (Xopenex) 0.63-1.25 mg by nebulization q6-8h prn.
- -Albuterol (Ventolin) MDI 2-4 puffs q4-6h.

-Albuterol/Ipratropium (Combivent) 2-4 puffs qid.

Maintenance Corticosteroids and Anticholinergics:

-Methylprednisolone (Solu-Medrol) 60-125 mg IV q6h or 30-60 mg PO qd. **Followed by:**
-Prednisone 20-60 mg PO qd.
-Triamcinolone (Azmacort) MDI 2 puffs qid or 4 puffs bid.
-Beclomethasone (Beclovent) MDI 4-8 puffs bid with spacer, followed by gargling with water **OR**
-Flunisolide (AeroBid) MDI 2-4 puffs bid **OR**
-Ipratropium (Atrovent) MDI 2 puffs tid-qid **OR**
-Fluticasone (Flovent) 2-4 puffs bid (44 or 110 mcg/puff).

Aminophylline and Theophylline (second line therapy):

-Aminophylline loading dose, 5.6 mg/kg **total** body weight over 20 min (if not already on theophylline); then 0.5-0.6 mg/kg **ideal** body weight/hr (500 mg in 250 mL of D5W); reduce if elderly, or heart or liver disease (0.2-0.4 mg/kg/hr). Reduce loading to 50-75% if already taking theophylline (1 mg/kg of aminophylline will raise levels by 2 mcg/mL) **OR**
-Theophylline IV solution loading dose, 4.5 mg/kg **total** body weight, then 0.4-0.5 mg/kg **ideal** body weight/hr.
-Theophylline long acting (Theo-Dur) 100-400 mg PO bid-tid (3 mg/kg q8h); 80% of daily IV aminophylline in 2-3 doses.

Acute Bronchitis

-Trimethoprim/sulfamethoxazole (Septra DS) 160/800 mg PO bid or 160/800 mg IV q12h (10-15 mL in 100 cc D5W tid) **OR**
-Cefuroxime (Zinacef) 750 mg IV q8h **OR**
-Ampicillin/sulbactam (Unasyn) 1.5 gm IV q6h **OR**
-Doxycycline (Vibra-tabs) 100 mg PO/IV bid **OR**
-Azithromycin (Zithromax) 500 mg x 1, then 250 mg PO qd x 4 or 500 mg IV q24h **OR**
-Clarithromycin (Biaxin) 250-500 mg PO bid **OR**
-Levofloxacin (Levaquin) 500 mg PO/IV qd [250, 500 mg].

10. Symptomatic Medications:

-Docusate sodium (Colace) 100 mg PO qhs.
-Famotidine (Pepcid) 20 mg IV/PO bid **OR**
-Lansoprazole (Prevacid) 30 mg qd.
-Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn headache.
-Zolpidem (Ambien) 5-10 mg qhs prn insomnia.

11. Extras: Portable CXR, PFTs with bronchodilators, ECG, impedance cardiography, echocardiogram.

12. Labs: ABG, CBC, SMA7, UA. Theophylline level stat and after 12-24h of infusion. Sputum Gram stain and C&S, alpha 1 antitrypsin level**.**

Hemoptysis

1. **Admit to:** Intensive care unit
2. **Diagnosis:** Hemoptysis
3. **Condition:**
4. **Vital Signs:** q1-6h. Orthostatic BP and pulse bid. Call physician if BP >160/90, <90/60; P >130, <50; R>25, <10; T >38.5°C; O_2 sat <90%.
5. **Activity:** Bed rest with bedside commode. Keep patient in lateral decubitus, Trendelenburg's position, bleeding side down.
6. **Nursing:** Quantify all sputum and expectorated blood, suction prn. O_2 at 100% by mask, pulse oximeter. Discontinue narcotics and sedatives. Have double lumen endotracheal tube available for use. Foley to closed drainage.
7. **Diet:** NPO
8. **IV Fluids:** 1 L of NS wide open (≥6 gauge), then transfuse PRBC. Then infuse D5 1/2 NS at 125 cc/h.
9. **Special Medications:**
   -Transfuse 2-4 U PRBC wide open.
   -Promethazine/codeine (Phenergan with codeine) 5 cc PO q4-6h prn cough. Contraindicated in massive hemoptysis.
   -Initiate empiric antibiotics if bronchitis or infection is present.
10. **Extras:** CXR PA, LAT, ECG, VQ scan, contrast CT, bronchoscopy. PPD, pulmonary and thoracic surgery consults.
11. **Labs:** Type and cross 2-4 U PRBC. ABG, CBC, platelets, SMA7 and 12, ESR. Anti-glomerular basement antibody, rheumatoid factor, complement, anti-nuclear cytoplasmic antibody. Sputum Gram stain, C&S, AFB, fungal culture, and cytology qAM for 3 days. UA, INR/PTT, von Willebrand Factor. Repeat CBC q6h.

Anaphylaxis

1. **Admit to:**
2. **Diagnosis:** Anaphylaxis
3. **Condition:**
4. **Vital Signs:** q1-4h; call physician if BP systolic >160, <90; diastolic >90, <60; P >120, <50; R>25, <10; T >38.5°C
5. **Activity:** Bedrest
6. **Nursing:** O_2 at 6 L/min by NC or mask. Keep patient in Trendelenburg's position, No. 4 or 5 endotracheal tube at bedside. Foley to closed drainage.
7. **Diet:** NPO
8. **IV Fluids:** 2 IV lines. Normal saline or LR 1 L over 1-2h, then D5 ½ NS at 125 cc/h.
9. **Special Medications:**

Gastrointestinal Decontamination:

-Gastric lavage with normal saline until clear fluid if indicated for recent oral ingestion.
-Activated charcoal 50-100 gm, followed by magnesium citrate 6% solution 150-300 mL PO.

Bronchodilators:

-Epinephrine (1:1000) 0.3-0.5 mL SQ or IM q10min or 1-4 mcg/min IV **OR** in severe life-threatening reactions, give 0.5 mg (5.0 mL of 1: 10,000 solution) IV q5-10min prn. Epinephrine, 0.3 mg of 1:1000 solution, may be injected SQ at site of allergen injection **OR**
-Albuterol (Ventolin) 0.5%, 0.5 mL in 2.5 mL NS q30min by nebulizer prn **OR**
-Aerosolized 2% racemic epinephrine, 0.5-0.75 mL in 2-3 mL saline nebulized q1-6h.

Corticosteroids:
-Methylprednisolone (Solu-Medrol) 250 mg IV x 1, then 125 mg IV q6h **OR**
-Hydrocortisone sodium succinate 200 mg IV x 1, then 100 mg q6h, followed by oral prednisone 60 mg PO qd, tapered over 5 days.

Antihistamines:
-Diphenhydramine (Benadryl) 25-50 mg PO/IV q4-6h **OR**
-Hydroxyzine (Vistaril) 25-50 mg IM or PO q2-4h.
-Cetrizine (Zyrtec) 5-10 mg PO qd.
-Cimetadine (Tagamet) 300 mg PO/IV q6-8h.

Pressors and Other Agents:
-Norepinephrine (Levophed) 8-12 mcg/min IV, titrate to systolic 100 mm Hg (8 mg in 500 mL D5W) **OR**
-Dopamine (Intropin) 5-20 mcg/kg/min IV.

10. Extras: Portable CXR, ECG, allergy consult.
11. Labs: CBC, SMA 7&12.

Pleural Effusion

1. **Admit to:**
2. **Diagnosis:** Pleural effusion
3. **Condition:**
4. **Vital Signs:** q shift. Call physician if BP >160/90, <90/60; P>120, <50; R>25, <10; T >38.5°C
5. **Activity:**
6. **Diet:** Regular.
7. **IV Fluids:** D5W at TKO
8. **Extras:** CXR PA and LAT, repeat after thoracentesis; left and right lateral decubitus x-rays, ECG, ultrasound, PPD; pulmonary consult.

9. Labs: CBC, SMA 7&12, protein, albumin, amylase, ANA, ESR, INR/PTT, UA. Cryptococcal antigen, histoplasma antigen, fungal culture.

Thoracentesis:
Tube 1: LDH, protein, amylase, triglyceride, glucose (10 mL).
Tube 2: Gram stain, C&S, AFB, fungal C&S (20-60 mL, heparinized).
Tube 3: Cell count and differential (5-10 mL, EDTA).
Syringe: pH (2 mL collected anaerobically, heparinized on ice).
Bag or Bottle: Cytology.

Hematologic Disorders

Anticoagulant Overdose

Unfractionated Heparin Overdose:
1. Discontinue heparin infusion.
2. Protamine sulfate, 1 mg IV for every 100 units of heparin infused in preceding hour, dilute in 25 mL fluid, and give IV over 10 min (max 50 mg in 10 min period).

Low-Molecular-Weight Heparin (Enoxaparin) Overdose:
-Protamine sulfate 1 mg IV for each 1 mg of enoxaparin given. Repeat protamine 0.5 mg IV for each 1 mg of enoxaparin, if bleeding continues after 2-4 hours. Measure factor Xa.

Warfarin (Coumadin) Overdose:
-Gastric lavage with normal saline until clear fluid and activated charcoal if recent oral ingestion. Discontinue coumadin and heparin, and monitor hematocrit q2h.

Partial Reversal:
-Vitamin K (Phytonadione), 0.5-1.0 mg IV/SQ. Check INR in 24 hours, and repeat vitamin K dose if INR remains elevated.

Minor Bleeds:
-Vitamin K (Phytonadione), 5-10 mg IV/SQ q12h, titrated to desired INR.

Serious Bleeds:
-Vitamin K (Phytonadione), 10-20 mg in 50-100 mL fluid IV over 30-60 min (check INR q6h until corrected) **AND**
-Fresh frozen plasma 2-4 units x 1.
-Type and cross match for 2 units of PRBC, and transfuse wide open.
-Cryoprecipitate 10 U x 1 if fibrinogen is less than 100 mg/dL.

Labs: CBC, platelets, PTT, INR.

Deep Venous Thrombosis

1. **Admit to:**
2. **Diagnosis:** Deep vein thrombosis
3. **Condition:**
4. **Vital Signs:** q shift. Call physician if BP systolic >160, <90 diastolic, >90, <60; P >120, <50; R>25, <10; T >38.5°C.
5. **Activity:** Bed rest with legs elevated; bedside commode.
6. **Nursing:** Guaiac stools, warm packs to leg prn; measure calf and thigh circumference qd; no intramuscular injections.
7. **Diet:** Regular
8. **IV Fluids:** D5W at TKO
9. **Special Medications:**

Anticoagulation:
-Heparin (unfractionated) 80 U/kg IVP, then 18 U/kg/hr IV infusion. Check PTT 6 hours after initial bolus; adjust q6h until PTT 1.5-2.0 times control (50-80 sec). Overlap heparin and warfarin (Coumadin) for at least 4 days and discontinue heparin when INR has been 2.0-3.0 for two consecutive days **OR**
-Enoxaparin (Lovenox) outpatient: 1 mg/kg SQ q12h for DVT without pulmonary embolism. Overlap enoxaparin and warfarin for 4-5 days until INR is 2-3.
-Enoxaparin (Lovenox) inpatient: 1 mg/kg SQ q12h or 1.5 mg/kg SQ q24 h for DVT with or without pulmonary embolism. Overlap enoxaparin and warfarin (Coumadin) for at least 4 days and discontinue heparin when INR has been 2.0-3.0 for two consecutive days.
-Warfarin (Coumadin) 5-10 mg PO qd x 2-3 d; maintain INR 2.0-3.0. Coumadin is initiated on the first or second day only if the PTT is 1.5-2.0 times control [tab 1, 2, 2.5, 3, 4, 5, 6, 7.5, 10 mg].

10. **Symptomatic Medications:**
-Propoxyphene/acetaminophen (Darvocet N100) 1-2 tab PO q3-4h prn pain **OR**
-Hydrocodone/acetaminophen (Vicodin), 1-2 tab q4-6h PO prn pain.
-Docusate sodium (Colace) 100 mg PO qhs.
-Famotidine (Pepcid) 20 mg IV/PO q12h **OR**
-Lansoprazole (Prevacid) 30 mg qd.
-Zolpidem (Ambien) 5-10 mg qhs prn insomnia.

11. **Extras:** CXR PA and LAT, ECG; Doppler scan of legs. V/Q scan, chest CT scan.
12. **Labs:** CBC, INR/PTT, SMA 7. Protein C, protein S, antithrombin III, anticardiolipin antibody. UA with dipstick for blood. PTT 6h after bolus and q4-6h until PTT 1.5-2.0 x control then qd. INR at initiation of warfarin and qd.

Pulmonary Embolism

1. **Admit to:**
2. **Diagnosis:** Pulmonary embolism
3. **Condition:**
4. **Vital Signs:** q1-4h. Call physician if BP >160/90, <90/60; P >120, <50; R >30, <10; T >38.5°C; O_2 sat < 90%
5. **Activity:** Bedrest with bedside commode
6. **Nursing:** Pulse oximeter, guaiac stools, O_2 at 2 L by NC. Antiembolism stockings. No intramuscular injections. Foley to closed drainage.
7. **Diet:** Regular
8. **IV Fluids:** D5W at TKO.
9. **Special Medications:**

Anticoagulation:
-Heparin IV bolus 5000-10,000 Units (100 U/kg) IVP, then 1000-1500 U/h IV infusion (20 U/kg/h) [25,000 U in 500 mL D5W (50 U/mL)]. Check PTT 6 hours after initial bolus; adjust q6h until PTT 1.5-2 times control (60-80 sec). Overlap heparin and Coumadin for at least 4 days and discontinue heparin when INR has been 2.0-3.0 for two consecutive days.
-Enoxaparin (Lovenox) 1 mg/kg SQ q12h for 5 days for uncompli-

cated pulmonary embolism. Overlap warfarin as outlined above.
-Warfarin (Coumadin) 5-10 mg PO qd for 2-3 d, then 2-5 mg PO qd. Maintain INR of 2.0-3.0. Coumadin is initiated on second day if the PTT is 1.5-2.0 times control. Check INR at initiation of warfarin and qd [tab 1, 2, 2.5, 3, 4, 5, 6, 7.5, 10 mg].

Thrombolytics (indicated for hemodynamic compromise):

Baseline Labs: CBC, INR/PTT, fibrinogen q6h.

Alteplase (recombinant tissue plasminogen activator, Activase): 100 mg IV infusion over 2 hours, followed by heparin infusion at 15 U/kg/h to maintain PTT 1.5-2.5 x control **OR**

Streptokinase (Streptase): Pretreat with methylprednisolone 250 mg IV push and diphenhydramine (Benadryl) 50 mg IV push. Then give streptokinase, 250,000 units IV over 30 min, then 100,000 units/h for 24-72 hours. Initiate heparin infusion at 10 U/kg/hour; maintain PTT 1.5-2.5 x control.

10. Symptomatic Medications:
-Meperidine (Demerol) 25-100 mg IV prn pain.
-Docusate sodium (Colace) 100 mg PO qhs.
-Famotidine (Pepcid) 20 mg IV/PO q12h **OR**
-Lansoprazole (Prevacid) 30 mg qd.

11. Extras: CXR PA and LAT, ECG, VQ scan; chest CT scan, pulmonary angiography; Doppler scan of lower extremities, impedance cardiography.

12. Labs: CBC, INR/PTT, SMA7, ABG, cardiac enzymes. Protein C, protein S, antithrombin III, anticardiolipin antibody. UA . PTT 6 hours after bolus and q4-6h. INR now and qd.

Sickle Cell Crisis

1. Admit to:
2. Diagnosis: Sickle Cell Crisis
3. Condition:
4. Vital Signs: q shift.
5. Activity: Bedrest with bathroom privileges.
6. Nursing:
7. Diet: Regular diet, push oral fluids.
8. IV Fluids: D5 ½ NS at 100-125 mL/h.
9. Special Medications:
-Oxygen 2 L/min by NC or 30-100% by mask.
-Meperidine (Demerol) 50-150 mg IM/IV q4-6h prn pain.
-Hydroxyzine (Vistaril) 25-100 mg IM/IV/PO q3-4h prn pain.
-Morphine sulfate 10 mg IV/IM/SC q2-4h prn pain **OR**
-Ketorolac (Toradol) 30-60 mg IV/IM, then 15-30 mg IV/IM q6h prn pain (maximum of 3 days).
-Acetaminophen/codeine (Tylenol 3) 1-2 tabs PO q4-6h prn.
-Folic acid 1 mg PO qd.
-Penicillin V (prophylaxis), 250 mg PO qid [tabs 125,250,500 mg].
-Ondansetron (Zofran) 4 mg PO/IV q4-6h prn nausea or vomiting.

10. Symptomatic Medications:
-Zolpidem (Ambien) 5-10 mg qhs prn insomnia.
-Docusate sodium (Colace) 100-200 mg PO qhs.

Vaccination:
-Pneumovax before discharge 0.5 cc IM x 1 dose.
-Influenza vaccine (Fluogen) 0.5 cc IM once a year in the Fall.

11. Extras: CXR.

12. Labs: CBC, SMA 7, blood C&S, reticulocyte count, blood type and screen, parvovirus titers. UA.

Infectious Diseases

Meningitis

1. Admit to:
2. Diagnosis: Meningitis.
3. Condition:
4. Vital Signs: q1h. Call physician if BP systolic >160/90, <90/60; P >120, <50; R>25, <10; T >39°C or less than 36°C
5. Activity: Bed rest with bedside commode.
6. Nursing: Respiratory isolation, inputs and outputs, lumbar puncture tray at bedside.
7. Diet: NPO
8. IV Fluids: D5 1/2 NS at 125 cc/h with KCL 20 mEq/L.
9. Special Medications:
Empiric Therapy 15-50 years old:
-Vancomycin 1 gm IV q12h **AND EITHER**
-Ceftriaxone (Rocephin) 2 gm IV q12h (max 4 gm/d) **OR**
Cefotaxime (Claforan) 2 gm IV q4h.
Empiric Therapy >50 years old, Alcoholic, Corticosteroids or Hematologic Malignancy or other Debilitating Condition:
-Ampicillin 2 gm IV q4h **AND EITHER**
-Cefotaxime (Claforan) 2 gm IV q6h **OR**
Ceftriaxone (Rocephin) 2 gm IV q12h.
-Use Vancomycin 1 gm IV q12h in place of ampicillin if drug-resistant pneumococcus is suspected.
10. Symptomatic Medications:
-Dexamethasone (Decadron) 0.4 mg/kg IV q12h x 2 days to commence with first dose of antibiotic.
-Heparin 5000 U SC q12h or pneumatic compression stockings.
-Famotidine (Pepcid) 20 mg IV/PO q12h.
-Acetaminophen (Tylenol) 650 mg PO/PR q4-6h prn temp >39˚C.
-Docusate sodium 100-200 mg PO qhs.
11. Extras: CXR, ECG, PPD, CT scan.
12. Labs: CBC, SMA 7&12. Blood C&S x 2. UA with micro, urine C&S. Antibiotic levels peak and trough after 3rd dose, VDRL.
Lumbar Puncture:
CSF Tube 1: Gram stain, C&S for bacteria (1-4 mL).
CSF Tube 2: Glucose, protein (1-2 mL).
CSF Tube 3: Cell count and differential (1-2 mL).
CSF Tube 4: Latex agglutination or counterimmunoelectrophoresis antigen tests for S. pneumoniae, H. influenzae (type B), N. meningitides, E. coli, group B strep, VDRL, cryptococcal antigen, toxoplasma titers. India ink, fungal cultures, AFB (8-10 mL).

Infective Endocarditis

1. Admit to:
2. Diagnosis: Infective endocarditis
3. Condition:
4. Vital Signs: q4h. Call physician if BP systolic >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C
5. Activity: Up ad lib, bathroom privileges.
6. Diet: Regular
7. IV Fluids: Heparin lock with flush q shift.
8. Special Medications:
Subacute Bacterial Endocarditis Empiric Therapy:
-Penicillin G 3-5 million U IV q4h or ampicillin 2 gm IV q4h **AND** Gentamicin 1-1.5/mg/kg IV q8h.
Acute Bacterial Endocarditis Empiric Therapy
-Gentamicin 2 mg/kg IV; then 1-1.5 mg/kg IV q8h **AND** Nafcillin or oxacillin 2 gm IV q4h **OR** Vancomycin 1 gm IV q12h (1 gm in 250 mL of D5W over 1h).
Streptococci viridans/bovis:
-Penicillin G 3-5 million U IV q4h for 4 weeks **OR** Vancomycin 1 gm IV q12h for 4 weeks **AND** Gentamicin 1 mg/kg q8h for first 2 weeks.
Enterococcus:
-Gentamicin 1 mg/kg IV q8h for 4-6 weeks **AND** Ampicillin 2 gm IV q4h for 4-6 weeks **OR** Vancomycin 1 gm IV q12h for 4-6 weeks.
Staphylococcus aureus (methicillin sensitive, native valve):
-Nafcillin or Oxacillin 2 gm IV q4h for 4-6 weeks **OR** Vancomycin 1 gm IV q12h for 4-6 weeks **AND** Gentamicin 1 mg/kg IV q8h for first 3-5 days.
Methicillin-resistant Staphylococcus aureus (native valve):
-Vancomycin 1 gm IV q12h (1 gm in 250 mL D5W over 1h) for 4-6 weeks **AND** Gentamicin 1 mg/kg IV q8h for 3-5 days.
Methicillin-resistant Staph aureus or epidermidis (prosthetic valve):
-Vancomycin 1 gm IV q12h for 6 weeks **AND** Rifampin 600 mg PO q8h for 6 weeks **AND** Gentamicin 1 mg/kg IV q8h for 2 weeks.
Culture Negative Endocarditis:
-Penicillin G 3-5 million U IV q4h for 4-6 weeks **OR** Ampicillin 2 gm IV q4h for 4-6 weeks **AND** Gentamicin 1.5 mg/kg q8h for 2 weeks (or nafcillin, 2 gm IV q4h, and gentamicin if Staph aureus suspected in drug abuser or prosthetic valve).
Fungal Endocarditis:
-Amphotericin B 0.5 mg/kg/d IV plus flucytosine (5-FC) 150 mg/kg/d PO.
9. Symptomatic Medications:
-Famotidine (Pepcid) 20 mg IV/PO q12h.
-Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn temp >39˚ C.
-Docusate sodium 100-200 mg PO qhs.
10. Extras: CXR PA and LAT, echocardiogram, ECG.
11. Labs: CBC with differential, SMA 7&12. Blood C&S x 3-4 over 24h, serum cidal titers, minimum inhibitory concentration, minimum bactericidal concentration. Repeat C&S in 48h, then once a week.

Antibiotic levels peak and trough at 3rd dose. UA, urine C&S.

Pneumonia

1. **Admit to:**
2. **Diagnosis:** Pneumonia
3. **Condition:**
4. **Vital Signs:** q4-8h. Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C or O_2 saturation <90%.
5. **Activity:** Up ad lib, bathroom privileges.
6. **Nursing:** Pulse oximeter, inputs and outputs, nasotracheal suctioning prn, incentive spirometry.
7. **Diet:** Regular.
8. **IV Fluids:** IV D5 ½ NS at 125 cc/hr.
9. **Special Medications:**
   -Oxygen by NC at 2-4 L/min, or 24-50% by Ventimask, or 100% by non-rebreather (reservoir) to maintain O_2 saturation >90%.

Moderately Ill Patients Without Underlying Lung Disease From the Community:
-Cefuroxime (Zinacef) 0.75-1.5 gm IV q8h **OR**
Ampicillin/sulbactam (Unasyn) 1.5 gm IV q6h **AND EITHER**
-Erythromycin 500 mg IV/PO q6h **OR**
Clarithromycin (Biaxin) 500 mg PO bid **OR**
Azithromycin (Zithromax) 500 mg PO x 1, then 250 mg PO qd x 4 **OR**
Doxycycline (Vibramycin) 100 mg IV/PO q12h.

Moderately Ill Patients With Recent Hospitalization or Debilitated Nursing Home Patient:
-Ceftazidime (Fortaz) 1-2 gm IV q8h **OR**
Cefepime (Maxipime) 1-2 gm IV q12h **AND EITHER**
Gentamicin 1.5-2 mg/kg IV, then 1.0-1.5 mg/kg IV q8h or 7 mg/kg in 50 mL of D5W over 60 min IV q24h **OR**
-Ciprofloxacin (Cipro) 400 mg IV q12h or 500 mg PO q12h.

Critically Ill Patients:
-Initial treatment should consist of a macrolide with 2 antipseudomonal agents for synergistic activity:
-Erythromycin 0.5-1.0 gm IV q6h **AND EITHER**
-Cefepime (Maxipime) 20 mg IV q12h **OR**
Piperacillin/tazobactam (Zosyn) 3.75-4.50 gm IV q6h **OR**
Ticarcillin/clavulanate (Timentin) 3.1 gm IV q6h **OR**
Imipenem/cilastatin (Primaxin) 0.5-1.0 gm IV q6h **AND EITHER**

-Levofloxacin (Levaquin) 500 mg IV q24h **OR**
Ciprofloxacin (Cipro) 400 mg IV q12h **OR**
Tobramycin 2.0 mg/kg IV, then 1.5 mg/kg IV q8h or 7 mg/kg IV q24h.

Aspiration Pneumonia (community acquired):
-Clindamycin (Cleocin) 600-900 mg IV q8h (with gentamicin or 3rd gen cephalosporin) **OR**
-Ampicillin/sulbactam (Unasyn) 1.5-3 gm IV q6h (with gentamicin or 3rd gen cephalosporin)

Aspiration Pneumonia (nosocomial):
-Tobramycin 2 mg/kg IV then 1.5 mg/kg IV q8h or 7 mg/kg in 50 mL of D5W over 60 min IV q24h **OR**
Ceftazidime (Fortaz) 1-2 gm IV q8h **AND EITHER**
-Clindamycin (Cleocin) 600-900 mg IV q8h **OR**
Ampicillin/sulbactam or ticarcillin/clavulanate, or piperacillin/tazobactam or imipenem/cilastatin (see above) **OR**
Metronidazole (Flagyl) 500 mg IV q8h.

10. **Symptomatic Medications:**
    -Acetaminophen (Tylenol) 650 mg 2 tab PO q4-6h prn temp >38˚C or pain.
    -Docusate sodium (Colace) 100 mg PO qhs.
    -Famotidine (Pepcid) 20 mg IV/PO q12h.
    -Heparin 5000 U SQ q12h or pneumatic compression stockings.
11. **Extras:** CXR PA and LAT, ECG, PPD.
12. **Labs:** CBC with differential, SMA 7&12, ABG. Blood C&S x 2. Sputum Gram stain, C&S. Methenamine silver sputum stain (PCP); AFB smear/culture. Aminoglycoside levels peak and trough 3rd dose. UA, urine culture.

Specific Therapy for Pneumonia

Pneumococcus:
-Ceftriaxone (Rocephin) 2 gm IV q12h **OR**
-Cefotaxime (Claforan) 2 gm IV q6h **OR**
-Erythromycin 500 mg IV q6h **OR**
-Levofloxacin (Levaquin) 500 mg IV q24h **OR**
-Vancomycin 1 gm IV q12h if drug resistance.

Staphylococcus aureus:
-Nafcillin 2 gm IV q4h **OR**
-Oxacillin 2 gm IV q4h.

Klebsiella pneumoniae:
-Gentamicin 1.5-2 mg/kg IV, then 1.0-1.5 mg/kg IV q8h or 7 mg/kg in 50 mL of D5W over 60 min IV q24h **OR**
Ceftizoxime (Cefizox) 1-2 gm IV q8h **OR**
Cefotaxime (Claforan) 1-2 gm IV q6h.

Methicillin-resistant staphylococcus aureus (MRSA):
-Vancomycin 1 gm IV q12h.

Vancomycin-Resistant Enterococcus:
-Linezolid (Zyvox) 600 mg IV/PO q12h; active against MRSA as well **OR**
-Quinupristin/dalfopristin (Synercid) 7.5 mg/kg IV q8h (does not cover E faecalis).

Haemophilus influenzae:
-Ampicillin 1-2 gm IV q6h (beta-lactamase negative) **OR**
-Ampicillin/sulbactam (Unasyn) 1.5-3.0 gm IV q6h **OR**
-Cefuroxime (Zinacef) 1.5 gm IV q8h (beta-lactamase pos) **OR**
-Ceftizoxime (Cefizox) 1-2 gm IV q8h **OR**
-Ciprofloxacin (Cipro) 400 mg IV q12h **OR**
-Ofloxacin (Floxin) 400 mg IV q12h.
-Levofloxacin (Levaquin) 500 mg IV q24h.

Pseudomonas aeruginosa:
-Tobramycin 1.5-2.0 mg/kg IV, then 1.5-2.0 mg/kg IV q8h or 7 mg/kg in 50 mL of D5W over 60 min IV q24h **AND EITHER**
-Piperacillin, ticarcillin, mezlocillin or azlocillin 3 gm IV q4h **OR**

-Cefepime (Maxipime) 2 gm IV q12h.

Enterobacter Aerogenes or Cloacae:
-Gentamicin 2.0 mg/kg IV, then 1.5 mg/kg IV q8h **AND EITHER**
Meropenem (Merrem) 1 gm IV q8h **OR**
Imipenem/cilastatin (Primaxin) 0.5-1.0 gm IV q6h.

Serratia Marcescens:
-Ceftizoxime (Cefizox) 1-2 gm IV q8h **OR**
-Aztreonam (Azactam) 1-2 gm IV q6h **OR**
-Imipenem/cilastatin (Primaxin) 0.5-1.0 gm IV q6h **OR**
-Meropenem (Merrem) 1 gm IV q8h.

Mycoplasma pneumoniae:
-Clarithromycin (Biaxin) 500 mg PO bid **OR**
-Azithromycin (Zithromax) 500 mg PO x 1, then 250 mg PO qd for 4 days **OR**
-Erythromycin 500 mg PO or IV q6h **OR**
-Doxycycline (Vibramycin) 100 mg PO/IV q12h **OR**
-Levofloxacin (Levaquin) 500 mg PO/IV q24h.

Legionella pneumoniae:
-Erythromycin 1.0 gm IV q6h **OR**
-Levofloxacin (Levaquin) 500 mg PO/IV q24h.
-Rifampin 600 mg PO qd may be added to erythromycin or levofloxacin.

Moraxella catarrhalis:
-Trimethoprim/sulfamethoxazole (Bactrim, Septra) one DS tab PO bid or 10 mL IV q12h **OR**
-Ampicillin/sulbactam (Unasyn) 1.5-3 gm IV q6h **OR**
-Cefuroxime (Zinacef) 0.75-1.5 gm IV q8h **OR**
-Erythromycin 500 mg IV q6h **OR**
-Levofloxacin (Levaquin) 500 mg PO/IV q24h.

Anaerobic Pneumonia:
-Penicillin G 2 MU IV q4h **OR**
-Clindamycin (Cleocin) 900 mg IV q8h **OR**
-Metronidazole (Flagyl) 500 mg IV q8h.

Pneumocystis Carinii Pneumonia and HIV

1. **Admit to:**
2. **Diagnosis:** PCP pneumonia
3. **Condition:**
4. **Vital Signs:** q2-6h. Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; O_2 sat <90%
5. **Activity:** Bedrest, bedside commode.
6. **Nursing:** Pulse oximeter.
7. **Diet:** Regular, encourage fluids.
8. **IV Fluids:** D5 ½ NS at 125 cc/h.
9. **Special Medications:**

Pneumocystis Carinii Pneumonia:
-Oxygen at 2-4 L/min by NC or by mask.
-Trimethoprim/sulfamethoxazole (Bactrim, Septra) 15 mg of TMP/kg/day (20 mL in 250 mL of D5W IVPB q8h) for 21 days [inj: 80/400 mg per 5 mL].
-If severe PCP (PaO_2 <70 mm Hg): add prednisone 40 mg PO bid for 5 days, then 40 mg qd for 5 days, then 20 mg qd for 11 days **OR** Methylprednisolone (Solu-Medrol) 30 mg IV q12h for 5 days, then 30 mg IV qd for 5 days, then 15 mg IV qd for 11 days.
-Pentamidine (Pentam) 4 mg/kg IV qd for 21 days, with prednisone as above. Pentamidine is an alternative if inadequate response or intolerant to TMP-SMX.

Pneumocystis Carinii Prophylaxis (previous PCP or CD4 <200, or constitutional symptoms):
-Trimethoprim/SMX DS (160/800 mg) PO qd **OR**
-Pentamidine, 300 mg in 6 mL sterile water via Respirgard II nebulizer over 20-30 min q4 weeks **OR**
-Dapsone (DDS) 50 mg PO bid or 100 mg twice a week; contraindicated in G-6-PD deficiency.

Antiretroviral Therapy:

A. Combination therapy with 3 agents (two nucleoside analogs and a protease inhibitor) is recommended as initial therapy. Nucleotide analogs are similar to nucleosides and may be used interchangeably. Combination of atazanavir plus tenofovir or lamivudine plus abacavir plus tenofovir should be avoided because of the risk of treatment failure.

B. Nucleoside Analogs
1. Abacavir (Ziagen) 300 mg PO bid [300 mg, 20 mg/mL].
2. Didanosine (Videx, ddI) 200 mg bid for patients >60 kg; or 125 mg bid for patients <60 kg. [chewable tabs: 25, 50, 100, 150 mg; pwd 100, 167, 250 mg packets].
3. Emtricitabine (Emtriva) 200 mg PO qd.
4. Lamivudine (Epivir, 3TC) 150 mg twice daily [150 mg].
5. Stavudine (Zerit, D4T) 40 mg bid [15 mg, 20 mg, 30 mg and 40 mg capsules].
6. Zalcitabine (Hivid, ddC) 0.75 mg tid [0.375, 0.75].
7. Zidovudine (Retrovir, AZT) 200 mg tid (100, 200 mg caps, 50 mg/5 mL syrup).

C. Protease Inhibitors
1. Amprenavir (Agenerase) 1200 mg bid [50, 150 mg].
2. Atazanavir (Reyataz) 400 mg PO qd.
3. Indinavir (Crixivan) 800 mg tid [200, 400 mg].
4. Lopinavir/ritonavir (Kaletra) 400 mg/100 mg PO bid.
5. Nelfinavir (Viracept) 750 mg PO tid [250 mg].
6. Ritonavir (Norvir) 600 mg bid [100 mg, 80 mg/dL].
7. Saquinavir (Invirase) 600 mg tid with a meal [cap 200 mg].

D. Non-Nucleoside Reverse Transcriptase Inhibitors
1. Delavirdine (U-90) 400 mg tid.
2. Efavirenz (Sustiva) 600 mg PO qd [50, 100, 200 mg].
3. Nevirapine (Viramune) 200 mg qd for 2 weeks, then bid [200 mg].

E. Nucleotide Analogs
1. Tenofovir (Viread) 300 mg PO qd with food.

Postexposure HIV Prophylaxis

A. The injury should be immediately washed and scrubbed with soap and water.

B. Zidovudine 200 mg PO tid and lamivudine (3TC) 150 mg PO bid, plus indinavir (Crixivan) 800 mg PO tid for highest risk exposures. Treatment is continued for one month.

Zidovudine-Induced Neutropenia/Ganciclovir-Induced Leucopenia
-Recombinant human granulocyte colony-stimulating factor (G-CSF, Filgrastim, Neupogen) 1-2 mcg/kg SQ qd until absolute neutrophil count 500-1000; indicated only if endogenous erythropoietin level is low.

10. Symptomatic Medications:
-Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn headache or fever.
-Docusate sodium 100-200 mg PO qhs.

10. Extras: CXR PA and LAT.

11. Labs: ABG, CBC, SMA 7&12. Blood C&S x 2. Sputum for Gram stain, C&S, AFB. Giemsa immunofluorescence for Pneumocystis. CD4 count, HIV RNA, VDRL, serum cryptococcal antigen, UA.

Opportunistic Infections in HIV-Infected Patients

Oral Candidiasis:
-Fluconazole (Diflucan) 100-200 mg PO qd **OR**
-Ketoconazole (Nizoral) 400 mg PO qd **OR**
-Itraconazole (Sporanox) 200 mg PO qd **OR**
-Clotrimazole (Mycelex) troches 10 mg dissolved slowly in mouth 5 times/d.

Candida Esophagitis:
-Fluconazole (Diflucan) 200-400 mg PO qd for 14-21 days **OR**
-Ketoconazole (Nizoral) 200 mg PO bid **OR**
-Itraconazole (Sporanox) 200 mg PO qd for 2 weeks.
-Caspofungin (Cancidas) 50 mg IV qd x 2 weeks.

Primary or Recurrent Mucocutaneous HSV
-Acyclovir (Zovirax), 200-400 mg PO 5 times a day for 10 days, or 5 mg/kg IV q8h **OR** in cases of acyclovir resistance, foscarnet, 40 mg/kg IV q8h for 21 days.

Herpes Simplex Encephalitis (or visceral disease):
-Acyclovir (Zovirax) 10 mg/kg IV q8h for 10-21 days.

Herpes Varicella Zoster
-Acyclovir (Zovirax) 10 mg/kg IV over 60 min q8h for 7-14 days **OR** 800 mg PO 5 times/d for 7-10 days **OR**
-Famciclovir (Famvir) 500 mg PO q8h for 7 days [500 mg] **OR**
-Valacyclovir (Valtrex) 1000 mg PO q8h for 7 days [500 mg] **OR**
-Foscarnet (Foscavir) 40 mg/kg IV q8h.

Cytomegalovirus Retinitis:
-Ganciclovir (Cytovene) 5 mg/kg IV (dilute in 100 mL D5W over 60 min) q12h for 14-21 days **OR**
-Foscarnet (Foscavir) 60 mg/kg IV q8h for 2-3 weeks **OR**
-Cidofovir (Vistide) 5 mg/kg IV over 60 min q week for 2 weeks. Administer probenecid, 2 g PO 3 hours prior to cidofovir, 1 g PO 2 hours after, and 1 g PO 8 hours after.

Suppressive Treatment for Cytomegalovirus Retinitis:
-Ganciclovir (Cytovene) 5 mg/kg qd.
-Foscarnet (Foscavir) 90-120 mg IV qd **OR**
-Cidofovir (Vistide) 5 mg/kg IV over 60 min every 2 weeks with probenecid.

Acute Toxoplasmosis:
-Pyrimethamine 200 mg, then 50-75 mg qd, plus sulfadiazine 1.0-1.5 gm PO q6h, plus folinic acid 10 mg PO qd **OR**
-Atovaquone (Mepron) 750 mg PO tid.

Suppressive Treatment for Toxoplasmosis:
-Pyrimethamine 25-50 mg PO qd plus sulfadiazine 0.5-1.0 gm PO q6h plus folinic acid 5 mg PO qd **OR**
-Pyrimethamine 50 mg PO qd, plus clindamycin 300 mg PO qid, plus folinic acid 5 mg PO qd.

Cryptococcus Neoformans Meningitis:
-Amphotericin B 0.7-1.0 mg/kg/d IV; total dosage of 2 g, with or without 5-flucytosine 100 mg/kg PO qd in divided doses, followed by fluconazole (Diflucan) 400 mg PO qd or itraconazole (Sporanox) 200 mg PO bid 6-8 weeks **OR**
-Amphotericin B liposomal (Abelcet) 5 mg/kg IV q24h **OR**
-Fluconazole (Diflucan) 400-800 mg PO qd for 8-12 weeks

Suppressive Treatment of Cryptococcus:
-Fluconazole (Diflucan) 200 mg PO qd indefinitely.

Active Tuberculosis:
-Isoniazid (INH) 300 mg PO qd; and rifampin 600 mg PO qd; and pyrazinamide 15-25 mg/kg PO qd (500 mg bid-tid); and ethambutol 15-25 mg/kg PO qd (400 mg bid-tid).
-All four drugs are continued for 2 months; isoniazid and rifampin are continued for a period of at least 9 months and at least 6 months after the last negative cultures.
-Pyridoxine (Vitamin B6) 50 mg PO qd concurrent with INH.

Prophylaxis for Inactive Tuberculosis:
-Isoniazid 300 mg PO qd; and pyridoxine 50 mg PO qd for 12 months.

Disseminated Mycobacterium Avium Complex (MAC):
-Clarithromycin (Biaxin) 500 mg PO bid **AND**
Ethambutol 800-1000 mg qd; with or without rifabutin 450 mg qd.

Prophylaxis against Mycobacterium Avium Complex:
-Azithromycin (Zithromax) 1200 mg once a week.

Disseminated Coccidioidomycosis:
-Amphotericin (Fungizone) B 0.5-0.8 mg/kg IV qd, to a total dose 2.0 gm **OR**
-Amphotericin B liposomal (Abelcet) 5 mg/kg IV q24h **OR**
-Fluconazole (Diflucan) 400-800 mg PO or IV qd.

Disseminated Histoplasmosis:
-Amphotericin B (Fungizone) 0.5-0.8 mg/kg IV qd, to a total dose 15 mg/kg **OR**
-Amphotericin B liposomal (Abelcet) 5 mg/kg IV q24h **OR**
-Fluconazole (Diflucan) 400 mg PO qd **OR**
-Itraconazole (Sporanox) 300 mg PO bid for 3 days, then 200 mg PO bid.

Suppressive Treatment for Histoplasmosis:
-Fluconazole (Diflucan) 400 mg PO qd **OR**
-Itraconazole (Sporanox) 200 mg PO bid.

Septic Arthritis

1. **Admit to:**
2. **Diagnosis:** Septic arthritis
3. **Condition:**
4. **Vital Signs:** q shift
5. **Activity:** Up in chair as tolerated. Bedside commode with assistance.
6. **Nursing:** Warm compresses prn, keep joint immobilized. Passive range of motion exercises of the affected joint bid.
7. **Diet:** Regular diet.
8. **IV Fluids:** Heparin lock
9. **Special Medications:**

Empiric Therapy for Adults without Gonorrhea Contact:
-Nafcillin or oxacillin 2 gm IV q4h **AND**
Ceftizoxime (Cefizox) 1 gm IV q8h or ceftazidime 1 gm IV q8h or ciprofloxacin 400 mg IV q12h if Gram stain indicates presence of Gram negative organisms.

Empiric Therapy for Adults with Gonorrhea:
-Ceftriaxone (Rocephin) 1 gm IV q12h **OR**
-Ceftizoxime (Cefizox) 1 gm IV q8h **OR**
-Ciprofloxacin (Cipro) 400 mg IV q12h.
-Complete course of therapy with cefuroxime axetil (Ceftin) 400 mg PO bid.

10. **Symptomatic Medications:**
-Acetaminophen and codeine (Tylenol 3) 1-2 PO q4-6h prn pain.
-Heparin 5000 U SQ bid.
-Famotidine (Pepcid) 20 mg IV/PO q12h.
-Zolpidem (Ambien) 5-10 mg qhs prn insomnia.
-Docusate sodium 100-200 mg PO qhs.

11. **Extras:** X-ray views of joint (AP and lateral), CXR. Synovial fluid culture. Physical therapy consult for exercise program.
12. **Labs:** CBC, SMA 7&12, blood C&S x 2, VDRL, UA. Gonorrhea cultures of urethra, cervix. Antibiotic levels. Blood cultures x 2 for gonorrhea.

Synovial fluid:
Tube 1 - Glucose, protein, lactate, pH.
Tube 2 - Gram stain, C&S.
Tube 3 - Cell count.

Septic Shock

1. **Admit to:**
2. **Diagnosis:** Sepsis
3. **Condition:**
4. **Vital Signs:** q1h; Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; urine output < 25 cc/hr for 4h, O_2 saturation <90%.
5. **Activity:** Bed rest.
6. **Nursing:** Inputs and outputs, pulse oximeter. Foley catheter to closed drainage.
7. **Diet:** NPO
8. **IV Fluids:** 1 liter of normal saline wide open, then D5 ½ NS at 125 cc/h
9. **Special Medications:**
-Oxygen at 2-5 L/min by NC or mask.

Antibiotic Therapy

A. Initial treatment of life-threatening sepsis should include a third-generation cephalosporin (cefepime, ceftazidime, cefotaxime, ceftizoxime or ceftriaxone), or piperacillin/tazobactam, or ticarcillin/clavulanic acid or imipenem, each with an aminoglycoside (gentamicin, tobramycin or amikacin). If Enterobacter aerogenes or cloacae is suspected, treatment should begin with meropenem or imipenem with an aminoglycoside.

B. Intra-abdominal or pelvic infections, likely to involve anaerobes, should be treated with ampicillin, gentamicin and metronidazole; or either ticarcillin/clavulanic acid, ampicillin/sulbactam, piperacillin/tazobactam, imipenem, cefoxitin or cefotetan, each with an aminoglycoside.

C. Febrile neutropenic patients with neutrophil counts <500/mm^3 should be treated with vancomycin and ceftazidime, or piperacillin/tazobactam and tobramycin or imipenem and tobramycin.

D. Dosages for Antibiotics Used in Sepsis
-Ampicillin 1-2 gm IV q4h.
-Cefepime (Maxipime) 2 gm IV q12h.
-Cefotaxime (Claforan) 2 gm q4-6h.
-Ceftizoxime (Cefizox) 1-2 gm IV q8h.
-Ceftriaxone (Rocephin) 1-2 gm IV q12h (max 4 gm/d).
-Cefoxitin (Mefoxin) 1-2 gm q6h.
-Cefotetan (Cefotan) 1-2 gm IV q12h.
-Ceftazidime (Fortaz) 1-2 g IV q8h.
-Ticarcillin/clavulanate (Timentin) 3.1 gm IV q4-6h (200-300 mg/kg/d).
-Ampicillin/sulbactam (Unasyn) 1.5-3.0 gm IV q6h.
-Piperacillin/tazobactam (Zosyn) 3.375-4.5 gm IV q6h.
-Piperacillin or ticarcillin 3 gm IV q4-6h.
-Imipenem/cilastatin (Primaxin) 1.0 gm IV q6h.
-Meropenem (Merrem) 0.5-1.0 gm IV q8h.
-Gentamicin, tobramycin 100-120 mg (1.5 mg/kg) IV, then 80 mg IV q8h (1 mg/kg) or 7 mg/kg in 50 mL of D5W over 60 min IV q24h.
-Amikacin (Amikin) 7.5 mg/kg IV loading dose; then 5 mg/kg IV q8h.
-Vancomycin 1 gm IV q12h.
-Metronidazole (Flagyl) 500 mg (7.5 mg/kg) IV q6-8h.
-Clindamycin (Cleocin) 900 mg IV q8h.
-Aztreonam (Azactam) 1-2 gm IV q6-8h; max 8 g/day.

Recombinant human activated protein C
-Drotrecogin alfa, (Xigris), 24 mg/kg/h IV infusion for 96 hours.

Blood Pressure Support
-Dopamine 4-20 mcg/kg/min (400 mg in 250 cc D5W, 1600 mcg/mL).
-Norepinephrine 2-8 mcg/min IV infusion (8 mg in 250 mL D5W).
-Albumin 25 gm IV (100 mL of 25% solution) **OR**
-Hetastarch (Hespan) 500-1000 cc over 30-60 min (max 1500

cc/d).
-Dobutamine 5 mcg/kg/min, and titrate blood pressure to keep systolic BP >90 mm Hg; max 10 mcg/kg/min.

10. Symptomatic Medications:
-Acetaminophen (Tylenol) 650 mg PR q4-6h prn temp >39°C.
-Famotidine (Pepcid) 20 mg IV/PO q12h.
-Heparin 5000 U SQ q12h or pneumatic compression stockings.
-Docusate sodium 100-200 mg PO qhs.

11. Extras: CXR, KUB, ECG. Ultrasound, lumbar puncture.

12. Labs: CBC with differential, SMA 7&12, blood C&S x 3, T&C for 3-6 units PRBC, INR/PTT, drug levels peak and trough at 3rd dose. UA. Cultures of urine, sputum, wound, IV catheters, decubitus ulcers, pleural fluid.

Peritonitis

1. Admit to:
2. Diagnosis: Peritonitis
3. Condition:
4. Vital Signs: q1-6h. Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C.
5. Activity: Bed rest.
6. Nursing: Guaiac stools.
7. Diet: NPO
8. IV Fluids: D5 ½ NS at 125 cc/h.
9. Special Medications:

Primary Bacterial Peritonitis - Spontaneous:

Option 1:
-Ampicillin 1-2 gm IV q 4-6h (vancomycin 1 gm IV q12h if penicillin allergic) **AND EITHER**
Cefotaxime (Claforan) 1-2 gm IV q6h **OR**
Ceftizoxime (Cefizox) 1-2 gm IV q8h **OR**
Gentamicin or tobramycin 1.5 mg/kg IV, then 1 mg/kg q8h or 7 mg/kg in 50 mL of D5W over 60 min IV q24h.

Option 2:
-Ticarcillin/clavulanate (Timentin) 3.1 gm IV q6h **OR**
-Piperacillin/tazobactam (Zosyn) 3.375 gm IV q6h **OR**
-Imipenem/cilastatin (Primaxin) 0.5-1.0 gm IV q6h **OR**
-Meropenem (Merrem) 500-1000 mg IV q8h.

Secondary Bacterial Peritonitis – Abdominal Perforation or Rupture:

Option 1:
-Ampicillin 1-2 gm IV q4-6h **AND**
Gentamicin or tobramycin as above **AND**
Metronidazole (Flagyl) 500 mg IV q8h **OR**
Cefoxitin (Mefoxin) 1-2 gm IV q6h **OR**
Cefotetan (Cefotan) 1-2 gm IV q12h.

Option 2:
-Ticarcillin/clavulanate (Timentin) 3.1 gm IV q4-6h (200-300 mg/kg/d) with an aminoglycoside as above **OR**
-Piperacillin/tazobactam (Zosyn) 3.375 gm IV q6h with an aminoglycoside as above **OR**
-Ampicillin/sulbactam (Unasyn) 1.5-3.0 gm IV q6h with aminoglycoside as above **OR**
-Imipenem/cilastatin (Primaxin) 0.5-1.0 gm IV q6-8h **OR**
-Meropenem (Merrem) 500-1000 mg IV q8h.

Fungal Peritonitis:
-Amphotericin B peritoneal dialysis, 2 mg/L of dialysis fluid over the first 24 hours, then 1.5 mg in each liter **OR**
-Fluconazole (Diflucan) 200 mg IV x 1, then 100 mg IV qd.
-Caspofungin (Candidas) 70 mg IV x1, then 50 mg IV qd.

10. Symptomatic Medications:
-Famotidine (Pepcid) 20 mg IV/PO q12h.
-Acetaminophen (Tylenol) 325 mg PO/PR q4-6h prn temp >38.5°C.
-Heparin 5000 U SQ q12h.

11. Extras: Plain film, upright abdomen, lateral decubitus, CXR PA and LAT; surgery consult; ECG, abdominal ultrasound, CT scan.

12. Labs: CBC with differential, SMA 7&12, amylase, lactate, INR/PTT, UA with micro, C&S; drug levels peak and trough 3rd dose.
Paracentesis Tube 1: Cell count and differential (1-2 mL, EDTA purple top tube).
Tube 2: Gram stain of sediment; inject 10-20 mL into anaerobic and aerobic culture bottle; AFB, fungal C&S (3-4 mL).
Tube 3: Glucose, protein, albumin, LDH, triglycerides, specific gravity, bilirubin, amylase (2-3 mL, red top tube).
Syringe: pH, lactate (3 mL).

Diverticulitis

1. Admit to:
2. Diagnosis: Diverticulitis
3. Condition:
4. Vital Signs: qid. Call physician if BP systolic >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C.
5. Activity: Up ad lib.
6. Nursing: Inputs and outputs.
7. Diet: NPO. Advance to clear liquids as tolerated.
8. IV Fluids: 0.5-2 L NS over 1-2 hr then, D5 ½ NS at 125 cc/hr. NG tube at low intermittent suction (if obstructed).
9. Special Medications:

Regimen 1:
-Gentamicin or tobramycin 100-120 mg IV (1.5-2 mg/kg), then 80 mg IV q8h (5 mg/kg/d) or 7 mg/kg in 50 mL of D5W over 60 min IV q24h **AND EITHER**
Cefoxitin (Mefoxin) 2 gm IV q6-8h **OR**
Clindamycin (Cleocin) 600-900 mg IV q8h.

Regimen 2:
-Metronidazole (Flagyl) 500 mg q8h **AND**
Ciprofloxacin (Cipro) 250-500 mg PO bid or 200-300 mg IV q12h.

Outpatient Regimen:
-Metronidazole (Flagyl) 500 mg PO q6h **AND EITHER**
Ciprofloxacin (Cipro) 500 mg PO bid **OR**
Trimethoprim/SMX (Bactrim) 1 DS tab PO bid.

10. Symptomatic Medications:
-Meperidine (Demerol) 50-100 mg IM or IV q3-4h prn pain.
-Zolpidem (Ambien) 5-10 mg qhs PO prn insomnia.
11. Extras: Acute abdomen series, CXR PA and LAT, ECG, CT scan of abdomen, ultrasound, surgery and GI consults.
12. Labs: CBC with differential, SMA 7&12, amylase, lipase, blood cultures x 2, drug levels peak and trough 3rd dose. UA, C&S.

Lower Urinary Tract Infection

1. Admit to:
2. Diagnosis: UTI.
3. Condition:
4. Vital Signs: q shift. Call physician if BP <90/60; >160/90; R >30, <10; P >120, <50; T >38.5°C.
5. Activity: Up ad lib
6. Nursing:
7. Diet: Regular
8. IV Fluids:
9. Special Medications:
Lower Urinary Tract Infection (treat for 3-7 days):
-Trimethoprim-sulfamethoxazole (Septra) 1 double strength tab (160/800 mg) PO bid.
-Norfloxacin (Noroxin) 400 mg PO bid.
-Ciprofloxacin (Cipro) 250 mg PO bid.
-Levofloxacin (Levaquin) 500 mg IV/PO q24h.
-Lomefloxacin (Maxaquin) 400 mg PO qd.
-Enoxacin (Penetrex) 200-400 mg PO q12h; 1h before or 2h after meals.
-Cefpodoxime (Vantin) 100 mg PO bid.
-Cephalexin (Keflex) 500 mg PO q6h.
-Cefixime (Suprax) 200 mg PO q12h or 400 mg PO qd.
-Cefazolin (Ancef) 1-2 gm IV q8h.
Complicated or Catheter-Associated Urinary Tract Infection:
-Ceftizoxime (Cefizox) 1 gm IV q8h.
-Gentamicin 2 mg/kg, then 1.5/kg q8h or 7 mg/kg in 50 mL of D5W over 60 min IV q24h.
-Ticarcillin/clavulanate (Timentin) 3.1 gm IV q4-6h
-Ciprofloxacin (Cipro) 500 mg PO bid.
-Levofloxacin (Levaquin) 500 mg IV/PO q24h.
Prophylaxis (≥3 episodes/yr):
-Trimethoprim/SMX single strength tab PO qhs.
Candida Cystitis
-Fluconazole (Diflucan) 100 mg PO or IV x 1 dose, then 50 mg PO or IV qd for 5 days **OR**
-Amphotericin B continuous bladder irrigation, 50 mg/1000 mL sterile water via 3-way Foley catheter at 1 L/d for 5 days.
10. Symptomatic Medications:
-Phenazopyridine (Pyridium) 100 mg PO tid.
-Docusate sodium (Colace) 100 mg PO qhs.
-Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn temp >39° C.
-Zolpidem (Ambien) 5-10 mg qhs prn insomnia.
11. Extras: Renal ultrasound.
12. Labs: CBC, SMA 7. UA with micro, urine Gram stain, C&S.

Pyelonephritis

1. Admit to:
2. Diagnosis: Pyelonephritis
3. Condition:
4. Vital Signs: tid. Call physician if BP <90/60; >160/90; R >30, <10; P >120, <50; T >38.5°C.
5. Activity:
6. Nursing: Inputs and outputs.
7. Diet: Regular
8. IV Fluids: D5 ½ NS at 125 cc/h.
9. Special Medications:
-Trimethoprim-sulfamethoxazole (Septra) 160/800 mg (10 mL in 100 mL D5W IV over 2 hours) q12h or 1 double strength tab PO bid.
-Ciprofloxacin (Cipro) 500 mg PO bid or 400 mg IV q12h.
-Norfloxacin (Noroxin) 400 mg PO bid.
-Ofloxacin (Floxin) 400 mg PO or IV bid.
-Levofloxacin (Levaquin) 500 mg PO/IV q24h.
-In more severely ill patients, treatment with an IV third-generation cephalosporin, or ticarcillin/clavulanic acid, or piperacillin/tazobactam or imipenem is recommended with an aminoglycoside.
-Ceftizoxime (Cefizox) 1 gm IV q8h.
-Ceftazidime (Fortaz) 1 gm IV q8h.
-Ticarcillin/clavulanate (Timentin) 3.1 gm IV q6h.
-Piperacillin/tazobactam (Zosyn) 3.375 gm IV/PB q6h.
-Imipenem/cilastatin (Primaxin) 0.5-1.0 gm IV q6-8h.
-Gentamicin or tobramycin, 2 mg/kg IV, then 1.5 mg/kg q8h or 7 mg/kg in 50 mL of D5W over 60 min IV q24h.
10. Symptomatic Medications:
-Phenazopyridine (Pyridium) 100 mg PO tid.
-Meperidine (Demerol) 50-100 mg IM q4-6h prn pain.
-Docusate sodium (Colace) 100 mg PO qhs.
-Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn temp >39° C.
-Zolpidem (Ambien) 5-10 mg qhs prn insomnia.
11. Extras: Renal ultrasound, KUB.
12. Labs: CBC with differential, SMA 7. UA with micro, urine Gram stain, C&S; blood C&S x 2. Drug levels peak and trough third dose.

Osteomyelitis

1. Admit to:
2. Diagnosis: Osteomyelitis
3. Condition:
4. Vital Signs: qid. Call physician if BP <90/60; T >38.5°C.
5. Activity: Bed rest with bathroom privileges.

6. Nursing: Keep involved extremity elevated. Range of motion exercises tid.
7. Diet: Regular, high fiber.
8. IV Fluids: Heparin lock with flush q shift.
9. Special Medications:
Adult Empiric Therapy:
-Nafcillin or oxacillin 2 gm IV q4h **OR**
-Cefazolin (Ancef) 1-2 gm IV q8h **OR**
-Vancomycin 1 gm IV q12h (1 gm in 250 cc D5W over 1h).
-**Add** 3rd generation cephalosporin if gram negative bacilli on Gram stain. Treat for 4-6 weeks.
Post-Operative or Post-Trauma:
-Vancomycin 1 gm IV q12h **AND** ceftazidime (Fortaz) 1-2 gm IV q8h.
-Imipenem/cilastatin (Primaxin)**(single-drug treatment)** 0.5-1.0 gm IV q6-8h.
-Ticarcillin/clavulanate (Timentin)**(single-drug treatment)** 3.1 gm IV q4-6h.
-Ciprofloxacin (Cipro) 500-750 mg PO bid or 400 mg IV q12h **AND**
Rifampin 600 mg PO qd.
Osteomyelitis with Decubitus Ulcer:
-Cefoxitin (Mefoxin), 2 gm IV q6-8h.
-Ciprofloxacin (Cipro) and metronidazole 500 mg IV q8h.
-Imipenem/cilastatin (Primaxin), 0.5-1.0 gm IV q6-8h.
-Nafcillin, gentamicin and clindamycin; see dosage above.
10. Symptomatic Medications:
-Meperidine (Demerol) 50-100 mg IM q3-4h prn pain.
-Docusate (Colace) 100 mg PO qhs.
-Heparin 5000 U SQ bid.
11. Extras: Technetium/gallium bone scans, multiple X-ray views, CT/MRI.
12. Labs: CBC with differential, SMA 7, blood C&S x 3, MIC, MBC, UA with micro, C&S. Needle biopsy of bone for C&S. Trough antibiotic levels.

Active Pulmonary Tuberculosis

1. Admit to:
2. Diagnosis: Active Pulmonary Tuberculosis
3. Condition:
4. Vital Signs: q shift
5. Activity: Up ad lib in room.
6. Nursing: Respiratory isolation.
7. Diet: Regular
8. Special Medications:
-Isoniazid 300 mg PO qd (5 mg/kg/d, max 300 mg/d) **AND**
Rifampin 600 mg PO qd (10 mg/kg/d, 600 mg/d max) **AND**
Pyrazinamide 500 mg PO bid-tid (15-30 mg/kg/d, max 2.5 gm) **AND**
Ethambutol 400 mg PO bid-tid (15-25 mg/kg/d, 2.5 gm/d max).
-Empiric treatment consists of a 4-drug combination of isoniazid (INH), rifampin, pyrazinamide (PZA), and either ethambutol or streptomycin. A modified regimen is recommended for patients known to have INH-resistant TB. Treat for 8 weeks with the four-drug regimen, followed by 18 weeks of INH and rifampin.
-Pyridoxine 50 mg PO qd with INH.
Prophylaxis
-Isoniazid 300 mg PO qd (5 mg/kg/d) x 6-9 months.
9. Extras: CXR PA, LAT, ECG.
10. Labs: CBC with differential, SMA7 and 12, LFTs, HIV serology. First AM sputum for AFB x 3 samples.

Cellulitis

1. Admit to:
2. Diagnosis: Cellulitis
3. Condition:
4. Vital Signs: tid. Call physician if BP <90/60; T >38.5°C
5. Activity: Up ad lib.
6. Nursing: Keep affected extremity elevated; warm compresses prn.
7. Diet: Regular, encourage fluids.
8. IV Fluids: Heparin lock with flush q shift.
9. Special Medications:
Empiric Therapy Cellulitis
-Nafcillin or oxacillin 1-2 gm IV q4-6h **OR**
-Cefazolin (Ancef) 1-2 gm IV q8h **OR**
-Vancomycin 1 gm q12h (1 gm in 250 cc D5W over 1h) **OR**
-Erythromycin 500 IV/PO q6h **OR**
-Dicloxacillin 500 mg PO qid; may add penicillin VK, 500 mg PO qid, to increase coverage for streptococcus **OR**
-Cephalexin (Keflex) 500 mg PO qid.
Immunosuppressed, Diabetic Patients, or Ulcerated Lesions:
-Nafcillin or cefazolin and gentamicin or aztreonam. Add clindamycin or metronidazole if septic.
-Cefazolin (Ancef) 1-2 gm IV q8h.
-Cefoxitin (Mefoxin) 1-2 gm IV q6-8h.
-Gentamicin 2 mg/kg, then 1.5 mg/kg IV q8h or 7 mg/kg in 50 mL of D5W over 60 min IV q24h **OR** aztreonam (Azactam) 1-2 gm IV q6h **PLUS**
-Metronidazole (Flagyl) 500 mg IV q8h or clindamycin 900 mg IV q8h.
-Ticarcillin/clavulanate (Timentin) **(single-drug treatment)** 3.1 gm IV q4-6h.
-Ampicillin/Sulbactam (Unasyn) **(single-drug therapy)** 1.5-3.0 gm IV q6h.
-Imipenem/cilastatin (Primaxin) **(single-drug therapy)** 0.5-1 mg IV q6-8h.
10. Symptomatic Medications:
-Acetaminophen/codeine (Tylenol #3) 1-2 PO q4-6h prn pain.
-Docusate (Colace) 100 mg PO qhs.
-Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn temp >39° C.
-Zolpidem (Ambien) 5-10 mg qhs prn insomnia.

11. Extras: Technetium/Gallium scans.
12. Labs: CBC, SMA 7, blood C&S x 2. Leading edge aspirate for Gram stain, C&S; UA, antibiotic levels.

Pelvic Inflammatory Disease

1. **Admit to:**
2. **Diagnosis:** Pelvic Inflammatory Disease
3. **Condition:**
4. **Vital Signs:** q8h. Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C
5. **Activity:** Up ad lib.
6. **Nursing:** Inputs and outputs.
7. **Diet:** Regular
8. **IV Fluids:** D5 ½ NS at 100-125 cc/hr.
9. **Special Medications:**
   - -Cefotetan (Cefotan), 2 g IV q12h, or cefoxitin (Mefoxin, 2 g IV q6h) plus doxycycline (100 mg IV or PO q12h) **OR**
   - -Clindamycin (Cleocin), 900 mg IV q8h, plus gentamicin (1-1.5 mg/kg IV q8h)
   - -Ampicillin-sulbactam (Unasyn), 3 g IV Q6h plus doxycycline (100 mg IV or PO Q12h)
   - -Parenteral administration of antibiotics should be continued for 24 hours after clinical response, followed by doxycycline (100 mg PO BID) or clindamycin (Cleocin, 450 mg PO QID) for a total of 14 days.
   - -Levofloxacin (Levaquin), 500 mg IV q24h, plus metronidazole (Flagyl, 500 mg IV q8h). With this regimen, azithromycin (Zithromax, 1 g PO once) should be given as soon as the patient is tolerating oral intake.
10. **Symptomatic Medications:**
    - -Acetaminophen (Tylenol) 1-2 tabs PO q4-6h prn pain or temperature >38.5°C.
    - -Meperidine (Demerol) 25-100 mg IM q4-6h prn pain.
    - -Zolpidem (Ambien) 10 mg PO qhs prn insomnia.

11. Labs: beta-HCG pregnancy test, CBC, SMA 7&12, ESR. GC culture, chlamydia direct fluorescent antibody stain. UA with micro, C&S, VDRL, HIV, blood cultures x 2. Pelvic ultrasound.

Gastrointestinal Disorders

Gastroesophageal Reflux Disease

1. Admit to:
2. Diagnosis: Gastroesophageal reflux disease.
3. Condition:
4. Vital Signs: q4h. Call physician if BP >160/90, <90/60; P >120, <50; T >38.5°C.
5. Activity: Up ad lib. Elevate the head of the bed by 6 to 8 inches.
6. Nursing: Guaiac stools.
7. Diet: Low-fat diet; no cola, citrus juices, or tomato products; avoid the supine position after meals; no eating within 3 hours of bedtime.
8. IV Fluids: D5 ½ NS with 20 mEq KCL at TKO.
9. Special Medications:
-Pantoprazole (Protonix) 40 mg PO/IV q24h **OR**
-Nizatidine (Axid) 300 mg PO qhs **OR**
-Omeprazole (Prilosec) 20 mg PO bid (30 minutes prior to meals) **OR**
-Lansoprazole (Prevacid) 15-30 mg PO qd [15, 30 mg caps] **OR**
-Esomeprazole (Nexium) 20 or 40 mg PO qd **OR**
-Rabeprazole (Aciphex) 20 mg delayed-release tablet PO qd **OR**
-Ranitidine (Zantac) 50 mg IV bolus, then continuous infusion at 12.5 mg/h (300 mg in 250 mL D5W at 11 mL/h over 24h) or 50 mg IV q8h **OR**
-Cimetidine (Tagamet) 300 mg IV bolus, then continuous infusion at 50 mg/h (1200 mg in 250 mL D5W over 24h) or 300 mg IV q6-8h **OR**
-Famotidine (Pepcid) 20 mg IV q12h.
10. Symptomatic Medications:
-Mylanta Plus or Maalox Plus 30 mg PO q2h prn.
-Trimethobenzamide (Tigan) 100-250 mg PO or 100-200 mg IM/PR q6h prn nausea **OR**
-Prochlorperazine (Compazine) 5-10 mg IM/IV/PO q4-6h or 25 mg PR q4-6h prn nausea.
11. Extras: Upright abdomen, KUB, CXR, ECG, endoscopy. GI consult, surgery consult.
12. Labs: CBC, SMA 7&12, amylase, lipase, LDH. UA.

Peptic Ulcer Disease

1. Admit to:
2. Diagnosis: Peptic ulcer disease.
3. Condition:
4. Vital Signs: q4h. Call physician if BP >160/90, <90/60; P >120, <50; T >38.5°C.
5. Activity: Up ad lib
6. Nursing: Guaiac stools.
7. Diet: NPO 48h, then regular diet, no caffeine.
8. IV Fluids: D5 ½ NS with 20 mEq KCL at 125 cc/h. NG tube at low intermittent suction (if obstructed).
9. Special Medications:
-Ranitidine (Zantac) 50 mg IV bolus, then continuous infusion at 12.5 mg/h (300 mg in 250 mL D5W at 11 mL/h over 24h) or 50 mg IV q8h **OR**
-Cimetidine (Tagamet) 300 mg IV bolus, then continuous infusion at 50 mg/h (1200 mg in 250 mL D5W over 24h) or 300 mg IV q6-8h **OR**
-Famotidine (Pepcid) 20 mg IV q12h **OR**
-Pantoprazole (Protonix) 40 mg PO/IV q24h **OR**
-Nizatidine (Axid) 300 mg PO qhs **OR**
-Omeprazole (Prilosec) 20 mg PO bid (30 minutes prior to meals) **OR**
-Lansoprazole (Prevacid) 15-30 mg PO qd prior to breakfast [15, 30 mg caps].

Eradication of Helicobacter pylori

A. Bismuth, Metronidazole, Tetracycline, Ranitidine
1. 14 day therapy.
2. Bismuth (Pepto Bismol) 2 tablets PO qid.
3. Metronidazole (Flagyl) 250 mg PO qid (tid if cannot tolerate the qid dosing).
4. Tetracycline 500 mg PO qid.
5. Ranitidine (Zantac) 150 mg PO bid.
6. Efficacy is greater than 90%.

B. Amoxicillin, Omeprazole, Clarithromycin (AOC)
1. 10 days of therapy.
2. Amoxicillin 1 gm PO bid.
3. Omeprazole (Prilosec) 20 mg PO bid.
4. Clarithromycin (Biaxin) 500 mg PO bid.

C. Metronidazole, Omeprazole, Clarithromycin (MOC)
1. 10 days of therapy
2. Metronidazole 500 mg PO bid.
3. Omeprazole (Prilosec) 20 mg PO bid.
4. Clarithromycin (Biaxin) 500 mg PO bid.
5. Efficacy is >80%
6. Expensive, usually well tolerated.

D. Omeprazole, Clarithromycin (OC)
1. 14 days of therapy.
2. Omeprazole (Prilosec) 40 mg PO qd for 14 days, then 20 mg qd for an additional 14 days of therapy.
3. Clarithromycin (Biaxin) 500 mg PO tid.

E. Ranitidine-Bismuth-Citrate, Clarithromycin (RBC-C)
1. 28 days of therapy.
2. Ranitidine-bismuth-citrate (Tritec) 400 mg PO bid for 28 days.
3. Clarithromycin (Biaxin) 500 mg PO tid for 14 days.
4. Efficacy is 70-80%; expensive

10. Symptomatic Medications:
-Mylanta Plus or Maalox Plus 30 mg PO q2h prn.
-Trimethobenzamide (Tigan) 100-250 mg PO or 100-200 mg IM/PR q6h prn nausea **OR**
-Prochlorperazine (Compazine) 5-10 mg IM/IV/PO q4-6h or 25 mg PR q4-6h prn nausea.

11. Extras: Upright abdomen, KUB, CXR, ECG, endoscopy. GI consult, surgery consult.
12. Labs: CBC, SMA 7&12, amylase, lipase, LDH. UA, Helicobacter pylori serology. Fasting serum gastrin qAM for 3 days. Urea breath test for H pylori.

Gastrointestinal Bleeding

1. Admit to:
2. Diagnosis: Upper/lower GI bleed
3. Condition:
4. Vital Signs: q30min. Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; urine output <15 mL/hr for 4h.
5. Activity: Bed rest
6. Nursing: Place nasogastric tube, then lavage with 2 L of room temperature normal saline, then connect to low intermittent suction. Repeat lavage q1h. Record volume and character of lavage. Foley to closed drainage; inputs and outputs.
7. Diet: NPO
8. IV Fluids: Two 16 gauge IV lines. 1-2 L NS wide open; transfuse 2-6 units PRBC to run as fast as possible, then repeat CBC.
9. Special Medications:
-Oxygen 2 L by NC.
-Pantoprazole (Protonix) 80 mg IV over 15min, then 8 mg/hr IV infusion **OR**
80 mg IV q12h.
-Ranitidine (Zantac) 50 mg IV bolus, then continuous infusion at 12.5 mg/h [300 mg in 250 mL D5W over 24h (11 cc/h)], or 50 mg IV q6-8h **OR**
-Famotidine (Pepcid) 20 mg IV q12h.
-Vitamin K (Phytonadione) 10 mg IV/SQ qd for 3 days (if INR is elevated).

Esophageal Variceal Bleeds:
-Somatostatin (Octreotide) 50 mcg IV bolus, followed by 50 mcg/h IV infusion (1200 mcg in 250 mL of D5W at 11 mL/h).

Vasopressin/Nitroglycerine Paste Therapy:
-Vasopressin (Pitressin) 20 U IV over 20-30 minutes, then 0.2-0.3 U/min [100 U in 250 mL of D5W (0.4 U/mL)] for 30 min, followed by increases of 0.2 U/min until bleeding stops or max of 0.9 U/min. If bleeding stops, taper over 24-48h **AND**
-Nitroglycerine paste 1 inch q6h **OR** nitroglycerin IV at 10-30 mcg/min continuous infusion (50 mg in 250 mL of D5W).

10. Extras: Portable CXR, upright abdomen, ECG. Surgery and GI consults.
Upper GI Bleeds: Esophagogastroduodenoscopy with coagulation or sclerotherapy; Linton-Nachlas tube for tamponade of esophageal varices.
Lower GI Bleeds: Sigmoidoscopy/colonoscopy (after a GoLytely purge 6-8 L over 4-6h), technetium 99m RBC scan, angiography with embolization.
11. Labs: Repeat hematocrit q2h; CBC with platelets q12-24h. Repeat INR in 6 hours. SMA 7&12, ALT, AST, alkaline phosphatase, INR/PTT, type and cross for 3-6 U PRBC and 2-4 U FFP.

Cirrhotic Ascites and Edema

1. Admit to:
2. Diagnosis: Cirrhotic ascites and edema
3. Condition:
4. Vital Signs: Vitals q4-6 hours. Call physician if BP >160/90, <90/60; P >120, <50; T >38.5°C; urine output <25 cc/hr for 4h.
5. Activity: Bed rest with legs elevated.
6. Nursing: Inputs and outputs, daily weights, measure abdominal girth qd, guaiac all stools.
7. Diet: 2500 calories, 100 gm protein; 500 mg sodium restriction; fluid restriction to 1-1.5 L/d (if hyponatremia, Na <130).
8. IV Fluids: Heparin lock with flush q shift.
9. Special Medications:
-Diurese to reduce weight by 0.5-1 kg/d (if edema) or 0.25 kg/d (if no edema).
-Spironolactone (Aldactone) 25-50 mg PO qid or 200 mg PO qAM, increase by 100 mg/d to max of 400 mg/d.
-Furosemide (Lasix [refractory ascites]) 40-120 mg PO or IV qd-bid. Add KCL 20-40 mEq PO qAM if renal function is normal **OR**
-Torsemide (Demadex) 20-40 mg PO/IV qd-bid.
-Metolazone (Zaroxolyn) 5-10 mg PO qd (max 20 mg/d).
-Captopril (Capoten) 6.75 mg PO q8h; increase to max 50 mg PO q8h for refractory ascites caused by hyperaldosteronism.
-Famotidine (Pepcid) 20 mg IV/PO q12h.
-Vitamin K 10 mg SQ qd for 3 days.
-Folic acid 1 mg PO qd.
-Thiamine 100 mg PO qd.
-Multivitamin PO qd.
Paracentesis: Remove up to 5 L of ascites if peripheral edema, tense ascites, or decreased diaphragmatic excursion. If large volume paracentesis without peripheral edema or with renal insufficiency, give salt-poor albumin, 12.5 gm for each 2 liters of fluid removed (50 mL of 25% solution); infuse 25 mL before paracentesis and 25 mL 6h after.

10. Symptomatic Medications:
-Docusate (Colace) 100 mg PO qhs.
-Lactulose 30 mL PO bid-qid prn constipation.
-Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn headache.
11. Extras: KUB, CXR, abdominal ultrasound, liver-spleen scan, GI consult.
12. Labs: Ammonia, CBC, SMA 7&12, LFTs, albumin, amylase, lipase, INR/PTT. Urine creatinine, Na, K. HBsAg, anti-HBs, hepatitis C virus antibody, alpha-1-antitrypsin.
Paracentesis Ascitic Fluid
Tube 1: Protein, albumin, specific gravity, glucose, bilirubin, amylase, lipase, triglyceride, LDH (3-5 mL, red top tube).
Tube 2: Cell count and differential (3-5 mL, purple top tube).
Tube 3: C&S, Gram stain, AFB, fungal (5-20 mL); inject 20 mL into bottle of blood culture at bedside.
Tube 4: Cytology (>20 mL).

Syringe: pH (2 mL).

Viral Hepatitis

1. Admit to:
2. Diagnosis: Hepatitis
3. Condition:
4. Vital Signs: qid. Call physician if BP <90/60; T >38.5°C.
5. Activity:
6. Nursing: Stool isolation.
7. Diet: Clear liquid (if nausea), low fat (if diarrhea).
8. Special Medications:
-Famotidine (Pepcid) 20 mg IV/PO q12h.
-Vitamin K 10 mg SQ qd for 3d.
-Multivitamin PO qd.
9. Symptomatic Medications:
-Meperidine (Demerol) 50-100 mg IM q4-6h prn pain.
-Trimethobenzamide (Tigan) 250 mg PO q6-8h prn pruritus or nausea q6-8h prn.
-Hydroxyzine (Vistaril) 25 mg IM/PO q4-6h prn pruritus or nausea.
-Diphenhydramine (Benadryl) 25-50 mg PO/IV q4-6h prn pruritus.
10. Extras: Ultrasound, GI consult.
11. Labs: CBC, SMA 7&12, GGT, LDH, amylase, lipase, INR/PTT, IgM anti-HAV, IgM anti-HBc, HBsAg, anti-HCV; alpha-1-antitrypsin, ANA, ferritin, ceruloplasmin, urine copper.

Cholecystitis and Cholangitis

1. Admit to:
2. Diagnosis: Bacterial cholangitis
3. Condition:
4. Vital Signs: q4h. Call physician if BP systolic >160, <90; diastolic. >90, <60; P >120, <50; R>25, <10; T >38.5°C.
5. Activity: Bed rest
6. Nursing: Inputs and outputs
7. Diet: NPO
8. IV Fluids: 0.5-1 L LR over 1h, then D5 ½ NS with 20 mEq KCL/L at 125 cc/h. NG tube at low constant suction. Foley to closed drainage.
9. Special Medications:
-Ticarcillin or piperacillin 3 gm IV q4-6h (single agent).
-Ampicillin 1-2 gm IV q4-6h and gentamicin 100 mg (1.5-2 mg/kg), then 80 mg IV q8h (3-5 mg/kg/d) and metronidazole 500 mg IV q8h.
-Imipenem/cilastatin (Primaxin) 1.0 gm IV q6h (single agent).
-Ampicillin/sulbactam (Unasyn) 1.5-3.0 gm IV q6h (single agent).
10. Symptomatic Medications:
-Meperidine (Demerol) 50-100 mg IV/IM q4-6h prn pain.
-Hydroxyzine (Vistaril) 25-50 mg IV/IM q4-6h prn with meperidine.

-Omeprazole (Prilosec) 20 mg PO bid.
-Heparin 5000 U SQ q12h.
-Enoxaparin (Lovenox) 30 mg SQ q12h.
11. Extras: CXR, ECG, RUQ ultrasound, HIDA scan, acute abdomen series. GI consult, surgical consult.
12. Labs: CBC, SMA 7&12, GGT, amylase, lipase, blood C&S x 2. UA, INR/PTT.

Acute Pancreatitis

1. Admit to:
2. Diagnosis: Acute pancreatitis
3. Condition:
4. Vital Signs: q1-4h, call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; urine output < 25 cc/hr for more than 4 hours.
5. Activity: Bed rest with bedside commode.
6. Nursing: Inputs and outputs, fingerstick glucose qid, guaiac stools. Foley to closed drainage.
7. Diet: NPO
8. IV Fluids: 1-4 L NS over 1-3h, then D5 ½ NS with 20 mEq KCL/L at 125 cc/hr. NG tube at low constant suction (if obstruction).
9. Special Medications:
-Ranitidine (Zantac) 6.25 mg/h (150 mg in 250 mL D5W at 11 mL/h) IV or 50 mg IV q6-8h **OR**
Famotidine (Pepcid) 20 mg IV q12h.
-Antibiotics are indicated for infected pancreatic pseudocysts or for abscess. Uncomplicated pancreatitis does not require antibiotics.
-Ticarcillin/clavulanate (Timentin) 3.1 gm IV, or ampicillin/sulbactam (Unasyn) 3.0 gm IV q6h or imipenem (Primaxin) 0.5-1.0 gm IV q6h.
-Heparin 5000 U SQ q12h.
-Total parenteral nutrition should be provided until the amylase and lipase are normal and symptoms have resolved.
10. Symptomatic Medications:
-Meperidine 50-100 mg IM/IV q3-4h prn pain.
11. Extras: Upright abdomen, portable CXR, ECG, ultrasound, CT with contrast. Surgery and GI consults.
12. Labs: CBC, platelets, SMA 7&12, calcium, triglycerides, amylase, lipase, LDH, AST, ALT; blood C&S x 2, hepatitis B surface antigen, INR/PTT, type and hold 4-6 U PRBC and 2-4 U FFP. UA.

Acute Gastroenteritis

1. Admit to:
2. Diagnosis: Acute Gastroenteritis
3. Condition:
4. Vital Signs: q6h; call physician if BP >160/90, <80/60; P >120; R>25; T >38.5°C.
5. Activity: Up ad lib
6. Nursing: Daily weights, inputs and outputs.
7. Diet: NPO except ice chips for 24h, then low residual elemental diet; no milk products.
8. IV Fluids: 1-2 L NS over 1-2 hours; then D5 ½ NS with 40 mEq KCL/L at 125 cc/h.
9. Special Medications:
Febrile or gross blood in stool or neutrophils on microscopic exam or prior travel:
-Ciprofloxacin (Cipro) 500 mg PO bid **OR**
-Levofloxacin (Levaquin) 500 mg PO qd **OR**
-Trimethoprim/SMX (Bactrim DS) (160/800 mg) one DS tab PO bid.
11. Extras: Upright abdomen. GI consult.
12. Labs: SMA7 and 12, CBC with differential, UA, blood culture x 2.
Stool studies: Wright's stain for fecal leukocytes, ova and parasites x 3, clostridium difficile toxin, culture for enteric pathogens, E coli 0157:H7 culture.

Specific Treatment of Acute Gastroenteritis

Shigella:
-Trimethoprim/SMX, (Bactrim) one DS tab PO bid for 5 days **OR**
-Ciprofloxacin (Cipro) 500 mg PO bid for 5 days **OR**
-Azithromycin (Zithromax) 500 mg PO x 1, then 250 mg PO qd x 4.
Salmonella (bacteremia):
-Ofloxacin (Floxin) 400 mg IV/PO q12h for 14 days **OR**
-Ciprofloxacin (Cipro) 400 mg IV q12h or 750 mg PO q12h for 14 days **OR**
-Trimethoprim/SMX (Bactrim) one DS tab PO bid for 14 days **OR**
-Ceftriaxone (Rocephin) 2 gm IV q12h for 14 days.
Campylobacter jejuni:
-Erythromycin 250 mg PO qid for 5-10 days **OR**
-Azithromycin (Zithromax) 500 mg PO x 1, then 250 mg PO qd x 4 **OR**
-Ciprofloxacin (Cipro) 500 mg PO bid for 5 days.
Enterotoxic/Enteroinvasive E coli (Travelers Diarrhea):
-Ciprofloxacin (Cipro) 500 mg PO bid for 5-7 days **OR**
-Trimethoprim/SMX (Bactrim), one DS tab PO bid for 5-7 days.
Antibiotic-Associated and Pseudomembranous Colitis (Clostridium difficile):
-Metronidazole (Flagyl) 250 mg PO or IV qid for 10-14 days **OR**
-Vancomycin 125 mg PO qid for 10 days (500 PO qid for 10-14 days, if recurrent).
Yersinia Enterocolitica (sepsis):
-Trimethoprim/SMX (Bactrim), one DS tab PO bid for 5-7 days **OR**
-Ciprofloxacin (Cipro) 500 mg PO bid for 5-7 days **OR**
-Ofloxacin (Floxin) 400 mg PO bid **OR**
-Ceftriaxone (Rocephin) 1 gm IV q12h.
Entamoeba Histolytica (Amebiasis):
Mild to Moderate Intestinal Disease:
-Metronidazole (Flagyl) 750 mg PO tid for 10 days **OR**
-Tinidazole 2 gm per day PO for 3 days **Followed By:**
-Iodoquinol 650 mg PO tid for 20 days **OR**
-Paromomycin 25-30 mg/kg/d PO tid for 7 days.
Severe Intestinal Disease:
-Metronidazole (Flagyl)750 mg PO tid for 10 days **OR**
-Tinidazole 600 mg PO bid for 5 days **Followed By:**
-Iodoquinol 650 mg PO tid for 20 days **OR**
-Paromomycin 25-30 mg/kg/d PO tid for 7 days.
Giardia Lamblia:
-Quinacrine 100 mg PO tid for 5d **OR**
-Metronidazole 250 mg PO tid for 7 days **OR**
-Nitazoxanide (Alinia) 200 mg PO q12h x 3 days.
Cryptosporidium:
-Paromomycin 500 mg PO qid for 7-10 days [250 mg] **OR**
-Nitazoxanide (Alinia) 200 mg PO q12h x 3 days.

Crohn's Disease

1. Admit to:
2. Diagnosis: Crohn's disease.
3. Condition:
4. Vital Signs: q8h. Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C
5. Activity: Up ad lib.
6. Nursing: Inputs and outputs. NG at low intermittent suction (if obstruction).
7. Diet: NPO except for ice chips and medications for 48h, then low residue or elemental diet, no milk products.
8. IV Fluids: 1-2 L NS over 1-3h, then D5 ½ NS with 40 mEq KCL/L at 125 cc/hr.
9. Special Medications:
-Mesalamine (Asacol) 400-800 mg PO tid or mesalamine (Pentasa) 1000 mg (four 250 mg tabs) PO qid **OR**
-Sulfasalazine (Azulfidine) 0.5-1 gm PO bid; increase over 10 days to 0.5-1 gm PO qid **OR**
-Olsalazine (Dipentum) 500 mg PO bid.
-Infliximab (Remicade) 5 mg/kg IV over 2 hours; may repeat at 2 and 6 weeks
-Prednisone 40-60 mg PO qd **OR**
-Hydrocortisone 50-100 mg IV q6h **OR**
-Methylprednisolone (Solu-Medrol) 10-20 mg IV q6h.
-Metronidazole (Flagyl) 250-500 mg PO q6h.

-Vitamin B_{12}, 100 mcg IM for 5d, then 100-200 mcg IM q month.
-Multivitamin PO qAM or 1 ampule IV qAM.
-Folic acid 1 mg PO qd.

10. Extras: Abdominal x-ray series, CXR, colonoscopy. GI consult.
11. Labs: CBC, SMA 7&12, Mg, ionized calcium, blood C&S x 2; stool Wright's stain, stool culture, C difficile antigen assay, stool ova and parasites x 3.

Ulcerative Colitis

1. Admit to:
2. Diagnosis: Ulcerative colitis
3. Condition:
4. Vital Signs: q4-6h. Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C.
5. Activity: Up ad lib in room.
6. Nursing: Inputs and outputs.
7. Diet: NPO except for ice chips for 48h, then low residue or elemental diet, no milk products.
8. IV Fluids: 1-2 L NS over 1-2h, then D5 ½ NS with 40 mEq KCL/L at 125 cc/hr.
9. Special Medications:
-Mesalamine (Asacol) 400-800 mg PO tid **OR**
-5-aminosalicylate (Mesalamine) 400-800 mg PO tid or 1 gm PO qid or enema 4 gm/60 mL PR qhs **OR**
-Sulfasalazine (Azulfidine) 0.5-1 gm PO bid, increase over 10 days as tolerated to 0.5-1.0 gm PO qid **OR**
-Olsalazine (Dipentum) 500 mg PO bid **OR**
-Hydrocortisone retention enema, 100 mg in 120 mL saline bid.
-Methylprednisolone (Solu-Medrol) 10-20 mg IV q6h **OR**
-Hydrocortisone 100 mg IV q6h **OR**
-Prednisone 40-60 mg PO qd.
-B12, 100 mcg IM for 5d then 100-200 mcg IM q month.
-Multivitamin PO qAM or 1 ampule IV qAM.
-Folate 1 mg PO qd.

10. Symptomatic Medications:
-Loperamide (Imodium) 2-4 mg PO tid-qid prn, max 16 mg/d **OR**
-Kaopectate 60-90 mL PO qid prn.

11. Extras: Upright abdomen. CXR, colonoscopy, GI consult.
12. Labs: CBC, SMA 7&12, Mg, ionized calcium, liver panel, blood C&S x 2; stool Wright's stain, stool for ova and parasites x 3, culture for enteric pathogens; Clostridium difficile antigen assay, UA.

Parenteral Nutrition

General Considerations: Daily weights, inputs and outputs. Finger stick glucose q6h.
Central Parenteral Nutrition:
-Infuse 40-50 mL/h of amino acid-dextrose solution in the first 24h; increase daily by 40 mL/hr increments until providing 1.3-2 x basal energy requirement and 1.2-1.7 gm protein/kg/d (see formula page 176).

Standard solution:

Amino acid solution (Aminosyn) 7-10%	500 mL
Dextrose 40-70%	500 mL
Sodium	35 mEq
Potassium	36 mEq
Chloride	35 mEq
Calcium	4.5 mEq
Phosphate	9 mmol
Magnesium	8.0 mEq
Acetate	82-104 mEq
Multi-trace element formula (zinc, copper, manganese, chromium)	1mL/d
Regular insulin (if indicated)	10-60 U/L
Multivitamin(12)(2 amp)	10 mL/d
Vitamin K (in solution, SQ, IM)	10 mg/week
Vitamin B12	1000 mcg/week
Selenium (after 20 days of continuous TPN)	80 mcg/d

Intralipid 20%, 500 mL/d IVPB; infuse in parallel with standard solution at 1 mL/min for 15 min; if no adverse reactions, increase to 100 mL/hr once daily or 20 mg/hr continuously. Obtain serum triglyceride 6h after end of infusion (maintain <250 mg/dL).

Cyclic Total Parenteral Nutrition:
-12h night schedule; taper continuous infusion in morning by reducing rate to half of original rate for 1 hour. Further reduce rate by half for an additional hour, then discontinue. Finger stick glucose q4-6h; restart TPN in afternoon. Taper at beginning and end of cycle. Final rate of 185 mL/hr for 9-10 h and 2 hours of taper at each end for total of 2000 mL.

Peripheral Parenteral Supplementation:
-3% amino acid solution (ProCalamine) up to 3 L/d at 125 cc/h **OR**
-Combine 500 mL amino acid solution 7% or 10% (Aminosyn) and 500 mL 20% dextrose and electrolyte additive. Infuse at up to 100 cc/hr in parallel with:
-Intralipid 10% or 20% at 1 mL/min for 15 min (test dose); if no adverse reactions, infuse 500 mL/d at 21 mL/h over 24h, or up to 100 mL/h over 5 hours daily.
-Draw triglyceride level 6h after end of Intralipid infusion.

7. **Special Medications:**
   -Famotidine (Pepcid) 20 mg IV q12h or 40 mg/day in TPN **OR**
   -Ranitidine (Zantac) 50 mg IV q8h or 150 mg/day in TPN.
8. **Extras:** Nutrition consult.
9. **Labs:**
   Daily labs: SMA7, osmolality, CBC, cholesterol, triglyceride, urine glucose and specific gravity.
   Twice weekly Labs: Calcium, phosphate, SMA-12, magnesium
   Weekly Labs: Serum albumin and protein, pre-albumin, ferritin, INR/PTT, zinc, copper, B12, folate, 24h urine nitrogen and creatinine.

Enteral Nutrition

General Considerations: Daily weights, inputs and outputs, naso-duodenal feeding tube. Head-of-bed at 30° while enteral feeding and 2 hours after completion.

Enteral Bolus Feeding: Give 50-100 mL of enteral solution (Pulmocare, Jevity, Vivonex, Osmolite, Vital HN) q3h. Increase amount in 50 mL steps to max of 250-300 mL q3-4h; 30 kcal of nonprotein calories/kg/d and 1.5 gm protein/kg/d. Before each feeding, measure residual volume, and delay feeding by 1h if >100 mL. Flush tube with 100 cc of water after each bolus.

Continuous enteral infusion: Initial enteral solution (Pulmocare, Jevity, Vivonex, Osmolite) 30 mL/hr. Measure residual volume q1h for 12h then tid; hold feeding for 1h if >100 mL. Increase rate by 25-50 mL/hr at 24 hr intervals as tolerated until final rate of 50-100 mL/hr. Three tablespoonfuls of protein powder (Promix) may be added to each 500 cc of solution. Flush tube with 100 cc water q8h.

Special Medications:
   -Metoclopramide (Reglan) 10-20 mg IV/NG **OR**
   -Erythromycin 125 mg IV or via nasogastric tube q8h.
   -Famotidine (Pepcid) 20 mg IV/PO q12h **OR**
   -Ranitidine (Zantac) 150 mg NG bid.

Symptomatic Medications:
   -Loperamide (Imodium) 2-4 mg NG/J-tube q6h prn, max 16 mg/d **OR**
   -Diphenoxylate/atropine (Lomotil) 1-2 tabs or 5-10 mL (2.5 mg/5 mL) PO/J-tube q4-6h prn, max 12 tabs/d **OR**
   -Kaopectate 30 cc NG or in J-tube q8h.

Extras: CXR, plain abdominal x-ray for tube placement, nutrition consult.

Labs:
   Daily labs: SMA7, osmolality, CBC, cholesterol, triglyceride. SMA-12
   Weekly labs when indicated: Protein, Mg, INR/PTT, 24h urine nitrogen and creatinine. Pre-albumin, retinol-binding protein.

Hepatic Encephalopathy

1. **Admit to:**
2. **Diagnosis:** Hepatic encephalopathy
3. **Condition:**
4. **Vital Signs:** q1-4h, neurochecks q4h. Call physician if BP >160/90,<90/60; P >120,<50; R>25,<10; T >38.5°C.
5. **Allergies:** Avoid sedatives, NSAIDS or hepatotoxic drugs.
6. **Activity:** Bed rest.
7. **Nursing:** Keep head-of-bed at 40 degrees, guaiac stools; turn patient q2h while awake, chart stools. Seizure precautions, egg crate mattress, soft restraints prn. Record inputs and outputs. Foley to closed drainage.
8. **Diet:** NPO for 8 hours, then low-protein nasogastric enteral feedings (Hepatic-Aid II) at 30 mL/hr. Increase rate by 25-50 mL/hr at 24 hr intervals as tolerated until final rate of 50-100 mL/hr as tolerated.
9. **IV Fluids:** D5W at TKO.
10. **Special Medications:**
   -Sorbitol 70% solution, 30-60 gm PO now.
   -Lactulose 30-45 mL PO q1h for 3 doses, then 15-45 mL PO bid-qid, titrate to produce 3 soft stools/d **OR**
   -Lactulose enema 300 mL added to 700 mL of tap water; instill 200-250 mL per rectal tube bid-qid **AND**
   -Neomycin 1 gm PO q6h (4-12 g/d) **OR**
   -Metronidazole (Flagyl) 250 mg PO q6h.
   -Ranitidine (Zantac) 50 mg IV q8h or 150 mg PO bid **OR**
   -Famotidine (Pepcid) 20 mg IV/PO q12h.
   -Flumazenil (Romazicon) 0.2 mg (2 mL) IV over 30 seconds q1min until a total dose of 3 mg; if a partial response occurs, continue 0.5 mg doses until a total of 5 mg. Flumazenil may help reverse hepatic encephalopathy, irrespective of benzodiazepine use.
   -Multivitamin PO qAM or 1 ampule IV qAM.
   -Folic acid 1 mg PO/IV qd.
   -Thiamine 100 mg PO/IV qd.
   -Vitamin K 10 mg SQ qd for 3 days if elevated INR.
11. **Extras:** CXR, ECG; GI and dietetics consults.
12. **Labs:** Ammonia, CBC, platelets, SMA 7&12, AST, ALT, GGT, LDH, alkaline phosphatase, protein, albumin, bilirubin, INR/PTT, ABG, blood C&S x 2, hepatitis B surface antibody. UA.

Alcohol Withdrawal

1. **Admit to:**
2. **Diagnosis:** Alcohol withdrawals/delirium tremens.
3. **Condition:**
4. **Vital Signs:** q4-6h. Call physician if BP >160/90, <90/60; P >130, <50; R>25, <10; T >38.5°C; or increase in agitation.
5. **Activity:**
6. **Nursing:** Seizure precautions. Soft restraints prn.
7. **Diet:** Regular, push fluids.
8. **IV Fluids:** Heparin lock or D5 ½ NS at 100-125 cc/h.
9. **Special Medications:**

Withdrawal syndrome:

-Chlordiazepoxide (Librium) 50-100 mg PO/IV q6h for 3 days **OR**
-Lorazepam (Ativan) 1 mg PO tid-qid.

Delirium tremens:

-Chlordiazepoxide (Librium) 100 mg slow IV push or PO, repeat q4-6h prn agitation or tremor for 24h; max 500 mg/d. Then give 50-100 mg PO q6h prn agitation or tremor **OR**
-Diazepam (Valium) 5 mg slow IV push, repeat q6h until calm, then 5-10 mg PO q4-6h.

Seizures:

-Thiamine 100 mg IV push **AND**
-Dextrose water 50%, 50 mL IV push.
-Lorazepam (Ativan) 0.1 mg/kg IV at 2 mg/min; may repeat x 1 if seizures continue.

Wernicke-Korsakoff Syndrome:

-Thiamine 100 mg IV stat, then 100 mg IV qd.

10. **Symptomatic Medications:**

-Multivitamin 1 amp IV, then 1 tab PO qd.
-Folate 1 mg PO qd.
-Thiamine 100 mg PO qd.
-Acetaminophen (Tylenol) 1-2 PO q4-6h prn headache.

11. **Extras:** CXR, ECG. Alcohol rehabilitation and social work consult.
12. **Labs:** CBC, SMA 7&12, Mg, amylase, lipase, liver panel, urine drug screen. UA, INR/PTT.

Toxicology

Poisoning and Drug Overdose

Decontamination:
- **-Gastric Lavage:** Place patient left side down, place nasogastric tube, and check position by injecting air and auscultating. Lavage with normal saline until clear fluid, then leave activated charcoal or other antidote. Gastric lavage is contraindicated for corrosives.
- **-Cathartics:**
- -Magnesium citrate 6% solution 150-300 mL PO
- -Magnesium sulfate 10% solution 150-300 mL PO.
- **-Activated Charcoal:** 50 gm PO (first dose should be given using product containing sorbitol). Repeat q2-6h for large ingestions.
- **-Hemodialysis** should be for isopropanol, methanol, ethylene glycol, severe salicylate intoxication (>100 mg/dL), lithium, or theophylline (if neurotoxicity, seizures, or coma).

Antidotes:

Narcotic Overdose:
- -Naloxone (Narcan) 0.4 mg IV/ET/IM/SC, may repeat q2min.

Methanol Ingestion:
- -Ethanol (10% in D5W) 7.5 mL/kg load, then 1.4 mL/kg/hr IV infusion until methanol level <20 mg/dL. Maintain ethanol level of 100-150 mg/100 mL.

Ethylene Glycol Ingestion:
- -Fomepizole (Antizol) 15 mg/kg IV over 30 min, then 10 mg/kg IV q12h x 4 doses, then 15 mg/kg IV q12h until ethylene glycol level is less than 20 mg/dL **AND**
- -Pyridoxine 100 mg IV q6h for 2 days and thiamine 100 mg IV q6h for 2 days.

Carbon Monoxide Intoxication:
- -Hyperbaric oxygen therapy or 100% oxygen by mask if hyperbaric oxygen is not available.

Tricyclic Antidepressants Overdose:
- -Gastric lavage
- -Magnesium citrate 300 mg PO/NG x1.
- -Activated charcoal premixed with sorbitol 50 gm NG round-the-clock until level is less than the toxic range.

Benzodiazepine Overdose:
- -Flumazenil (Romazicon) 0.2 mg (2 mL) IV over 30 seconds q1min until a total dose of 3 mg; if a partial response occurs, repeat 0.5 mg doses until a total of 5 mg. If sedation persists, repeat the above regimen or start a continuous IV infusion of 0.1-0.5 mg/h.

Labs: Drug screen (serum, gastric, urine); blood levels, SMA 7, fingerstick glucose, CBC, LFTs, ECG.

Acetaminophen Overdose

1. **Admit to:** Medical intensive care unit.
2. **Diagnosis:** Acetaminophen overdose
3. **Condition:**
4. **Vital Signs:** q1h with neurochecks. Call physician if BP >160/90, <90/60; P >130, <50 <50; R>25, <10; urine output <20 cc/h for 3 hours.
5. **Activity:** Bed rest with bedside commode.
6. **Nursing:** Inputs and outputs, aspiration and seizure precautions. Place large bore (Ewald) NG tube, then lavage with 2 L of NS.
7. **Diet:** NPO
8. **IV Fluids:**
9. **Special Medications:**
   - -Activated charcoal 30-100 gm doses, remove via nasogastric suction prior to acetylcysteine.
   - -Acetylcysteine (Mucomyst, NAC) 5% solution loading dose 140 mg/kg via nasogastric tube, then 70 mg/kg via NG tube q4h x 17 doses **OR** acetylcysteine 150 mg/kg IV in 200 mL D5W over 15 min, followed by 50 mg/kg in 500 mL D5W, infused over 4h, followed by 100 mg/kg in 1000 mL of D5W over next 16h. Complete all NAC doses even if acetaminophen levels fall below toxic range.
   - -Phytonadione (Aquamephyton) 5 mg IV/IM/SQ (if INR increased).
   - -Fresh frozen plasma 2-4 U (if INR is unresponsive to Aquamephyton).
   - -Trimethobenzamide (Tigan) 100-200 mg IM/PR q6h prn nausea.
10. **Extras:** ECG.
11. **Labs:** CBC, SMA 7&12, LFTs, INR/PTT, acetaminophen level now and in 4h. UA.

Theophylline Overdose

1. **Admit to:** Medical intensive care unit.
2. **Diagnosis:** Theophylline overdose
3. **Condition:**
4. **Vital Signs:** Neurochecks q2h. Call physician if BP >160/90, <90/60; P >130; <50; R >25, <10.
5. **Activity:** Bed rest
6. **Nursing:** ECG monitoring until level <20 mcg/mL, aspiration and seizure precautions. Insert single lumen NG tube and lavage with normal saline if recent ingestion.
7. **Diet:** NPO
8. **IV Fluids:** D5 ½ NS at 125 cc/h
9. **Special Medications:**
   - -Activated charcoal 50 gm PO round-the-clock, with sorbitol cathartic, until theophylline level <20 mcg/mL. Maintain head-of-bed at 30-45 degrees to prevent aspiration of charcoal.
   - -Charcoal hemoperfusion should be considered if the serum level is >60 mcg/mL or if signs of neurotoxicity, seizure, coma are present.
   - -**Seizure:** Lorazepam (Ativan) 0.1 mg/kg IV at 2 mg/min; may repeat x 1 if seizures continue.
10. **Extras:** ECG.

11. Labs: CBC, SMA 7&12, theophylline level now and in q6-8h; INR/PTT, liver panel. UA.

Tricyclic Antidepressant Overdose

1. **Admit to:** Medical intensive care unit.
2. **Diagnosis:** TCA Overdose
3. **Condition:**
4. **Vital Signs:** Neurochecks q1h.
5. **Activity:** Bedrest.
6. **Nursing:** Continuous suicide observation. ECG monitoring, measure QRS width hourly, inputs and outputs, aspiration and seizure precautions. Place single-lumen nasogastric tube and lavage with 2 liters of normal saline if recent ingestion.
7. **Diet:** NPO
8. **IV Fluids:** NS at 100-150 cc/hr.
9. **Special Medications:**
   -Activated charcoal premixed with sorbitol, 50 gm via NG tube q4-6h round-the-clock until the TCA level decreases to therapeutic range. Maintain head-of-bed at 30-45 degree angle to prevent charcoal aspiration.
   -Magnesium citrate 300 mL via nasogastric tube x 1 dose.
10. **Protection Against Cardiac Toxicity:**
    -If mechanical ventilation is necessary, hyperventilate to maintain pH 7.50-7.55.
    -Administer sodium bicarbonate 50-100 mEq (1-2 amps or 1-2 mEq/kg) IV over 5-10 min, followed by infusion of sodium bicarbonate (2 amps in D5W 1 L) at 100-150 cc/h. Adjust rate to maintain pH 7.50-7.55.
11. **Extras:** ECG.
12. **Labs:** Urine toxicology screen, serum TCA levels, liver panel, CBC, SMA-7 and 12, UA.

Neurologic Disorders

Ischemic Stroke

1. Admit to:
2. Diagnosis: Ischemic stroke
3. Condition:
4. Vital Signs: Vital signs and neurochecks q30minutes for 6 hours, then q60 minutes for 12 hours. Call physician if BP >185/105, <110/60; P >120, <50; R>24, <10; T >38.5°C; or change in neurologic status.
5. Activity: Bedrest.
6. Nursing: Head-of-bed at 30 degrees, turn q2h when awake, range of motion exercises qid. Foley catheter, eggcrate mattress. Guaiac stools, inputs and outputs.
Bleeding precautions: check puncture sites for bleeding or hematomas. Apply digital pressure or pressure dressing to active compressible bleeding sites.
7. Diet: NPO except medications for 24 hours, then dysphagia ground diet with thickened liquids.
8. IV Fluids and Oxygen: 0.45% normal saline at 100 cc/h. Oxygen at 2 L per minute by nasal cannula.
9. Special Medications:
Ischemic Stroke <3 hours:
a. Tissue plasminogen activator (t-PA, Alteplase) is indicated if the patient presents within 3 hours of onset of symptoms and the stroke is non-hemorrhagic; 0.9 mg/kg (max 90 mg) over 60 min. Give 10% of the total dose as an initial bolus over 1 minute.
b. Repeat CT scan or MRI 24 hours after completion of tPA. Begin heparin if scan results are negative for hemorrhage.
c. Heparin 12 U/kg/h continuous IV infusion, without a bolus. Check aPTT q6h to maintain 1.2-1.5 x control.

Completed Ischemic Stroke >3 hours:
-Aspirin enteric coated 325 mg PO qd **OR**
-Clopidogrel (Plavix) 75 mg PO qd **OR**
-Aspirin 25 mg/dipyridamole 200 mg (Aggrenox) 1 tab PO bid **OR**
-Aspirin 325 mg PO qd **PLUS** Clopidogrel (Plavix) 75 mg PO qd
10. Symptomatic Medications:
-Famotidine (Pepcid) 20 mg IV/PO q12h.
-Omeprazole (Prilosec) 20 mg PO bid or qhs.
-Docusate sodium (Colace) 100 mg PO qhs
-Bisacodyl (Dulcolax) 10-15 mg PO qhs or 10 mg PR prn.
-Acetaminophen (Tylenol) 650 mg PO/PR q4-6h prn temp >38˚C or headache.
11. Extras: CXR, ECG, CT without contrast or MRI with gadolinium contrast; carotid duplex scan; echocardiogram, 24-hour Holter monitor; swallowing studies. Physical therapy consult for range of motion exercises; neurology and rehabilitation medicine consults.
12. Labs: CBC, glucose, SMA 7&12, fasting lipid profile, VDRL, ESR; drug levels, INR/PTT, UA. Lupus anticoagulant, anticardiolipin antibody.

Transient Ischemic Attack

1. Admit to:
2. Diagnosis: Transient ischemic attack
3. Condition:
4. Vital Signs: q1-4h with neurochecks. Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; or change in neurologic status.
5. Activity: Up as tolerated.
6. Nursing: Guaiac stools.
7. Diet: Dysphagia ground with thickened liquids or regular diet.
8. IV Fluids: Heparin lock with flush q shift.
9. Special Medications:
-Aspirin 325 mg PO qd **OR**
-Clopidogrel (Plavix) 75 mg PO qd **OR**
-Aspirin 25 mg/dipyridamole 200 mg (Aggrenox) 1 tab PO bid.
-Heparin (only if recurrent TIAs or cardiogenic or vertebrobasilar source for emboli) 700-800 U/h (12 U/kg/h) IV infusion without a bolus (25,000 U in 500 mL D5W); adjust q6-12h until PTT 1.2-1.5 x control.
-Warfarin (Coumadin) 5.0-7.5 mg PO qd for 3d, then 2-4 mg PO qd. Titrate to INR of 2.0-2.5.
10. Symptomatic Medications:
-Famotidine (Pepcid) 20 mg IV/PO q12h.
-Docusate sodium (Colace) 100 mg PO qhs.
-Milk of magnesia 30 mL PO qd prn constipation.
11. Extras: CXR, ECG, CT without contrast; carotid duplex scan, echocardiogram, 24-hour Holter monitor. Physical therapy, neurology consults.
12. Labs: CBC, glucose, SMA 7&12, fasting lipid profile, VDRL, drug levels, INR/PTT, UA.

Subarachnoid Hemorrhage

1. Admit to:
2. Diagnosis: Subarachnoid hemorrhage
3. Condition:
4. Vital Signs: Vital signs and neurochecks q1-4h. Call physician if BP >185/105, <110/60; P >120, <50; R>24, <10; T >38.5°C; or change in neurologic status.
5. Activity: Bedrest.
6. Nursing: Head-of-bed at 30 degrees, turn q2h when awake. Foley catheter to closed drainage, eggcrate mattress. Guaiac stools, inputs and outputs.
7. Diet: NPO except medications.
8. IV Fluids and Oxygen: 0.45% normal saline at 100 cc/h. Oxygen at 2 L per minute by nasal cannula.
-Keep room dark and quiet; strict bedrest. Neurologic checks q1h for 12 hours, then q2h for 12 hours, then q4h. Call physician if abrupt change in neurologic status.

-Restrict total fluids to 1000 mL/day; diet as tolerated.

9. Special Medications:

-Nimodipine (Nimotop) 60 mg PO or via NG tube q4h for 21d, must start within 96 hours.

-Phenytoin (seizures) load 15 mg/kg IV in NS (infuse at max 50 mg/min), then 300 mg PO/IV qAM (4-6 mg/kg/d) **OR**

-Valproic acid (Depakene) 500-1000 mg IV q6h.

Hypertension:

-Nitroprusside sodium, 0.1-0.5 mcg/kg/min (50 mg in 250 mL NS), titrate to control blood pressure **OR**

-Labetalol (Trandate) 10-20 mg IV q15min prn or 1-2 mg/min IV infusion.

10. Extras: CXR, ECG, CT without contrast; MRI angiogram; cerebral angiogram. Neurology, neurosurgery consults.

11. Labs: CBC, SMA 7&12, VDRL, UA.

Seizure and Status Epilepticus

1. **Admit to:**
2. **Diagnosis:** Seizure
3. **Condition:**
4. **Vital Signs:** q6h with neurochecks. Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; or any change in neurological status.
5. **Activity:** Bed rest
6. **Nursing:** Finger stick glucose. Seizure precautions with bed rails up; padded tongue blade at bedside. EEG monitoring.
7. **Diet:** NPO for 24h, then regular diet if alert.
8. **IV Fluids:** D5 ½ NS at 100 cc/hr; change to heparin lock when taking PO.
9. **Special Medications:**

Status Epilepticus:

1. Maintain airway.

2. Position the patient laterally with the head down. The head and extremities should be cushioned to prevent injury.

3. A bite block or other soft object may be inserted into the mouth to prevent injury to the tongue.

4. Give 100% O_2 by mask. Obtain brief history and a fingerstick glucose.

5. Secure IV access and draw blood for glucose analysis. Give thiamine 100 mg IV push, then dextrose 50% 50 mL IV push.

6. Initial Control:

Lorazepam (Ativan) 6-8 mg (0.1 mg/kg; not to exceed 2 mg/min) IV at 1-2 mg/min. May repeat 6-8 mg q5-10min (max 80 mg/24h) **OR**

Diazepam (Valium), 5-10 mg slow IV at 1-2 mg/min. Repeat 5-10 mg q5-10 min prn (max 100 mg/24h).

Phenytoin (Dilantin) 15-20 mg/kg load in NS at 50 mg/min. Repeat 100-150 mg IV q30min, max 1.5 gm; monitor BP.

Fosphenytoin (Cerebyx) 20 mg/kg IV/IM (at 150 mg/min), then 4-6 mg/kg/day in 2 or 3 doses (150 mg IV/IM q8h). Fosphenytoin is metabolized to phenytoin; fosphenytoin may be given IM.

If seizures persist, administer phenobarbital 20 mg/kg IV at 50 mg/min, repeat 2 mg/kg q15min; additional phenobarbital may be given, up to max of 30-60 mg/kg.

7. If seizures persist, intubate the patient and give:

- Midazolam (Versed) 0.2 mg/kg IV push, then 0.045 mg/kg/hr; titrate up to 0.6 mg/kg/hr **OR**

-Propofol (Diprivan) 2 mg/kg IV push over 2-5 min, then 50 mcg/kg/min; titrate up to 165 mcg/kg/min **OR**

-Phenobarbital as above.

-Induce coma with pentobarbital 10-15 mg/kg IV over 1-2h, then 1-1.5 mg/kg/h continuous infusion. Initiate continuous EEG monitoring.

8. Consider Intubation and General Anesthesia

Maintenance Therapy for Epilepsy:

Primary Generalized Seizures – First-Line Therapy:

-Carbamazepine (Tegretol) 200-400 mg PO tid [100, 200 mg]. Monitor CBC.

-Phenytoin (Dilantin) loading dose of 400 mg PO, followed by 300 mg PO q4h for 2 doses (total of 1 g), then 300 mg PO qd or 100 mg tid or 200 mg bid [30, 50, 100 mg].

-Divalproex (Depakote) 250-500 mg PO tid-qid with meals [125, 250, 500 mg].

-Valproic acid (Depakene) 250-500 mg PO tid-qid with meals [250 mg].

Primary Generalized Seizures -- Second Line Therapy:

-Phenobarbital 30-120 mg PO bid [8, 16, 32, 65, 100 mg].

-Primidone (Mysoline) 250-500 mg PO tid [50, 250 mg]; metabolized to phenobarbital.

-Felbamate (Felbatol) 1200-2400 mg PO qd in 3-4 divided doses, max 3600 mg/d [400, 600 mg; 600 mg/5 mL susp]; adjunct therapy; aplastic anemia, hepatotoxicity.

-Gabapentin (Neurontin), 300-400 mg PO bid-tid; max 1800 mg/day [100, 300, 400 mg]; adjunct therapy.

-Lamotrigine (Lamictal) 50 mg PO qd, then increase to 50-250 mg PO bid [25, 100, 150, 200 mg]; adjunct therapy .

Partial Seizure:

-Carbamazepine (Tegretol) 200-400 mg PO tid [100, 200 mg].

-Divalproex (Depakote) 250-500 mg PO tid with meals [125, 250, 500 mg].

-Valproic acid (Depakene) 250-500 mg PO tid-qid with meals [250 mg].

-Phenytoin (Dilantin) 300 mg PO qd or 200 mg PO bid [30, 50, 100].

-Phenobarbital 30-120 mg PO tid or qd [8, 16, 32, 65, 100 mg].

-Primidone (Mysoline) 250-500 mg PO tid [50, 250 mg]; metabolized to phenobarbital.

-Gabapentin (Neurontin), 300-400 mg PO bid-tid; max 1800 mg/day [100, 300, 400 mg]; adjunct therapy.

-Lamotrigine (Lamictal) 50 mg PO qd, then increase to 50-250 mg PO bid [25, 100, 150, 200 mg]; adjunct therapy.

-Topiramate (Topamax) 25 mg PO bid; titrate to max 200 mg PO bid [tab 25, 100, 200 mg]; adjunctive therapy.

Absence Seizure:

-Divalproex (Depakote) 250-500 mg PO tid-qid [125, 250, 500 mg].

-Clonazepam (Klonopin) 0.5-5 mg PO bid-qid [0.5, 1, 2 mg].

-Lamotrigine (Lamictal) 50 mg PO qd, then increase to 50-250 mg PO bid [25, 100, 150, 200 mg]; adjunct therapy.

10. Extras: MRI with and without gadolinium or CT with contrast; EEG (with photic stimulation, hyperventilation, sleep deprivation, awake and asleep tracings); portable CXR, ECG.

11. Labs: CBC, SMA 7, glucose, Mg, calcium, phosphate, liver panel, VDRL, anticonvulsant levels. UA, drug screen.

Endocrinologic Disorders

Diabetic Ketoacidosis

1. **Admit to:**
2. **Diagnosis:** Diabetic ketoacidosis
3. **Condition:**
4. **Vital Signs:** q1-4h, postural BP and pulse. Call physician if BP >160/90, <90/60; P >140, <50; R >30, <10; T >38.5°C; or urine output <20 mL/hr for more than 2 hours.
5. **Activity:** Bed rest with bedside commode.
6. **Nursing:** Inputs and outputs. Foley to closed drainage. Record labs on flow sheet.
7. **Diet:** NPO for 12 hours, then clear liquids as tolerated.
8. **IV Fluids:**
   1-2 L NS over 1-3h (≥16 gauge), infuse at 400-1000 mL/h until hemodynamically stable, then change to 0.45% saline at 125-150 cc/hr; keep urine output >30-60 mL/h.
   Add KCL when serum potassium is <5.0 mEq/L.
   Concentration.....20-40 mEq KCL/L
   Use K phosphate, 20-40 mEq/L, in place of KCL if hypophosphatemic.
   Change to 5% dextrose in 0.45% saline with 20-40 mEq KCL/liter when blood glucose is 250-300 mg/dL.
9. **Special Medications:**
   -Oxygen at 2 L/min by NC.
   -Insulin regular (Humulin) 7-10 units (0.1 U/kg) IV bolus, then 7-10 U/h IV infusion (0.1 U/kg/h); 50 U in 250 mL of 0.9% saline; flush IV tubing with 20 mL of insulin solution before starting infusion. Adjust insulin infusion to decrease serum glucose by 100 mg/dL or less per hour. When bicarbonate level is >16 mEq/L and the anion gap is <16 mEq/L, decrease insulin infusion rate by half.
   -When the glucose level reaches 250 mg/dL, 5% dextrose should be added to the replacement fluids with KCL 20-40 mEq/L.
   -Use 10% glucose at 50-100 mL/h if anion gap persists and serum glucose has decreased to less than 100 mg/dL while on insulin infusion.
   -Change to subcutaneous insulin when the anion gap has cleared; discontinue insulin infusion 1-2h after subcutaneous dose.
10. **Symptomatic Medications:**
    -Famotidine (Pepcid) 20 mg IV q12h.
    -Docusate sodium (Colace) 100 mg PO qhs.
    -Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn headache.
11. **Extras:** Portable CXR, ECG.
12. **Labs:** Fingerstick glucose q1-2h. SMA 7 q4-6h. SMA 12, pH, bicarbonate, phosphate, amylase, lipase, hemoglobin A1c; CBC. UA, serum pregnancy test.

Nonketotic Hyperosmolar Syndrome

1. **Admit to:**
2. **Diagnosis:** Nonketotic hyperosmolar syndrome
3. **Condition:**
4. **Vital Signs:** q1h. Call physician if BP >160/90, <90/60; P >140, <50; R>25, <10; T >38.5° C; or urine output <20 cc/hr for more than 4 hours.
5. **Activity:** Bed rest with bedside commode.
6. **Nursing:** Input and output measurement. Foley to closed drainage. Record labs on flow sheet.
7. **Diet:** NPO.
8. **IV Fluids:** 1-2 L NS over 1h (≥16 gauge IV catheter), then give 0.45% saline at 125 cc/hr. Maintain urine output ≥50 mL/h.
   -Add 20-40 mEq/L KCL when urine output adequate.
9. **Special Medications:**
   -Insulin regular 2-3 U/h IV infusion (50 U in 250 mL of 0.9% saline).
   -Famotidine (Pepcid) 20 mg IV/PO q12h **OR**
   -Lansoprazole (Prevacid) 30 mg PO qd.
   -Heparin 5000 U SQ q12h.
10. **Extras:** Portable CXR, ECG.
11. **Labs:** Fingerstick glucose q1-2h x 6h, then q6h. SMA 7, osmolality. SMA 12, phosphate, ketones, hemoglobin A1C, CBC. UA.

Nephrologic Disorders

Renal Failure

1. **Admit to:**
2. **Diagnosis:** Renal failure
3. **Condition:**
4. **Vital Signs:** q8h. Call physician if QRS complex >0.14 sec; urine output <20 cc/hr; BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C.
5. **Allergies:** Avoid magnesium containing antacids, salt substitutes, NSAIDS. Discontinue phosphate or potassium supplements.
6. **Activity:** Bed rest.
7. **Nursing:** Daily weights, inputs and outputs, chart urine output. If no urine output for 4h, in-and-out catheterize. Guaiac stools.
8. **Diet:** Renal diet of high biologic value protein of 0.6-0.8 g/kg, sodium 2 g, potassium 1 mEq/kg, and at least 35 kcal/kg of nonprotein calories. In oliguric patients, daily fluid intake should be restricted to less than 1 L after volume has been normalized.
9. **IV Fluids:** D5W at TKO.
10. **Special Medications:**
    - -Consider fluid challenge (to rule out pre-renal azotemia if not fluid overloaded) with 500-1000 mL NS IV over 30 min. In acute renal failure, in-and-out catheterize and check postvoid residual to rule out obstruction.
    - -Furosemide (Lasix) 80-320 mg IV bolus over 10-60 min, double the dose if no response after 2 hours to total max 1000 mg/24h, or furosemide 1000 mg in 250 mL D5W at 20-40 mg/hr continuous IV infusion **OR**
    - -Torsemide (Demadex) 20-40 mg IV bolus over 5-10 min, double the dose up to max 200 mg/day **OR**
    - -Bumetanide (Bumex) 1-2 mg IV bolus over 1-20 min; double the dose if no response in 1-2 h to total max 10 mg/day.
    - -Metolazone (Zaroxolyn) 5-10 mg PO (max 20 mg/24h) 30 min before a loop diuretic.
    - -Hyperkalemia is treated with sodium polystyrene sulfonate (Kayexalate), 15-30 gm PO/NG/PR q4-6h.
    - -Hyperphosphatemia is controlled with calcium acetate (PhosLo), 2-3 tabs with meals.
    - -Metabolic acidosis is treated with sodium bicarbonate to maintain the serum pH >7.2 and the bicarbonate level >20 mEq/L. 1-2 amps (50-100 mEq) IV push, followed by infusion of 2-3 amps in 1000 mL of D5W at 150 mL/hr.
    - -Adjust all medications to creatinine clearance, and remove potassium phosphate and magnesium from IV. Avoid NSAIDs and nephrotoxic drugs.
11. **Extras:** CXR, ECG, renal ultrasound, nephrology and dietetics consults.
12. **Labs:** CBC, platelets, SMA 7&12, creatinine, BUN, potassium, magnesium, phosphate, calcium, uric acid, osmolality, ESR, INR/PTT, ANA.
Urine specific gravity, UA with micro, urine C&S; 1st AM spot urine electrolytes, eosinophils, creatinine, pH, osmolality; Wright's stain, urine electrophoresis. 24h urine protein, creatinine, sodium.

Nephrolithiasis

1. **Admit to:**
2. **Diagnosis:** Nephrolithiasis
3. **Condition:**
4. **Vital Signs:** q8h. Call physician if urine output <30 cc/hr; BP >160/90, <90/60; T >38.5°C.
5. **Activity:** Up ad lib.
6. **Nursing:** Strain urine, measure inputs and outputs. Place Foley if no urine for 4 hours.
7. **Diet:** Regular, push oral fluids.
8. **IV Fluids:** IV D5 ½ NS at 100-125 cc/hr (maintain urine output of 80 mL/h).
9. **Special Medications:**
    - -Cefazolin (Ancef) 1-2 gm IV q8h
    - -Meperidine (Demerol) 75-100 mg and hydroxyzine 25 mg IM/IV q2-4h prn pain **OR**
    - -Butorphanol (Stadol) 0.5-2 mg IV q3-4h.
    - -Hydrocodone/acetaminophen (Vicodin), 1-2 tab q4-6h PO prn pain **OR**
    - -Oxycodone/acetaminophen (Percocet) 1 tab q6h prn pain **OR**
    - -Acetaminophen with codeine (Tylenol 3) 1-2 tabs PO q3-4h prn pain.
    - -Ketorolac (Toradol) 10 mg PO q4-6h prn pain, or 30-60 mg IV/IM then 15-30 mg IV/IM q6h (max 5 days).
    - -Zolpidem (Ambien) 10 mg PO qhs prn insomnia.
11. **Extras:** Intravenous pyelogram, KUB, CXR, ECG.
12. **Labs:** CBC, SMA 6 and 12, calcium, uric acid, phosphorous, UA with micro, urine C&S, urine pH, INR/PTT. Urine cystine (nitroprusside test), send stones for X-ray crystallography. 24 hour urine collection for uric acid, calcium, creatinine.

Hypercalcemia

1. **Admit to:**
2. **Diagnosis:** Hypercalcemia
3. **Condition:**
4. **Vital Signs:** q4h. Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; or tetany or any abnormal mental status.
5. **Activity:** Encourage ambulation; up in chair at other times.
6. **Nursing:** Seizure precautions, measure inputs and outputs.
7. **Diet:** Restrict dietary calcium to 400 mg/d, push PO fluids.
8. **Special Medications:**
    - -1-2 L of 0.9% saline over 1-4 hours until no longer hypotensive, then saline diuresis with 0.9% saline infused at 125 cc/h **AND**
    - -Furosemide (Lasix) 20-80 mg IV q4-12h. Maintain urine output of 200 mL/h; monitor serum sodium, potassium, magnesium.

-Calcitonin (Calcimar) 4-8 IU/kg IM q12h or SQ q6-12h.
-Etidronate (Didronel) 7.5 mg/kg/day in 250 mL of normal saline IV infusion over 2 hours. May repeat in 3 days.
-Pamidronate (Aredia) 60 mg in 500 mL of NS infused over 4 hours or 90 mg in 1 liter of NS infused over 24 hours x one dose.

9. Extras: CXR, ECG, mammogram.
10. Labs: Total and ionized calcium, parathyroid hormone, SMA 7&12, phosphate, Mg, alkaline phosphatase, prostate specific antigen and carcinoembryonic antigen. 24h urine calcium, phosphate.

Hypocalcemia

1. Admit to:
2. Diagnosis: Hypocalcemia
3. Condition:
4. Vital Signs: q4h. Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; or any abnormal mental status.
5. Activity: Up ad lib
6. Nursing: I and O.
7. Diet: No added salt diet.
8. Special Medications:
Symptomatic Hypocalcemia:
-Calcium chloride, 10% (270 mg calcium/10 mL vial), give 5-10 mL slowly over 10 min or dilute in 50-100 mL of D5W and infuse over 20 min, repeat q20-30 min if symptomatic, or hourly if asymptomatic. Correct hyperphosphatemia before hypocalcemia **OR**
-Calcium gluconate, 20 mL of 10% solution IV (2 vials)(90 mg elemental calcium/10 mL vial) infused over 10-15 min, followed by infusion of 60 mL of calcium gluconate in 500 cc of D5W (1 mg/mL) at 0.5-2.0 mg/kg/h.

Chronic Hypocalcemia:
-Calcium carbonate with vitamin D (Oscal-D) 1-2 tab PO tid **OR**
-Calcium carbonate (Oscal) 1-2 tab PO tid **OR**
-Calcium citrate (Citracal) 1 tab PO q8h or Extra strength Tums 1-2 tabs PO with meals.
-Vitamin D2 (Ergocalciferol) 1 tab PO qd.
-Calcitriol (Rocaltrol) 0.25 mcg PO qd, titrate up to 0.5-2.0 mcg qid.
-Docusate sodium (Colace) 1 tab PO bid.

9. Extras: CXR, ECG.
10. Labs: SMA 7&12, phosphate, Mg. 24h urine calcium, potassium, phosphate, magnesium.

Hyperkalemia

1. Admit to:
2. Diagnosis: Hyperkalemia
3. Condition:
4. Vital Signs: q4h. Call physician if QRS complex >0.14 sec or BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C.
5. Activity: Bed rest; up in chair as tolerated.
6. Nursing: Inputs and outputs. Chart QRS complex width q1h.
7. Diet: Regular, no salt substitutes.
8. IV Fluids: D5NS at 125 cc/h
9. Special Medications:
-Discontinue ACE inhibitors, angiotensin II receptor blockers, beta-blockers, potassium sparing diuretics.
-Calcium gluconate (10% solution) 10-30 mL IV over 2-5 min; second dose may be given in 5 min. Contraindicated if digoxin toxicity is suspected. Keep 10 mL vial of calcium gluconate at bedside for emergent use.
-Sodium bicarbonate 1 amp (50 mEq) IV over 5 min (give after calcium in separate IV).
-Regular insulin 10 units IV push with 1 ampule of 50% glucose IV push.
-Kayexalate 30-45 gm premixed in sorbitol solution PO/NG/PR now and q3-4h prn.
-Furosemide 40-80 mg IV, repeat prn.
-Consider emergent dialysis if cardiac complications or renal failure.

10. Extras: ECG.
11. Labs: CBC, platelets, SMA7, magnesium, calcium, SMA-12. UA, urine specific gravity, urine sodium, pH, 24h urine potassium, creatinine.

Hypokalemia

1. Admit to:
2. Diagnosis: Hypokalemia
3. Condition:
4. Vital Signs: Vitals, urine output q4h. Call physician if BP >160/90, <90/60; P>120, <50; R>25, <10; T >38.5°C.
5. Activity: Bed rest; up in chair as tolerated.
6. Nursing: Inputs and outputs
7. Diet: Regular
8. Special Medications:
Acute Therapy:
-KCL 20-40 mEq in 100 cc saline infused IVPB over 2 hours; or add 40-80 mEq to 1 liter of IV fluid and infuse over 4-8 hours.
-KCL elixir 40 mEq PO tid (in addition to IV); max total dose 100-200 mEq/d (3 mEq/kg/d).

Chronic Therapy:
-Micro-K 10 mEq tabs 2-3 tabs PO tid after meals (40-100 mEq/d) **OR**
-K-Dur 20 mEq tabs 1 PO bid-tid.

Hypokalemia with metabolic acidosis:
-Potassium citrate 15-30 mL in juice PO qid after meals (1 mEq/mL).
-Potassium gluconate 15 mL in juice PO qid after meals (20 mEq/15 mL).

9. Extras: ECG, dietetics consult.

10. Labs: CBC, magnesium, SMA 7&12. UA, urine Na, pH, 24h urine for K, creatinine.

Hypermagnesemia

1. Admit to:
2. Diagnosis: Hypermagnesemia
3. Condition:
4. Vital Signs: q6h. Call physician if QRS >0.14 sec.
5. Activity: Up ad lib
6. Nursing: Inputs and outputs, daily weights.
7. Diet: Regular
8. Special Medications:
-Saline diuresis 0.9% saline infused at 100-200 cc/h to replace urine loss **AND**
-Calcium chloride, 1-3 gm added to saline (10% solution; 1 gm per 10 mL amp) to run at 1 gm/hr **AND**
-Furosemide (Lasix) 20-40 mg IV q4-6h as needed.
-Magnesium of >9.0 mEq/L requires stat hemodialysis because of risk of respiratory failure.
9. Extras: ECG
10. Labs: Magnesium, calcium, SMA 7&12, creatinine. 24 hour urine magnesium, creatinine.

Hypomagnesemia

1. Admit to:
2. Diagnosis: Hypomagnesemia
3. Condition:
4. Vital Signs: q6h
5. Activity: Up ad lib
6. Diet: Regular
7. Special Medications:
-Magnesium sulfate 4-6 gm in 500 mL D5W IV at 1 gm/hr. Hold if no patellar reflex. (Estimation of Mg deficit = 0.2 x kg weight x desired increase in Mg concentration; give deficit over 2-3d) **OR**
-Magnesium sulfate (severe hypomagnesemia <1.0) 1-2 gm (2-4 mL of 50% solution) IV over 15 min, **OR**
-Magnesium chloride (Slow-Mag) 65-130 mg (1-2 tabs) PO tid-qid (64 mg or 5.3 mEq/tab) **OR**
-Milk of magnesia 5 mL PO qd-qid.
8. Extras: ECG
9. Labs: Magnesium, calcium, SMA 7&12. Urine Mg, electrolytes, 24h urine magnesium, creatinine.

Hypernatremia

1. Admit to:
2. Diagnosis: Hypernatremia
3. Condition:
4. Vital Signs: q2-8h. Call physician if BP >160/90, <70/50; P >140, <50; R>25, <10; T >38.5°C.
5. Activity: Bed rest; up in chair as tolerated.
6. Nursing: Inputs and outputs, daily weights.
7. Diet: No added salt. Push oral fluids.
8. Special Medications:
Hypernatremia with Hypovolemia:
If volume depleted, give 1-2 L NS IV over 1-3 hours until not orthostatic, then give D5W IV to replace half of body water deficit over first 24hours (correct sodium at 1 mEq/L/h), then remaining deficit over next 1-2 days.
Body water deficit (L) = $\frac{0.6(\text{weight kg})([\text{Na serum}]-140)}{140}$
Hypernatremia with ECF Volume Excess:
-Furosemide 40-80 mg IV or PO qd-bid.
-Salt poor albumin (25%) 50-100 mL bid-tid x 48-72 h.
Hypernatremia with Diabetes Insipidus:
-D5W to correct body water deficit (see above).
-Pitressin 5-10 U IM/IV q6h or desmopressin (DDAVP) 4 mcg IV/SQ q12h; keep urine specific gravity >1.010.
9. Extras: CXR, ECG.
10. Labs: SMA 7&12, serum osmolality, liver panel, ADH, plasma renin activity. UA, urine specific gravity. Urine osmolality, Na, 24h urine K, creatinine.

Hyponatremia

1. Admit to:
2. Diagnosis: Hyponatremia
3. Condition:
4. Vital Signs: q4h. Call physician if BP >160/90, <70/50; P >140, <50; R>25, <10; T >38.5°C.
5. Activity: Up in chair as tolerated.
6. Nursing: Inputs and outputs, daily weights.
7. Diet: Regular diet.
8. Special Medications:
Hyponatremia with Hypervolemia and Edema (low osmolality <280 mOsm/L, UNa <10 mmol/L: nephrosis, heart failure, cirrhosis):
-Water restrict to 0.5-1.0 L/d.
-Furosemide 40-80 mg IV or PO qd-bid.
Hyponatremia with Normal Volume Status (low osmolality <280 mOsm/L, UNa <10 mmol: water intoxication; UNa >20: SIADH, diuretic-induced):
-Water restrict to 0.5-1.5 L/d.
Hyponatremia with Hypovolemia (low osmolality <280 mOsm/L) UNa <10 mmol/L: vomiting, diarrhea, third space/respiratory/skin loss; UNa >20 mmol/L: diuretics, renal injury, RTA, adrenal insufficiency, partial obstruction, salt wasting:
-If volume depleted, give 0.5-2 L of 0.9% saline over 1-2 hours until no longer hypotensive, then 0.9% saline at 125 mL/h or 100-500 mL 3% hypertonic saline over 4h.

Severe Symptomatic Hyponatremia:
If volume depleted, give 1-2 L of 0.9% saline (154 mEq/L) over 1-2 hours until no longer orthostatic.
Determine volume of 3% hypertonic saline (513 mEq/L) to be infused:

Na (mEq) deficit = 0.6 x (wt kg)x(desired [Na] - actual [Na])

$$\frac{\text{Volume of solution (L)}}{\text{Number of hrs}} = \frac{\text{Sodium to be infused (mEq)}}{\text{(mEq/L in solution) x Number of hrs}}$$

-Correct half of sodium deficit intravenously over 24 hours until serum sodium is 120 mEq/L; increase sodium by 12-20 mEq/L over 24 hours (1 mEq/L/h).
-Alternative Method: 3% saline 100-300 mL over 4-6h, repeated as needed.
9. Extras: CXR, ECG, head/chest CT scan.
10. Labs: SMA 7&12, osmolality, triglyceride, liver panel. UA, urine specific gravity. Urine osmolality, Na.

Hyperphosphatemia

1. Admit to:
2. Diagnosis: Hyperphosphatemia
3. Condition:
4. Vital Signs: qid
5. Activity: Up ad lib
6. Nursing: Inputs and outputs
7. Diet: Low phosphorus diet.
8. Special Medications:
Moderate Hyperphosphatemia:
-Restrict dietary phosphate to 0.7-1.0 gm/d.
-Calcium acetate (PhosLo) 1-3 tabs PO tid with meals **OR**
-Aluminum hydroxide (Amphojel) 5-10 mL or 1-2 tablets PO before meals tid.
Severe Hyperphosphatemia:
-Volume expansion with 0.9% saline 1-2 L over 1-2h.
-Acetazolamide (Diamox) 500 mg PO or IV q6h.
-Consider dialysis.
9. Extras: CXR PA and LAT, ECG.
10. Labs: Phosphate, SMA 7&12, magnesium, calcium. UA, parathyroid hormone.

Hypophosphatemia

1. Admit to:
2. Diagnosis: Hypophosphatemia
3. Condition:
4. Vital Signs: qid
5. Activity: Up ad lib
6. Nursing: Inputs and outputs.
7. Diet: Regular diet.
8. Special Medications:
Mild to Moderate Hypophosphatemia (1.0-2.2 mg/dL):
-Sodium or potassium phosphate 0.25 mMoles/kg in 150-250 mL of NS or D5W at 10 mMoles/h.
-Neutral phosphate (Nutra-Phos), 2 tab PO bid (250 mg elemental phosphorus/tab) **OR**
-Phospho-Soda 5 mL (129 mg phosphorus) PO bid-tid.
Severe Hypophosphatemia (<1.0 mg/dL):
-Na or K phosphate 0.5 mMoles/kg in 250 mL D5W or NS, IV infusion at 10 mMoles/hr **OR**
-Add potassium phosphate to IV solution in place of maintenance KCL; max IV dose 7.5 mg phosphorus/kg/6h.
9. Extras: CXR PA and LAT, ECG.
10. Labs: Phosphate, SMA 7&12, Mg, calcium, UA.

Rheumatologic Disorders

Systemic Lupus Erythematosus

1. **Admit to:**
2. **Diagnosis:** Systemic Lupus Erythematosus
3. **Condition:**
4. **Vital Signs:** tid
5. **Allergies:**
6. **Activity:** Up as tolerated with bathroom privileges
7. **Nursing:**
8. **Diet:** No added salt, low psoralen diet.
9. **Special Medications:**
   - Ibuprofen (Motrin) 400 mg PO qid (max 2.4 g/d) **OR**
   - Indomethacin (Indocin) 25-50 mg tid-qid.
   - Hydroxychloroquine (Plaquenil) 200-600 mg/d PO
   - Prednisone 60-100 mg PO qd. Maintenance 10-20 mg PO qd or 20-40 mg PO qOD **OR**
   - Methylprednisolone (pulse therapy) 500 mg IV over 30 min q12h for 3-5d, then prednisone 50 mg PO qd.
   - Betamethasone dipropionate (Diprolene) 0.05% ointment applied bid.
10. **Extras:** CXR PA, LAT, ECG. Rheumatology consult.
11. **Labs:** CBC, platelets, SMA 7&12, INR/PTT, ESR, complement CH-50, C3, C4, C-reactive protein, LE prep, Coombs test, VDRL, rheumatoid factor, ANA, DNA binding, lupus anticoagulant, anti-cardiolipin, antinuclear cytoplasmic antibody. UA.

Acute Gout Attack

1. **Admit to:**
2. **Diagnosis:** Acute gout attack
3. **Condition:**
4. **Vital Signs:** tid
5. **Activity:** Bed rest with bedside commode
6. **Nursing:** Keep foot elevated; support sheets over foot; guaiac stools.
7. **Diet:** Low purine diet.
8. **Special Medications:**
   - Ibuprofen (Motrin) 800 mg, then 400-800 mg PO q4-6h **OR**
   - Diclofenac (Voltaren) 25-75 mg tid-qid with food **OR**
   - Indomethacin (Indocin) 50 mg PO q6h for 2d, then 50 mg tid for 2 days, then 25 mg PO tid **OR**
   - Ketorolac (Toradol) 30-60 mg IV/IM, then 15-30 mg IV/IM q6h or 10 mg PO tid-qid **OR**
   - Naproxen sodium (Anaprox, Anaprox-DS) 550 mg PO bid **OR**
   - Methylprednisolone (SoluMedrol) 125 mg IV x 1 dose **THEN**
   - Prednisone 60 mg PO qd for 5 days, followed by tapering.
   - Colchicine 2 tablets (0.5 mg or 0.6 mg), followed by 1 tablet q1h until relief, max dose of 9.6 mg/24h. Maintenance colchicine: 0.5-0.6 mg PO qd-bid.

Hypouricemic Therapy:

   - Probenecid (Benemid), 250 mg bid. Increase the dosage to 500 mg bid after 1 week, then increase by 500-mg increments every 4 weeks until the uric acid level is below 6.5 mg/dL. Max dose 2 g/d. Contraindicated during acute attack.
   - Allopurinol (Zyloprim) 300 mg PO qd, may increase by 100-300 mg q2weeks. Usually initiated after the acute attack.

9. **Symptomatic Medications:**
   - Famotidine (Pepcid) 20 mg IV/PO q12h.
   - Meperidine (Demerol) 50-100 mg IM/IV q4-6h prn pain **OR**
   - Hydrocodone/acetaminophen (Vicodin), 1-2 tab q4-6h PO prn pain.
   - Docusate sodium (Colace) 100 mg PO qhs.
   - Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn headache.
   - Zolpidem (Ambien) 5-10 mg qhs prn insomnia.
10. **Labs:** CBC, SMA 7, uric acid. UA with micro. Synovial fluid for light and polarizing micrography for crystals; C&S, Gram stain, glucose, protein, cell count. X-ray views of joint. 24-hour urine for uric acid.

PEDIATRICS

General Pediatrics

Pediatric History and Physical Examination

History

Identifying Data: Patient's name; age, sex. List the patient's significant medical problems. Name and relationship to child of informant (patient, parent).
Chief Compliant: Reason given for seeking medical care and the duration of the symptom(s).
History of Present Illness (HPI): Describe the course of the patient's illness, including when it began, character of the symptom(s); aggravating or alleviating factors; pertinent positives and negatives. Past diagnostic testing.
Past Medical History (PMH): Past diseases, surgeries, hospitalizations; medical problems; history of asthma.
Birth History: Gestational age at birth, preterm, obstetrical problems.
Developmental History: Motor skills, language development, self-care skills.
Medications: Include prescription and OTC drugs, vitamins, herbal products, natural remedies, nutritional supplements.
Feedings: Diet, volume of formula per day.
Immunizations: Up-to-date?
Drug Allergies: Penicillin, codeine?
Food Allergies:
Family History: Medical problems in family, including the patient's disorder. Asthma, cancer, tuberculosis, allergies.
Social History: Family situation, alcohol, smoking, drugs. Level of education.
Review of Systems (ROS):
- **General**: Weight loss, fever, chills, fatigue, night sweats.
- **Skin:** Rashes, skin discolorations.
- **Head:** Headaches, dizziness, seizures.
- **Eyes:** Visual changes.
- **Ears:** Tinnitus, vertigo, hearing loss.
- **Nose:** Nose bleeds, discharge.
- **Mouth and Throat:** Dental disease, hoarseness, throat pain.
- **Respiratory:** Cough, shortness of breath, sputum (color and consistency).
- **Cardiovascular:** Dyspnea on exertion, edema, valvular disease.
- **Gastrointestinal:** Abdominal pain, vomiting, diarrhea, constipation.
- **Genitourinary:** Dysuria, frequency, hematuria.
- **Gynecological:** Last menstrual period (frequency, duration), age of menarche; dysmenorrhea, contraception, vaginal bleeding, breast masses.
- **Endocrine:** Polyuria, polydipsia.
- **Musculoskeletal:** Joint pain or swelling, arthritis, myalgias.
- **Skin and Lymphatics:** Easy bruising, lymphadenopathy.
- **Neuropsychiatric:** Weakness, seizures.
- **Pain:** quality (sharp/stabbing, aching, pressure), location, duration

Physical Examination

General appearance: Note whether the patient looks "ill," well, or malnourished.
Physical Measurements: weight, height, head circumference (plot on growth charts).
Vital Signs: Temperature, heart rate, respiratory rate, blood pressure.
Skin: Rashes, scars, moles, skin turgor, capillary refill (in seconds).
Lymph Nodes: Cervical, axillary, inguinal nodes: size, tenderness.
Head: Bruising, masses, fontanels.
Eyes: Pupils: equal, round, and reactive to light and accommodation (PERRLA); extra ocular movements intact (EOMI). Funduscopy (papilledema, hemorrhages, exudates).
Ears: Acuity, tympanic membranes (dull, shiny, intact, infected, bulging).
Mouth and Throat: Mucus membrane color and moisture; oral lesions, dentition, pharynx, tonsils.
Neck: Thyromegaly, lymphadenopathy, masses.
Chest: Equal expansion, rhonchi, crackles, rubs, breath sounds.
Heart: Regular rate and rhythm (RRR), first and second heart sounds (S1, S2); gallops (S3, S4), murmurs (grade 1-6), pulses (graded 0-2+).
Breast: Discharge, masses; axillary masses.
Abdomen: Bowel sounds, bruits, tenderness, masses; hepatomegaly, splenomegaly; guarding, rebound, percussion note (tympanic), suprapubic tenderness.
Genitourinary: Inguinal masses, hernias, scrotum, testicles.
Pelvic Examination: Vaginal mucosa, cervical discharge, uterine size, masses, adnexal masses, ovaries.
Extremities: Joint swelling, range of motion, edema (grade 1-4+); cyanosis, clubbing, edema (CCE); pulses.
Rectal Examination: Sphincter tone, masses, fissures; test for occult blood
Neurological: Mental status and affect; gait, strength (graded 0-5), sensation, deep tendon reflexes (biceps, triceps, patellar, ankle; graded 0-4+).
Labs: Electrolytes (sodium, potassium, bicarbonate, chloride, BUN, creatinine), CBC (hemoglobin, hematocrit, WBC count, platelets, differential); x-rays, ECG, urine analysis (UA), liver function tests (LFTs).
Assessment (Impression): Assign a number to each problem and discuss separately. Discuss differential diagnosis and give reasons that support the working diagnosis; give reasons for excluding other diagnoses.
Plan: Describe therapeutic plan for each numbered problem, including testing, laboratory studies, medications.

Progress Notes

Daily progress notes should summarize developments in a patient's hospital course, problems that remain active, plans to treat those problems, and arrangements for discharge. Progress notes should address every element of the problem list.

Example Progress Note
Date/time: **Identify Discipline and Level of Education:** e.g. Pediatric resident PL-3 **Subjective:** Any problems and symptoms of the patient should be charted. Appetite, pain, or fussiness may be included. **Objective:** General appearance. Vitals, including highest temperature (T^{max}) over past 24 hours. Feedings, fluid inputs and outputs (I/O), including oral and parenteral intake and urine and stool volume output. Physical exam, including chest and abdomen, with particular attention to active problems. Emphasize changes from previous physical exams. **Labs:** Include new test results and flag abnormal values. **Current Medications:** List all medications and dosages. **Assessment and Plan:** This section should be organized by problem. A separate assessment and plan should be written for each problem.

Developmental Milestones

Age	Milestones
1 month	Raises head slightly when prone; alerts to sound; regards face, moves extremities equally.
2-3 months	Smiles, holds head up, coos, reaches for familiar objects, recognizes parent.
4-5 months	Rolls front to back and back to front; sits well when propped; laughs, orients to voice; enjoys looking around; grasps rattle, bears some weight on legs.
6 months	Sits unsupported; passes cube hand to hand; babbles; uses raking grasp; feeds self crackers.
8-9 months	Crawls, cruises; pulls to stand; pincer grasp; plays pat-a-cake; feeds self with bottle; sits without support; explores environment.
12 months	Walking, talking a few words; understands "no"; says "mama/dada" discriminantly; throws objects; imitates actions, marks with crayon, drinks from a cup.
15-18 months	Comes when called; scribbles; walks backward; uses 4-20 words; builds tower of 2 blocks.
24-30 months	Removes shoes; follows 2 step command; jumps with both feet; holds pencil, knows first and last name; knows pronouns. Parallel play; points to body parts, runs, spoon feeds self, copies parents.
3 years	Dresses and undresses; walks up and down steps; draws a circle; uses 3-4 word sentences; takes turns; shares. Group play.
4 years	Hops, skips, catches ball; memorizes songs; plays cooperatively; knows colors; copies a circle; uses plurals.
5 years	Jumps over objects; prints first name; knows address and mother's name; follows game rules; draws three part man; hops on one foot.

Immunizations

Immunization Schedule for Infants and Children		
Age	**Immunizations**	**Comments**
Birth - 2 mo	HBV	If mother is HbsAg positive or unknown status, the first dose of HBV should be given within 12 hours of birth along with hepatitis B immune globulin 0.5 mL.
1-4 mo	HBV	The second HBV dose should be given at least one month after the first dose. For infants of HbsAg positive or unknown status mothers, the second dose should be given at 1-2 months of age.

Age	Immunizations	Comments
2 mo	DTaP, Hib, IPV, PCV	DTP and Hib are available combined as Tetramune. The pneumococcal vaccine recommendation is new for 2001.
4 mo	DTaP, Hib, IPV, PCV	
6 mo	DTaP, (Hib), PCV	Dose 3 of Hib is not indicated if the product for doses 1 and 2 was PedvaxHIB.
6-18 mo	HBV, IPV	The third HBV dose should be administered at least 4 months after the first dose and at least 2 months after the second dose. For infants of HbsAg positive or unknown status mothers, the third dose should be given at 6 months of age.
12-15 mo 12-18 mo	Hib, PCV, MMR VAR	Tuberculin testing may be done at the same visit if indicated. Varicella vaccine is recommended in children who do not have a reliable history of having had the clinical disease.
15-18 mo	DTaP	The 4th dose of DTaP should be given 6-12 mo after the third dose of DTaP and may be given as early as 12 mo, provided that the interval between doses 3 and 4 is at least 6 mo.
4-6 yr	DTaP, IPV, MMR	DTaP and IPV should be given at or before school entry. DTaP should not be given after the 7th birthday
11-12 yr	MMR	Omit if MMR dose was given at age 4-6 years.
14-16 yr	Td	Repeat every 10 yrs throughout life

HBV = Hepatitis B virus vaccine; DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine; Hib = Haemophilus influenzae type b conjugate vaccine; IPV = inactivated polio vaccine; MMR = live measles, mumps, and rubella viruses vaccine; PCV = pneumococcal conjugate vaccine (Prevnar); Td = adult tetanus toxoid (full dose) and diphtheria toxoid (reduced dose), for children >7 yr and adults; VAR = varicella virus vaccine

Recommended Schedule for Children Younger than 7 Years Not Immunized in the First Year of Life

Age	Immunizations	Comments
First visit	DTaP, (Hib), HBV, MMR, IPV, (PCV), VAR	If indicated, tuberculin testing may be done at the same visit. If child is ≥5 years, Hib is not indicated. PCV recommended for all children < 2 yrs or 24-59 months of age and at high risk for invasive pneumococcal disease (e.g. sickle cell anemia, HIV, immunocompromised). Varicella vaccine if child has not had varicella disease.
Interval after 1st visit 1 month 2 months ≥8 months	 DTaP, HBV DTaP, Hib, IPV, (PCV) DTaP, HBV, IPV	Second dose of Hib is indicated only if first dose was received when <15 months. Second dose of PCV 6-8 weeks after first dose (if criteria met above).
4-6 years (at or before school entry)	DTaP, IPV, MMR	DTaP is not necessary if the fourth dose was given after the fourth birthday. IPV is not necessary if the third dose was given after the fourth birthday.
11-12 yr	MMR	MMR should be given at entry to middle school or junior high school if it wasn't given at age 4-6 years.
10 yr later	Td	Repeat every 10 yrs

HBV = Hepatitis B virus vaccine; DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine; Hib = Haemophilus influenzae type b conjugate vaccine; IPV = inactivated polio vaccine; MMR = live measles, mumps, and rubella viruses vaccine; PCV = pneumococcal conjugate vaccine (Prevnar); Td = adult tetanus toxoid (full dose) and diphtheria toxoid (reduced dose), for children >7 yr and adults; VAR = varicella virus vaccine

Recommended Schedule for Children >7 Years Who Were Not Immunized Previously

Age	Immunizations	Comments
First visit	HBV, IPV, MMR, Td, VAR	Varicella vaccine if child has not had varicella disease.

Age	Immunizations	Comments
Interval after First visit 2 months 8-14 months	 HBV, IPV, Td, VAR, MMR HBV, Td, IPV	 If child is ≥13 years old, a second varicella vaccine dose is needed 4-8 weeks after the first dose.
11-12 yrs old	MMR	Omit if MMR dose was given at age 4-6 years.
10 yr later	Td	Repeat every 10 years

HBV = Hepatitis B virus vaccine; DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine; Hib = Haemophilus influenzae type b conjugate vaccine; IPV = inactivated polio vaccine; MMR = live measles, mumps, and rubella viruses vaccine; PCV = pneumococcal conjugate vaccine (Prevnar); Td = adult tetanus toxoid (full dose) and diphtheria toxoid (reduced dose), for children >7 yr and adults; VAR = varicella virus vaccine

Haemophilus Immunization

H influenzae type b Vaccination in Children Immunized Beginni 2 to 6 Months of Age		
Vaccine Product	**Total Number of Doses**	**Regimens**
PedvaxHIB (PRP-OMP)	3	2 doses two months apart plus bo 12-15 months which must be at le months after previous dose. Any v may be used for the booster.
HibTITER (HbOC), ActHIB (PRP-T), OmniHIB (PRP-T)	4	3 doses two months apart plus bo 12-15 months which must be at le months after previous dose. Any v may be used for the booster.

H influenzae type b Vaccination When the Initial Vaccination w Delayed Until 7 Months of Age or Older			
Age at Initiation	**Vaccine Product**	**Total Doses**	**Regimens**
7-11 mo	any vaccine (PedvaxHIB or HibTITER or ActHIB or OmniHIB)	3	2 doses at 2-m intervals plus at 12-18 mont least 2 months previous dose
12-14 mo	any vaccine	2	2 doses 2 mo apart
15-59 mo	any vaccine	1	Single dose o product
≥5 years	Any vaccine	1	Only recomme for children wi chronic illness to be associat an increased r H flu disease.

Varicella Immunization

Indications for Varicella Immunization:

- **A.** Age 12 to 18 months: One dose of varicella vaccine is recommended for universal immunization for all healthy children who lack a reliable history of varicella.
- **B.** Age 19 months to the 13th birthday: Vaccination of susceptible children is recommended and may be given any time during childhood but before the 13th birthday because of the potential increased severity of natural varicella after this age. Susceptible is defined by either lack of proof of either varicella vaccination or a reliable history of varicella. One dose is recommended.
- **C.** Healthy adolescents and young adults: Healthy adolescents past their 13th birthday who have not been immunized previously and have no history of varicella infection should be immunized against varicella by administration of two doses of vaccine 4 to 8 weeks apart. Longer intervals between doses do not necessitate a third dose, but may leave the individual unprotected during the intervening months.
- **D.** All susceptible children aged 1 year to 18 years old who are in direct contact with people at high risk for varicella related complications (eg, immunocompromised individuals) and who have not had a documented case of varicella.

Influenza Immunization

Indications for Influenza Vaccination

- **A.** Targeted high-risk children and adolescents (eg, chronic pulmonary disease including asthma, sickle cell anemia, HIV infection).
- **B.** Other high-risk children and adolescents (eg, diabetes mellitus, chronic renal disease, chronic metabolic disease).
- **C.** Close contacts of high risk patients.
- **D.** Foreign travel if exposure is likely.

Vaccine Administration. Administer in the Fall, usually October 1 - November 15, before the start of the influenza season.

Influenza Immunization Administration			
Age	**Vaccine Type**	**Dosage (mL)**	**Number of Doses**
6-35 months	Split virus only	0.25	1-2*
3-8 yrs	Split virus only	0.5	1-2*
9-12 yrs	Split virus only	0.5	1
> 12 yrs	Whole or split virus	0.5	1

*Two doses administered at least one month apart are recommended for children who are receiving influenza vaccine for the first time.

Pediatric Symptomatic Care

Antipyretics

Analgesics/Antipyretics:

-Acetaminophen (Tylenol) 10-20 mg/kg/dose PO/PR q4-6h, max 5 doses/day or 80 mg/kg/day or 4 gm/day (whichever is smaller) **OR**

-Acetaminophen dose by age (if weight appropriate for age):

AGE:	**mg/dose PO/PR q4-6h prn:**
0-3 mo	40 mg/dose
4-11 mo	80 mg/dose
1-2 yr	120 mg/dose
2-3 yr	160 mg/dose
4-5 yr	240 mg/dose
6-8 yr	320 mg/dose
9-10 yr	400 mg/dose
11-12 yr	480 mg/dose
>12 yr	325-650 mg/dose

-Preparations: caplets: 160, 500 mg; caplet, ER: 650 mg; drops: 80 mg/0.8 mL; elixir: 80 mg/2.5 mL, 80 mg/5 mL, 120 mg/5 mL, 160 mg/5 mL, 325 mg/5 mL, 500 mg/15 mL; suppositories: 80, 120, 325, 650 mg; tabs: 325, 500 mg; tabs, chewable: 80, 120, 160 mg.

-Ibuprofen (Motrin, Advil, Nuprin, Medipren, Children's Motrin)
Analgesic: 4-10 mg/kg/dose PO q6-8h prn
Antipyretic: 5-10 mg/kg/dose PO q6-8h.

-Preparations: cap: 200 mg; caplet: 100 mg; oral drops: 40 mg/mL; susp: 100 mg/5 mL; tabs: 100, 200, 300, 400, 600, 800 mg; tabs, chewable: 50, 100 mg. May cause GI distress, bleeding.

Antitussives, Decongestants, Expectorants, and Antihistamines

Antihistamines:

-Brompheniramine (Dimetane) [elixir: 2 mg/5 mL; tab: 4, 8, 12 mg; tab, SR: 8, 12 mg]
< 6 yr: 0.5 mg/kg/day PO q6h prn (max 8 mg/day)
6-11 yr: 2-4 mg PO q6-8h
≥12 yr: 4-8 mg PO q4-6h or 8 mg SR PO q8-12h or 12 mg SR PO q12h (max 24 mg/day).

-Chlorpheniramine (Chlor-Trimeton) [cap, SR: 8, 12 mg; syrup 2mg/5mL; tabs: 4, 8, 12 mg; tab, chew: 2 mg; tab, SR: 8, 12 mg]
2-5 yr: 1 mg PO q4-6h prn
6-11 yr: 2 mg PO q4-6h prn
≥ 12 yr: 4 mg PO q4-6h prn or 8-12 mg SR PO q8-12h

Antitussives (Pure) - Dextromethorphan:

-Benylin DM Cough Syrup [syrup: 10 mg/5mL]
-Benylin Pediatric [syrup: 37.5mg/5mL]
-Robitussin Pediatric [syrup: 7.5 mg/5mL]
-Vick's Formula 44 Pediatric Formula [syrup: 3 mg/5mL]
2-5 yr: 2.5-5 mg PO q4h prn or 7.5 mg PO q6-8h prn
6-11 yr 5-10 mg PO q4h prn or 15 mg PO q6-8h prn
≥12 yr: 10-20 mg PO q4h prn or 30 mg PO q6-8h prn.

Expectorants:

-Guaifenesin (Robitussin) [syrup: 100 mg/5 mL]
<2 yr: 12 mg/kg/day PO q4-6h prn
2-5 yr: 50-100 mg PO q4h prn (max 600 mg/day)
6-11 yr: 100-200 mg PO q4h prn (max 1.2 gm/day)
≥12 yr: 100-400 mg PO q4h prn (max 2.4 gm/day)
May irritate gastric mucosa; take with large quantities of fluids.

Decongestants:

-Pseudoephedrine (Sudafed, Novafed): [cap: 60 mg; cap, SR: 120, 240 mg; drops: 7.5 mg/0.8 mL; syrup: 15 mg/5 mL, 30 mg/5 mL; tabs: 30, 60 mg].
<2 yr: 4 mg/kg/day PO q6h.
2-5 yr: 15 mg po q6h
6-11 yr: 30 mg po q6h
>12 yr: 30-60 mg/dose PO q6h or sustained release 120 mg PO q12h or sustained release 240 mg PO q24h.

-Phenylephrine (Neo-synephrine) [nasal drops: 1/4, 1/2, 1%; nasal spray: 1/4, 1/2, 1%].
Children: Use 1/4 % spray or drops, 1-2 drops/spray in each nostril q3-4h.
Adults: Use 1/4-1/2% drops/spray, 1-2 drops/sprays in each nostril q3-4h
Discontinue use after 3 days to avoid rebound congestion.

Combination Products:

-Actifed [per cap or tab or 10 mL syrup: Triprolidine 2.5 mg, Pseudoephedrine 60 mg].
4 mth-2 yr: 1.25 mL PO q6-8h
2-4 yr: 2.5 mL PO q6-8h
4-6 yr: 3.75 mL PO q6-8h
6-11y: 5 mL or ½ tab PO q6-8h
≥12 yr: 10 mL or 1 cap/tab PO q6-8h **OR**
4 mg pseudoephedrine/kg/day PO tid-qid

-Actifed with Codeine cough syrup [syrup/5 mL: Codeine 10 mg, Triprolidine 1.25 mg, Pseudoephedrine 30 mg].
4 mth-2 yr: 1.25 mL PO q6-8h
2-4 yr: 2.5 mL PO q6-8h
4-6 yr: 3.75 mL PO q6-8h
6-11y: 5 mL PO q6-8h
≥12 yr: 10 mL PO q6-8h **OR**
4 mg pseudoephedrine/kg/day PO tid-qid.

-Dimetane Decongestant [cap/cplt or 10 mL: Brompheniramine 4 mg, Phenylephrine 5 mg].
6-11 yr: 5 mL or ½ cap/caplet PO q4-6h prn
≥ 12 yr: 10 mL or 1 cap/caplet PO q4-6h prn

-Dimetane DX [syrup per 5 mL: Brompheniramine 2 mg, Dextromethorphan 10 mg, Pseudoephedrine 30 mg].
2-5 yrs: 2.5 mL PO q4-6h prn
6-11 yrs: 5 mL PO q4-6h prn
≥ 12 yrs: 10 mL PO q4-6h prn

-PediaCare Cough-Cold Chewable Tablets: [tab, chew: Pseudoephedrine 15 mg, Chlorpheniramine 1 mg, Dextromethorphan 5 mg].
  3-5 yr: 1 tab PO q4-6h prn (max 4 tabs/day)
  6-11 yr: 2 tabs PO q4-6h (max 8 tabs/day)
  ≥12 yr: 4 tabs PO q4-6h (max 16 tabs/day)
-PediaCare Cough-Cold Liquid [liquid per 5 mL: Pseudoephedrine 15 mg, Chlorpheniramine 1 mg, Dextromethorphan 5 mg].
  3-5 yr: 5 mL PO q6-8h prn
  6-11 yr: 10 mL PO q6-8h prn
  ≥12 yr: 20 mL PO q6-8h prn
-PediaCare Night Rest Cough-Cold Liquid [liquid per 5 mL: Pseudoephedrine 15 mg, Chlorpheniramine 1 mg, Dextromethorphan 7.5 mg].
  3-5 yr: 5 mL PO q6-8h prn
  6-11 yr: 10 mL PO q6-8h prn
  ≥12 yr: 20 mL PO q6-8h prn
-Phenergan VC [syrup per 5 mL: Phenylephrine 5 mg, Promethazine 6.25 mg].
  2-5 yr: 1.25 mL PO q4-6h prn
  6-11 yr: 2.5 mL PO q4-6h prn
  ≥12 yr: 5 mL PO q4-6h prn
-Phenergan VC with Codeine [per 5 mL: Promethazine 6.25 mg, Codeine 10 mg, Phenylephrine 5 mg].
  2-5 yr: 1.25 mL PO q4-6h prn
  6-11 yr: 2.5 mL PO q4-6h prn
  ≥12 yr: 5 mL PO q4-6h prn
  Adults: 5-10 mL q4-6h prn (max 120 mg codeine per day)
-Phenergan with Codeine [syrup per 5 mL: Promethazine 6.25 mg, Codeine 10 mg].
  2-5 yr: 1.25 mL PO q4-6h prn
  6-11 yr: 2.5 mL PO q4-6h prn
  ≥12 yr: 5 mL PO q4-6h prn
  Adults: 5-10 mL q4-6h prn (max 120 mg codeine per day)
-Phenergan with Dextromethorphan [syrup per 5 mL: Promethazine 6.25 mg, Dextromethorphan 15 mg].
  2-5 yr: 1.25 mL PO q4-6h prn
  6-11 yr: 2.5 mL PO q4-6h prn
  ≥12 yr: 5 mL PO q4-6h prn
-Robitussin AC [syrup per 5 mL: Guaifenesin 100 mg, Codeine 10 mg].
  6 mos-2 yr: 1.25-2.5 mL PO q4h prn
  2-5 yrs: 2.5 mL PO q4h prn
  6-11 yrs: 5 mL PO q4h prn
  ≥12 yrs: 10 mL PO q4-6h prn.
-Robitussin-DAC [syrup per 5 mL: Codeine 10mg, Guaifenesin 100 mg, Pseudoephedrine 30 mg].
  2-5 yrs: 1-1.5 mg/kg/day of codeine PO q4-6h prn (max 30 mg/day)
  6-11 yrs: 5 mL PO q4-6h prn
  ≥12 yrs: 10 mL PO q4-6h prn
-Robitussin DM [syrup per 5 mL: Guaifenesin 100 mg, Dextromethorphan 10 mg].
  2-5 yr: 2.5 mL PO q4h prn, max 10 mL/day
  6-11 yr: 5 mL PO q4h prn, max 20 mL/day
  ≥12 yr: 10 mL PO q4h prn, max 40 mL/day
-Robitussin Pediatric Cough and Cold [syrup per 5 mL: Dextromethorphan 7.5mg, Pseudoephedrine 15 mg].
  2-5 yr: 5 mL PO q4-6h prn
  6-11 yr: 10 mL PO q4-6h prn
  ≥12 yr: 15 mL po q4-6h prn
  Maximum four doses daily.
-Rondec drops [drops per 1 mL: Carbinoxamine maleate 2 mg, Pseudoephedrine 25 mg].
  4-5 mg pseudoephedrine/kg/day PO q6h prn **OR**
  1-3 m: 1/4 dropperful (1/4 mL) PO q6h prn
  3-6 m: 1/2 dropperful (1/2 mL) PO q6h prn
  6-9 m: 3/4 dropperful (0.75 mL) PO q6h prn
  9-18 m: 1 dropperful (1 mL) PO q6h prn.
-Rondec syrup [syrup per 5 mL: Pseudoephedrine 60 mg, Carbinoxamine maleate 4 mg].
  4-5 mg pseudoephedrine/kg/day PO q6h prn.
-Rondec DM drops [drops per mL: Carbinoxamine maleate 2 mg, Pseudoephedrine 25 mg, Dextromethorphan 4 mg].
  4-5 mg pseudoephedrine/kg/day PO q6h prn **OR**
  1-3 m: 1/4 dropperful (1/4 mL) PO q6h prn
  3-6 m: 1/2 dropperful (1/2 mL) PO q6h prn
  6-9 m: 3/4 dropperful (0.75 mL) PO q6h prn
  9-18 m: 1 dropperful (1 mL) PO q6h prn.
-Rondec DM syrup [syrup per 5 mL: Carbinoxamine maleate 4 mg, Pseudoephedrine 60 mg, Dextromethorphan 15 mg].
  4-5 mg pseudoephedrine/kg/day PO q6h prn.
-Ryna Liquid [liquid per 5 mL: Chlorpheniramine 2 mg; Pseudoephedrine 30 mg].
  6-11 yrs: 5 mL PO q6h prn
  ≥12 yr: 10 mL PO q6h prn
-Ryna-C [liquid per 5 mL: Chlorpheniramine 2mg, Codeine 10 mg, Pseudoephedrine 30 mg].
  4-5 mg/kg/day of pseudoephedrine component PO q6h prn
-Ryna-CS [liquid per 5 mL: Codeine 10 mg, Guaifenesin 100 mg, Pseudoephedrine 30 mg].
  4-5 mg pseudoephedrine/kg/day PO q6h prn
-Rynatan Pediatric [susp per 5 mL: Chlorpheniramine 2 mg, Phenylephrine 5 mg, Pyrilamine 12.5 mg].
  2-5 yr: 2.5-5 mL PO bid prn
  6-11 yr: 5-10 mL PO bid prn
  ≥12 yr: 10-15 mL PO bid prn
-Tylenol Cold Multi-Symptom Plus Cough Liquid, Children's [liquid per 5 mL: Acetaminophen 160 mg, Chlorpheniramine 1 mg, Pseudoephedrine 15 mg].
  2-5 yr: 5 mL PO q4h prn
  6-11 yr: 10 mL PO q4h prn
  ≥12 yr: 20 mL po q4h prn
  Maximum four doses daily.
-Tylenol Cold Plus Cough Chewable Tablet, Children's [tab, chew: Acetaminophen 80 mg, Chlorpheniramine 0.5 mg, Dextromethorphan 2.5 mg, Pseudoephedrine 7.5 mg].
  2-5 yr: 2 tabs PO q4h prn

6-11 yr: 4 tabs PO q4h prn
≥12 yr: 4 tabs PO q4h prn
Maximum four doses daily.

- Vick's Children's NyQuil Night-time Cough/Cold [liquid per 5 mL: Chlorpheniramine 0.67 mg; Dextromethorphan 5 mg, Pseudoephedrine 10 mg].
  6-11 yr: 15 mL PO q6-8h prn
  ≥12 yr: 30 mL PO q6-8h prn
- Vicks Pediatric Formula 44D [liquid per 5 mL: Dextromethorphan 5 mg, Pseudoephedrine 10 mg].
  2-5 yr: 3.75 mL PO q6h prn
  6-11 yr: 7.5 mL po q6h prn
  ≥12 yr: 15 mL PO q6h prn
- Vicks Pediatric Formula 44E [syrup per 5 mL: Dextromethorphan 3.3 mg, Guaifenesin 33.3 mg].
  2-5 yr: 5 mL PO q4h prn
  6-11 yr: 10 mL PO q4h prn
  ≥12 yr: 15 mL po q4h prn
- Vick's Pediatric Formula 44M Multi-Symptom Cough and Cold Liquid [liquid per 5 mL: Chlorpheniramine 0.67 mg, Dextromethorphan 5 mg, Pseudoephedrine 10 mg].
  2-5 yr: 7.5 mL PO q6h prn
  6-11 yr: 15 mL PO q6h prn
  ≥12 yr: 30 mL PO q6h prn

Analgesia and Sedation

Analgesics/Anesthetic Agents:

- Acetaminophen (Tylenol) 10-15 mg/kg PO/PR q4-6h prn (see page 91 for detailed list of available products)
- Acetaminophen/Codeine [per 5 mL: Acetaminophen 120 mg, Codeine 12 mg; tabs: Tylenol #2: 15 mg codeine/300 mg acetaminophen; #3: 30 mg codeine/300 mg acetaminophen; #4: 60 mg codeine/300 mg acetaminophen]
  0.5-1.0 mg codeine/kg/dose PO q4h prn.
- Acetaminophen/Hydrocodone [elixir per 5 mL: hydrocodone 2.5 mg, acetaminophen 167 mg]
  Tab:
  Lortab 2.5/500: Hydrocodone 2.5 mg, acetaminophen 500 mg
  Lortab 5/500 and Vicodin: Hydrocodone 5 mg, acetaminophen 500 mg
  Lortab 7.5/500: Hydrocodone 7.5 mg, acetaminophen 500 mg
  Vicodin ES: Hydrocodone 7.5 mg, acetaminophen 750 mg
  Lortab 10/500: Hydrocodone 10 mg, acetaminophen 500 mg
  Lortab 10/650: Hydrocodone 10 mg, acetaminophen 650 mg
  Children: 0.6 mg hydrocodone/kg/day PO q6-8h prn
  <2 yr: do not exceed 1.25 mg/dose
  2-12 yr: do not exceed 5 mg/dose
  >12 yr: do not exceed 10 mg/dose
- ELAMax [lidocaine 4% cream (liposomal): 5, 30 gm]
  Apply 10-60 minutes prior to procedure. Occlusive dressing is optional. Available OTC.
- EMLA cream (eutectic mixture of local anesthetics) [cream: 2.5% lidocaine and 2.5% prilocaine: 5, 30 gm; transdermal disc]. Apply and cover with occlusive dressing at least 1 hour (max 4 hours) prior to procedure.
- Fentanyl 1-2 mcg/kg IV q1-2h prn or 1-3 mcg/kg/hr continuous IV infusion.
- Hydromorphone (Dilaudid) 0.015 mg/kg IV/IM/SC q3-4h or 0.0075 mg/kg/hr continuous IV infusion titrated as necessary for pain relief or 0.03-0.08 mg/kg PO q6h prn.
- Ketamine 4 mg/kg IM or 0.5-1 mg/kg IV. Onset for IV administration is 30 seconds, duration is 5-15 minutes.
- Lidocaine, buffered: Add sodium bicarbonate 1 mEq/mL 1 part to 9 parts lidocaine 1% for local infiltration (eg, 2 mL lidocaine 1% and 0.22 mL sodium bicarbonate 1 mEq/mL) to raise the pH of the lidocaine to neutral and decrease the "sting" of subcutaneous lidocaine.
- Meperidine (Demerol) 1 mg/kg IV/IM q2-3h prn pain.
- Morphine 0.05-0.1 mg/kg IV q2-4h prn or 0.02-0.06 mg/kg/hr continuous IV infusion or 0.1-0.15 mg/kg IM/SC q3-4h or 0.2-0.5 mg/kg PO q4-6h.

Sedation:

Fentanyl and Midazolam Sedation:

- Fentanyl 1 mcg/kg IV slowly, may repeat to total of 3 mcg/kg **AND**
- Midazolam (Versed) 0.05-0.1 mg/kg slow IV [inj: 1 mg/mL, 5 mg/mL].
  Have reversal agents available: naloxone 0.1 mg/kg (usual max 2 mg) IM/IV for fentanyl reversal and flumazenil 0.01 mg/kg (usual max 5 mg) IM/IV for midazolam reversal.

Benzodiazepines:

- Diazepam (Valium) 0.2-0.5 mg/kg/dose PO/PR or 0.05-0.2 mg/kg/dose IM/IV, max 10 mg.
- Lorazepam (Ativan) 0.05-0.1 mg/kg/dose IM/IV/PO, max 4 mg.
- Midazolam (Versed) 0.08-0.2 mg/kg/dose IM/IV over 10-20 min, max 5 mg; or 0.2-0.4 mg/kg/dose PO x 1, max 15 mg, 30-45 min prior to procedure; or 0.2 mg/kg intranasal (using 5 mg/mL injectable solution, insert into nares with needleless tuberculin syringe.)

Phenothiazines:

- Promethazine (Phenergan) 0.5-1 mg/kg/dose IM or slow IV over 20 min, max 50 mg/dose.
- Chlorpromazine (Thorazine) 0.5-1 mg/kg/dose IM or slow IV over 20min, max 50 mg/dose.

Antihistamines:

- Diphenhydramine (Benadryl) 1 mg/kg/dose IV/IM/PO, max 50 mg.
- Hydroxyzine (Vistaril) 0.5-1 mg/kg/dose IM/PO, max 50 mg.

Barbiturates:

- Methohexital (Brevital)
  IM: 5-10 mg/kg
  IV: 1-2 mg/kg

PR: 25 mg/kg (max 500 mg/dose)
-Thiopental (Pentothal): Sedation, rectal: 5-10 mg/kg; seizures, IV: 2-3 mg/kg

Other Sedatives:

-Chloral hydrate 25-100 mg/kg/dose PO/PR (max 1.5 gm/dose), allow 30 min for absorption.

Nonsteroidal Anti-inflammatory Drugs:

-Ibuprofen (Motrin, Advil, Nuprin, Medipren, Children's Motrin)
Anti-inflammatory: 30-50 mg/kg/day PO q6h, max 2400 mg/day.
[cap: 200 mg; caplet: 100 mg; oral drops: 40 mg/mL; susp: 100 mg/5 mL; tabs: 100, 200, 300, 400, 600, 800 mg; tabs, chewable: 50, 100 mg].

-Ketorolac (Toradol)
Single dose: 0.4-1 mg/kg IV/IM (max 30 mg/dose IV, 60 mg/dose IM)
Multiple doses: 0.4-0.5 mg/kg IV/IM q6h prn (max 30 mg/dose)
[inj: 15 mg/mL, 30 mg/mL].
Do not use for more than three days because of risk of GI bleed.

-Naproxen (Naprosyn)
Analgesia: 5-7 mg/kg/dose PO q8-12h
Inflammatory disease: 10-15 mg/kg/day PO q12h, max 1000 mg/day
[susp: 125 mg/5mL; tab: 250, 375, 500 mg; tab, DR: 375, 500 mg

-Naproxen sodium (Aleve, Anaprox, Naprelan)
Analgesia: 5-7 mg/kg/dose PO q8-12h
Inflammatory disease: 10-15 mg/kg/day PO q12h, max 1000 mg/day
[tab: 220, 275, 550 mg; tab, ER: 375, 500, 750 mg]. Naproxen sodium 220 mg = 200 mg base.

Antiemetics

-Chlorpromazine (Thorazine)
0.25-1 mg/kg/dose slow IV over 20 min/IM/PO q4-8h prn, max 50 mg/dose
[inj: 25 mg/mL,; oral concentrate 30 mg/mL; supp: 25,100 mg; syrup: 10 mg/5 mL; tabs: 10, 25, 50, 100, 200 mg].

-Diphenhydramine (Benadryl)
1 mg/kg/dose IM/IV/PO q6h prn, max 50 mg/dose
[caps: 25, 50 mg; inj: 10 mg/mL, 50 mg/mL; liquid: 12.5 mg/5 mL; tabs: 25, 50 mg].

-Dimenhydrinate (Dramamine)
≥12 yrs: 5 mg/kg/day IM/IV/PO q6h prn, max 300 mg/day
Not recommended in <12y due to high incidence of extrapyramidal side effects.
[cap: 50 mg; inj: 50 mg/mL; liquid 12.5 mg/4 mL; tab: 50 mg; tab, chew: 50mg].

-Prochlorperazine (Compazine)
≥12 yrs: 0.1-0.15 mg/kg/dose IM, max 10 mg/dose or 5-10 mg PO q6-8h, max 40 mg/day OR 5-25 mg PR q12h, max 50 mg/day
Not recommended in <12y due to high incidence of extrapyramidal side effects
[caps, SR: 10, 15, 30 mg; inj: 5 mg/mL; supp: 2.5, 5, 25 mg; syrup: 5 mg/5 mL; tabs: 5, 10, 25 mg].

-Promethazine (Phenergan)
0.25-1 mg/kg/dose PO/IM/IV over 20 min or PR q4-6h prn, max 50 mg/dose
[inj: 25,50 mg/mL; supp: 12.5, 25, 50 mg;syrup 6.25 mg/5 mL, 25 mg/5 mL; tabs: 12.5, 25, 50 mg].

-Trimethobenzamide (Tigan)
15 mg/kg/day IM/PO/PR q6-8h, max 100 mg/dose if <13.6 kg or 200 mg/dose if 13.6-41kg.
[caps: 100, 250 mg; inj: 100 mg/mL; supp: 100, 200 mg].

Post-Operative Nausea and Vomiting:

-Ondansetron (Zofran) 0.1 mg/kg IV x 1, max 4 mg.

-Droperidol (Inapsine) 0.01-0.05 mg/kg IV/IM q4-6h prn, max 5 mg [inj: 2.5 mg/mL].

Chemotherapy-Induced Nausea:

-Dexamethasone
10 mg/m^2/dose (max 20 mg) IV x 1, then 5 mg/m^2/dose (max 10 mg) IV q6h prn
[inj: 4 mg/mL, 10 mg/mL]

-Dronabinol (Marinol)
5 mg/m^2/dose PO 1-3 hrs prior to chemotherapy, then q4h prn afterwards. May titrate up in 2.5 mg/m^2/dose increments to max of 15 mg/m^2/dose.
[cap: 2.5, 5, 10 mg]

-Granisetron (Kytril)
10-20 mcg/kg IV given just prior to chemotherapy (single dose)
[inj: 1 mg/mL]
Adults (oral) 1 mg PO bid or 2 mg PO qd [tab: 1 mg]

-Metoclopramide (Reglan)
0.5-1 mg/kg/dose IV q6h prn.
Pretreatment with diphenhydramine 1 mg/kg IV is recommended to decrease the risk of extrapyramidal reactions.
[inj: 5 mg/mL]

-Ondansetron (Zofran)
0.15 mg/kg/dose IV 30 minutes before chemotherapy and repeated 4 hr and 8 hr later (total of 3 doses) **OR**
0.3 mg/kg/dose IV x 1 30 minutes before chemotherapy **OR**
0.45 mg/kg/day as a continuous IV infusion **OR**
Oral:
<0.3 m^2: 1 mg PO three times daily
0.3-0.6 m^2: 2 mg PO three times daily
0.6-1 m^2: 3 mg PO three times daily
>1 m^2: 4 mg PO three times daily **OR**
4-11 yr: 4 mg PO three times daily
>11 yr: 8 mg PO three times daily
[inj: 2 mg/mL; oral soln: 4mg/5 mL; tab: 4, 8, 24 mg; tab, orally disintegrating: 4, 8 mg]

Cardiovascular Disorders

Pediatric Advanced Life Support

I. Cardiopulmonary assessment

A. Airway (A) assessment. The airway should be assessed and cleared.

B. Breathing (B) assessment determines the respiratory rate, respiratory effort, breath sounds (air entry) and skin color. A respiratory rate of less than 10 or greater than 60 is a sign of impending respiratory failure.

C. Circulation (C) assessment should quantify the heart rate and pulse. In infants, chest compressions should be initiated if the heart rate is less than 80 beats/minute (bpm). In children, chest compressions should be initiated if the heart rate is less than 60 bpm.

II. Respiratory failure

A. An open airway should be established. Bag-valve-mask ventilation should be initiated if the respiratory rate is less than 10. Intubation is performed if prolonged ventilation is required. Matching the endotracheal tube to the size of the nares or fifth finger provides an estimate of tube size.

Intubation

Age	ETT	Laryngoscope Blade	NG Tube Size
Premature	2.0-2.5	0	8
Newborn >2 kg	3.0-3.5	1	10
Infant	3.5-4.0	1	10
12 mo	4.0-4.5	1.5	12
36 mo	4.5-5.0	2	12-14
6 yr	5.0-5.5	2	14-16
10 yr	6.0-6.5	2	16-18
Adolescent	.0-7.5	3	18-20
Adult	7.5-8.0	3	20

Uncuffed ET tube in children <8 yrs.
Straight laryngoscope blade if <6-10 yrs; curved blade if older.

B. Vascular access should be obtained. Gastric decompression with a nasogastric or oral gastric tube is necessary in endotracheally intubated children and in children receiving bag-valve-mask ventilation.

III. Shock

A. If the child is in shock, oxygen administration and monitoring are followed by initiation of vascular access. Crystalloid (normal saline or lactated Ringer's) solutions are used for rapid fluid boluses of 20 mL/kg over less than 20 minutes until the shock is resolved.

B. Shock secondary to traumatic blood loss may require blood replacement if perfusion parameters have not normalized after a total of 40 to 60 mL/kg of crystalloid has been administered.

C. Children in septic shock and cardiogenic shock should initially receive crystalloid solution (boluses of 20 mL/kg). Epinephrine should be considered if septic or cardiogenic shock persists after intravenous volume has been repleted (repletion requires 40 to 60 mL/kg of crystalloid).

IV. Cardiopulmonary failure

A. Oxygen is delivered at a concentration of 100%.

B. Intubation and foreign body removal are completed. If signs of shock persist, crystalloid replacement is initiated with boluses of 20 mL/kg over less than 20 minutes. Inotropic agents are added if indicated.

Inotropic Agents Used in Resuscitation of Children

Agent	Intravenous dosage	Indications
Epinephrine	0.1 to 1.0 µg/kg/minute (continuous infusion)	Symptomatic bradycardia, shock (cardiogenic, septic, anaphylactic), hypotension
Dopamine	2 to 5 µg/kg/minute (continuous infusion) 10 to 20 µg/kg/minute (continuous infusion)	Low dose: improve renal and splanchnic blood flow High dose: useful in the treatment of hypotension and shock in the presence of adequate intravascular volume
Dobutamine	2 to 20 µg/kg/minute (continuous infusion)	Normotensive cardiogenic shock

V. Dysrhythmias

A. Bradycardia

1. Bradycardia is the most common dysrhythmia in children. Initial management is ventilation and oxygenation. Chest compressions should be initiated if the heart rate is <60 bpm in a child or <80 bpm in an infant.

2. If these measures do not restore the heart rate, epinephrine is administered. Intravenous or intraosseous epinephrine is given in a dose of 0.1 mL/kg of the 1:10,000 concentration (0.01 mg/kg). Endotracheal tube epinephrine is given as a

dose of 0.1 mL/kg of the 1:1,000 concentration (0.1 mg/kg) diluted to a final volume of 3-5 mL in normal saline. This dose may be repeated every three to five minutes.

3. Atropine may be tried if multiple doses of epinephrine are unsuccessful. Atropine is given in a dose of 0.2 mL/kg IV/IO/ET of the 1:10,000 concentration (0.02 mg/kg. The minimum dose is 0.1 mg; the maximum single dose is 0.5 mg for a child and 1 mg for an adolescent. Endotracheal tube administration of atropine should be further diluted to a final volume of 3-5 mL in normal saline.
4. Pacing may be attempted if drug therapy has failed.

B. Asystole

1. Epinephrine is the drug of choice for asystole. The initial dose of intravenous or intraosseous epinephrine is given in a dose of 0.1 mL/kg of the 1:10,000 concentration of epinephrine (0.01 mg/kg). Endotracheal tube administration of epinephrine is given as a dose of 0.1 mL/kg of the 1:1,000 concentration of epinephrine (0.1 mg/kg), further diluted to a final volume of 3-5 mL in normal saline.
2. Subsequent doses of epinephrine are administered every three to five minutes at 0.1 mL/kg IV/IO/ET of the 1:1,000 concentration (0.1 mg/kg).

C. Supraventricular tachycardia

1. Supraventricular tachycardia presents with a heart rate >220 beats/minute in infants and >180 beats/minute in children. Supraventricular tachycardia is the most common dysrhythmia in the first year of life.
2. **Stable children with no signs of respiratory compromise or shock and a normal blood pressure**
   a. Initiate 100% oxygen and cardiac monitoring, and obtain pediatric cardiology consultation.
   b. Administer adenosine 0.1 mg/kg (max 6 mg) by rapid intravenous push. The dose of adenosine may be doubled to 0.2 mg/kg (max 12 mg) and repeated if supraventricular tachycardia is not converted.
   c. **Verapamil (Calan)** may be used; however, it is contraindicated under one year; in congestive heart failure or myocardial depression; in children receiving beta-adrenergic blockers; and in the presence of a possible bypass tract (ie, Wolff-Parkinson-White syndrome). Dose is 0.1-0.3 mg/kg/dose (max 5 mg) IV; may repeat dose in 30 minutes prn (max 10 mg).
3. **Supraventricular tachycardia in unstable child with signs of shock**: Administer synchronized cardioversion at 0.5 joules (J)/kg. If supraventricular tachycardia persists, cardioversion is repeated at double the dose: 1.0 J/kg.

D. Ventricular tachycardia with palpable pulse

1. A palpable pulse with heart rate ≥120 bpm with a wide QRS (>0.08 seconds) is present. Initiate cardiac monitoring, administer oxygen and ventilate.
2. If vascular access is available, administer a lidocaine bolus of 1 mg/kg; if successful, begin lidocaine infusion at 20-50 µg/kg/minute.
3. If ventricular tachycardia persists, perform synchronized cardioversion using 0.5 J/kg.
4. If ventricular tachycardia persists, repeat synchronized cardioversion using 1.0 J/kg.
5. If ventricular tachycardia persists, administer a lidocaine bolus of 1.0 mg/kg, and begin lidocaine infusion at 20-50 µg/kg/min.
6. Repeat synchronized cardioversion as indicated.

E. Ventricular fibrillation and pulseless ventricular tachycardia

1. Apply cardiac monitor, administer oxygen, and ventilate.
2. Perform defibrillation using 2 J/kg. Do not delay defibrillation.
3. If ventricular fibrillation persists, perform defibrillation using 4 J/kg.
4. If ventricular fibrillation persists, perform defibrillation using 4 J/kg.
5. If ventricular fibrillation persists, perform intubation, continue CPR, and obtain vascular access. Administer epinephrine, 0.1 mL/kg of 1:10,000 IV or IO (0.01 mg/kg); or 0.1 mL/kg of 1:1000 ET (0.1 mg/kg).
6. If ventricular fibrillation persists, perform defibrillation using 4 J/kg.
7. If ventricular fibrillation persists, administer lidocaine 1 mg/kg IV or IO, or 2 mg/kg ET.
8. If ventricular fibrillation persists, perform defibrillation using 4 J/kg.
9. If ventricular fibrillation persists, continue epinephrine, 0.1 mg/kg IV/IO/ET, 0.1 mL/kg of 1:1,000; administer every 3 to 5 minutes.
10. If ventricular fibrillation persists, alternate defibrillation (4 J/kg) with lidocaine and epinephrine. Consider bretylium 5 mg/kg IV first dose, 10 mg/kg IV second dose.

F. Pulseless electrical activity is uncommon in children. It usually occurs secondary to hypoxemia, hypovolemia, hypothermia, hypoglycemia, hyperkalemia, cardiac tamponade, tension pneumothorax, severe acidosis or drug overdose. Successful resuscitation depends on treatment of the underlying etiology.

1. The initial dose of IV or IO epinephrine is given in a dose of 0.1 mL/kg of the 1:10,000 concentration (0.01 mg/kg). Endotracheal epinephrine is given as a dose of 0.1 mL/kg of the 1:1,000 concentration (0.1 mg/kg) diluted to a final volume of 3-5 mL in normal saline.
2. Subsequent doses are administered every three to five minutes as 0.1 mL/kg of the 1:1,000 concentration IV/IO/ET (0.1 mg/kg).

VI. Serum glucose concentration should be determined in all children undergoing resuscitation. Glucose replacement is provided with 25% dextrose in water, 2 to 4 mL/kg (0.5 to 1 g/kg) IV over 20 to 30 minutes for hypoglycemia. In neonates, 10% dextrose in water, 5 to 10 mL/kg (0.5 to 1 g/kg), is recommended.

Congestive Heart Failure

1. **Admit to:**
2. **Diagnosis:** Congestive Heart Failure
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Daily weights, inputs and outputs
7. **Diet:** Low salt diet
8. **IV Fluids:**
9. **Special Medications:**
   -Oxygen 2-4 L/min by NC.
   -Furosemide (Lasix) 1 mg/kg/dose IV/IM/PO q6-12h prn, max 80 mg PO, 40 mg IV; may increase to 2 mg/kg/dose IV/IM/PO [inj: 10 mg/mL; oral liquid: 10 mg/mL, 40 mg/5 mL; tabs: 20, 40, 80 mg] **OR**
   -Bumetanide (Bumex) 0.015-0.1 mg/kg PO/IV/IM q12-24h, max 10 mg/day [inj: 0.25 mg/mL; tabs: 0.5, 1, 2 mg].

Digoxin:

-Obtain a baseline ECG, serum electrolytes (potassium), and serum creatinine before administration.

Initial digitalization is given over 24 hours in three divided doses: ½ total digitalizing dose (TDD) at time 0 hours, 1/4 TDD at 8-12 hours, and 1/4 TDD 8-12 hours later.

Maintenance therapy is then started.

Total Digitalizing Dose

	PO	IV
Premature infant	20-30 mcg/kg	10-30 mcg/kg
Full term newborn (0-2 weeks)	30 mcg/kg	20-25 mcg/kg
2 wks-2 yr	40-50 mcg/kg	30-40 mcg/kg
2-10 yr	30-40 mcg/kg	25-30 mcg/kg
>10 yr	0.75-1.5 mg	10 mcg/kg (max 1 mg)

Maintenance digoxin dose

	PO	IV
Preterm neonate	4-10 mcg/kg/day	4 - 9 mcg/kg/day
Term neonate (0-2 wks)	6-10 mcg/kg/day	6 - 8 mcg/kg/day
2 weeks - 2 yr	10-12 mcg/kg/day	8 - 10 mcg/kg/day
2-10 yr	8-10 mcg/kg/day	6 - 8 mcg/kg/day
>10 yr	5 mcg/kg/day	2 - 3 mcg/kg/day
Adult	0.125-0.5 mg/day	0.1-0.4 mg/day

Divide bid if <10 yrs or qd if ≥10 yrs.

[caps: 50, 100, 200 mcg; elixir: 50 mcg/mL; inj: 100 mcg/mL, 250 mcg/mL; tabs: 0.125, 0.25, 0.5 mg].

Other Agents:

-Dopamine (Intropin) 2-20 mcg/kg/min continuous IV infusion, titrate cardiac output and BP.

-Dobutamine (Dobutrex) 2-20 mcg/kg/min continuous IV infusion, max of 40 mcg/kg/min.

-Nitroglycerin 0.5 mcg/kg/min continuous IV infusion, may increase by 1 mcg/kg q20min; usual max 5 mcg/kg/min.

-Captopril (Capoten)

Neonates: 0.05-0.1 mg/kg/dose PO q6-8h

Infants: 0.15-0.3 mg/kg/dose PO q8h.

Children: 0.5 mg/kg/dose PO q6-12h. Titrate as needed up to max of 6 mg/kg/day

[tabs: 12.5, 25, 50,100 mg]. Tablets can be crushed and made into extemporaneous suspension.

-KCl 1-4 mEq/kg/day PO q6-24h.

10. **Extras and X-rays:** CXR PA and LAT, ECG, echocardiogram.
11. **Labs:** ABG, SMA 7, Mg, Ca, CBC, iron studies, digoxin level, UA.

Pulmonary Disorders

Asthma

1. **Admit to:**
2. **Diagnosis:** Exacerbation of asthma
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Pulse oximeter, measure peak flow rate in older patients.
7. **Diet:**
8. **IV Fluids:** D5 1/4 NS or D5 ½ NS at maintenance rate.
9. **Special Medications:**

-Oxygen humidified prn, 1-6 L/min by NC or 25-80% by mask, keep sat >92%.

Aerosolized and Nebulized Beta 2 Agonists:

-Albuterol (Ventolin) (using 0.5% = 5 mg/mL soln) nebulized 0.2-0.5 mL in 2 mL NS q1-4h and prn; may also be given by continuous aerosol.
[soln for inhalation: 0.83 mg/3 mL unit dose; 5 mg/mL 20 mL multidose bulk bottle]

-Albuterol (Ventolin, Proventil) 2 puffs q1-6h prn with spacer and mask.
[capsule for inhalation (Rotacaps) using Rotahaler inhalation device: 200 mcg; MDI: 90 mcg/puff, 200 puffs/17 gm]

-Levalbuterol (Xopenex)
2-11 yrs: 0.16-1.25 mg nebulized
>12 yrs: 0.63-1.25mg nebulized q6-8h
[Soln for inhalation: 0.63 mg/3 mL, 1.25 mg/3 mL]. Levalbuterol 0.63 mg is comparable to albuterol 2.5 mg.

-Salmeterol (Serevent) > 4 yrs: 2 puffs bid. Not indicated for acute treatment. [Serevent Diskus: 50 mcg/puff; MDI: 21 mcg/puff, 60 puffs/6.5gm or 120 puffs/13 gm]

-Formoterol (Foradil): >5 yrs: 12 mcg capsule aerosolized using dry powder inhaler bid. [capsule for aerosolization: 12 mcg]

-Metaproterenol (Alupent, Metaprel)
> 12 yrs: 2-3 puffs q3-4h prn, max 12 puffs/24 hrs. [MDI: 0.65 mg/puff]

-Racemic epinephrine (2.25% sln) 0.05 mL/kg/dose (max 0.5 mL) in 2-3 mL saline nebulized q1-6h.

Intravenous Beta-2 Agonist:

-Terbutaline (Brethaire, Brethine, Bricanyl)
Loading dose: 2-10 mcg/kg IV
Maintenance continuous IV infusion: 0.08-6 mcg/kg/min
Monitor heart rate and blood pressure closely.
[inj: 1 mg/mL]

Corticosteroid (systemic) Pulse Therapy:

-Prednisolone 1-2 mg/kg/day PO q12-24h x 3-5 days
[syrup: 5 mg/5 mL; Orapred 20.2 mg/5mL; Prelone 15 mg/5 mL] **OR**

-Prednisone 1-2 mg/kg/day PO q12-24h x 3-5 days
[oral solution: 1 mg/mL, 5 mg/mL; tabs: 1, 2, 5, 10, 20, 50 mg] **OR**

-Methylprednisolone (Solu-Medrol) 2 mg/kg/dose IV/IM q6h x 1-4 doses, then 0.5-1 mg/kg/dose IV/IM q6h x 3-5 days.

Aminophylline and theophylline:

-Therapeutic range 10-20 mcg/mL. Concomitant drugs (e.g. erythromycin or carbamazepine) may increase serum theophylline levels by decreasing drug metabolism.

-Aminophylline loading dose 5-6 mg/kg **total** body weight IV over 20-30 min [1 mg/kg of aminophylline will raise serum level by 2 mcg/mL].

-Aminophylline maintenance as continuous IV infusion (based on ideal body weight)
1-6 mth: 0.5 mg/kg/hr
6-12 mth: 0.6-0.75 mg/kg/hr
1-10 yr: 1.0 mg/kg/hr
10-16 yr: 0.75-0.9 mg/kg/hr
>16 yr: 0.7 mg/kg/hr **OR**

-Theophylline PO maintenance
80% of total daily maintenance IV aminophylline dose in 2-4 doses/day **OR**
1-6 mth: 9.6 mg/kg/day.
6-12 mth: 11.5-14.4 mg/kg/day.
1-10 yr: 19.2 mg/kg/day.
10-16 yr: 14.4-17.3 mg/kg/day.
>16 yr: 10 mg/kg/day.

-Give theophylline as sustained release theophylline preparation: q8-12h or liquid immediate release: q6h.

-Slo-Phyllin Gyrocaps, may open caps and sprinkle on food [60, 125, 250 mg caps] q8-12h

-Slobid Gyrocaps, may open caps and sprinkle on food [50, 75, 100, 125, 200, 300 mg caps] q8-12h

-Theophylline oral liquid: 80 mg/15 mL, 10 mg/mL] q6-8h.

-Theo-Dur [100, 200, 300, 450 mg tabs; scored, may cut in half, but do not crush] q8-12h.

-Theophylline Products
Cap: 100, 200 mg
Cap, SR: 50, 60, 65, 75, 100, 125, 130, 200, 250, 260, 300 mg
Liquid: 80 mg/15 mL, 10 mg/mL
Tab: 100, 125, 200, 250, 300 mg
Tab, SR: 50, 75, 100, 125, 130, 200, 250, 260, 300, 400, 450, 500 mg

Corticosteroid metered dose inhalers or nebulized solution:

-Beclomethasone (Beclovent, Vanceril) MDI 1-4 puffs bid-qid with spacer and mask, followed by gargling with water. [42 mcg/puff].

-Beclomethasone (Vanceril Double Strength) MDI 2 puffs bid [84 mcg/puff]

-Budesonide (Pulmicort Turbohaler) MDI 1-2 puffs bid [200 mcg/puff]

-Budesonide (Pulmicort) 0.25-0.5 mg nebulized bid [0.25 mg/2mL, 0.5 mg/2mL]

-Flunisolide (Aerobid) MDI 2-4 puffs bid [250 mcg/puff]

-Fluticasone (Flovent) MDI 1-2 puffs bid [44, 110, 220 mcg/actuation]
-Triamcinolone (Azmacort) MDI 1-4 puffs bid-qid [100 mcg/puff]

Cromolyn/nedocromil:
-Cromolyn sodium (Intal) MDI 2-4 puffs qid [800 mcg/puff] or nebulized 20 mg bid-qid [10 mg/mL 2 mL unit dose ampules]
-Nedocromil (Tilade) MDI 2 puffs bid-qid [1.75 mg/puff]

Oral beta-2 agonists:
-Albuterol (Proventil)
2-6 years: 0.1-0.2 mg/kg/dose PO q6-8h
6-12 years: 2 mg PO tid-qid
>12 years: 2-4 mg PO tid-qid or 4-8 mg ER tab PO bid
[soln: 2 mg/5 mL; tab: 2, 4 mg; tab, ER: 4, 8 mg]
-Metaproterenol (Alupent, Metaprel)
< 2 yrs: 0.4 mg/kg/dose PO tid-qid
2-6 yrs: 1.3-2.6 mg PO q6-8h
6-9 yrs: 10 mg PO q6-8h
[syrup: 10 mg/5mL; tabs: 10, 20 mg]

Leukotriene receptor antagonists:
-Montelukast (Singulair)
2-5 yr: 4 mg PO qPM
6-14 yr: 5 mg PO qPM
> 14 yr: 10 mg PO qPM
[tab: 10 mg; tab, chew : 4, 5 mg]
-Zafirlukast (Accolate)
7-11 yr: 10 mg PO bid
>12 yr: 20 mg PO bid
[tabs: 10, 20 mg]
-Zileuton (Zyflo)
>12 yr: 600 mg PO qid (with meals and at bedtime)
[tab: 600 mg]

10. **Extras and X-rays:** CXR, pulmonary function test, peak flow rates.
11. **Labs:** CBC, CBG/ABG. Urine antigen screen, UA, theophylline level.

Allergic Rhinitis and Conjunctivitis

Antihistamines:
-Astemizole (Hismanal):
6-12 yr: 5 mg/day PO qd
>12 yr: 10 mg PO qd
[tab: 10 mg].
-Loratadine (Claritin)
>3 yrs and < 30 kg: 5 mg PO qd
>30 kg: 10 mg PO qd.
[syrup: 1mg/mL; tab: 10 mg; tab, rapidly disintegrating: 10 mg]
-Cetirizine (Zyrtec)
12 y: 5-10 mg qd
6-11 y: 5-10 mg qd
[tabs: 5, 10 mg Syrup: 5 mg/5 mL]
-Fexofenadine (Allegra), 12 y: 60 mg bid [60 mg]
-Actifed [per cap or tab or 10 mL syrup: triprolidine 2.5 mg, pseudoephedrine 60 mg]
4 mg pseudoephedrine/kg/day PO tid-qid **OR**
4 m-2 yr: 1.25 mL PO q6-8h
2-4 yr: 2.5 mL PO q6-8h
4-6 yr: 3.75 mL PO q6-8h
6-11y: 5 mL or ½ tab PO q6-8h
>12 yr: 10 mL or 1 cap/tab PO q6-8h.
-Chlorpheniramine maleate (Chlor-Trimeton):
0.35 mg/kg/day PO q4-6h OR
2-5 yr: 1 mg PO q4-6h (max 4 mg/day)
6-11y: 2 mg PO q4-6h (max 12 mg/day)
>12y: 4 mg PO q4-6h or 8-12 mg SR q8-12h (max 24 mg/day).
[cap, SR: 8,12 mg; soln: 2 mg/5 mL; tab: 4, 8, 12 mg; tab, chew: 2 mg; tab, SR: 8, 12 mg]
-Diphenhydramine (Benadryl)
1 mg/kg/dose PO q6h prn, max 50 mg/dose
[elixir/liquid: 12.5 mg/5 mL; tab, cap: 25, 50 mg].

Intranasal Therapy:
-Azelastine (Astelin)
3-12 yr: 1 spray in each nostril bid
> 12 yr: 2 sprays in each nostril bid
[nasal soln: 1 mg/mL, 17 mL (137 mcg/spray)]
-Beclomethasone (Beconase, Vancenase)
6-11 yrs: 1 spray into each nostril tid
>12 yrs: 1 spray into each nostril bid-qid
[42 mcg/actuation]
-Beclomethasone aqueous (Beconase AQ)
6-11 yrs: 1-2 sprays into each nostril bid
>12 yrs: 1-2 sprays into each nostril bid
[42 mcg/actuation]
-Beclomethasone Double Strength (Vancenase AQ)
6-11 yrs: 1-2 puffs into each nostril qd
>12 yrs: 1-2 sprays into each nostril qd
[84 mcg/actuation]
-Budesonide (Rhinocort)
6-11 yrs: 2 sprays into each nostril bid or 4 sprays into each nostril qAM
≥12 yrs: 2 sprays into each nostril bid or 4 sprays into each nostril qAM
[32 mcg/actuation]
-Budesonide aqueous(Rhinocort AQ)
6-11 yrs: 1-2 sprays into each nostril bid
≥12 yrs: 1 sprays into each nostril qd, may increase up to 4 sprays into each nostril qAM
[32 mcg/actuation]
-Cromolyn (Nasalcrom)
1 puff into each nostril q3-4h
[40 mg/mL 13 mL].
-Flunisolide (Nasalide, Nasarel)
6-11 yrs: 1 spray into each nostril tid or 2 sprays into each nostril bid
>12 yrs: 2 sprays into each nostril bid-tid
[25 mcg/actuation].
-Fluticasone (Flonase)

4-6 yrs: 1-2 sprays into each nostril qd
6-11 yrs: 1-2 sprays into each nostril qd
≥ 12 yrs: 1 spray into each nostril bid or 2 sprays into each nostril qd
[50 mcg/actuation]

-Mometasone (Nasonex)
4-6 yrs: 1 spray into each nostril qd
6-11 yrs: 1 spray into each nostril qd
≥12 yrs: 2 sprays into each nostril qd
[50 mcg/actuation]

-Triamcinolone (Nasacort)
6-11 yr: 2 sprays into each nostril qd
>12 yr: 2 sprays into each nostril qd.
[55 mcg/actuation]

-Triamcinolone aqueous (Nasacort AQ)
6-11 yr: 2 spray into each nostril qd
>12 yr: 2 sprays into each nostril qd.
[55 mcg/actuation]

Allergic Conjunctivitis Therapy:

-Azelastine (Optivar)
≥3 yr: instill 1 drop into affected eye(s) bid
[ophth soln: 0.05% 6 mL]

-Cromolyn ophthalmic (Crolom, Opticrom)
Instill 2 drops into each affected eye(s) q4-6h
[ophth soln: 4% 2.5, 10 mL].**Decongestants:**

-Pseudoephedrine (Sudafed, Novafed)
<12 yr: 4 mg/kg/day PO q6h.
>12 yr and adults: 30-60 mg/dose PO q6-8h or sustained release 120 mg PO q12h or sustained release 240 mg PO q24h
[cap/cplt, SR: 120, 240 mg; drops: 7.5 mg/0.8mL; syrup: 15 mg/5mL, 30 mg/5mL; tabs: 30, 60 mg].

Infectious Diseases

Suspected Sepsis

1. **Admit to:**
2. **Diagnosis:** Suspected sepsis
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights, cooling measures prn temp >38°C, consent for lumbar puncture.
7. **Diet:**
8. **IV Fluids:** Correct hypovolemia if present; NS 10-20 mL/kg IV bolus, then IV fluids at 1-1.5 times maintenance.
9. **Special Medications:**

Term newborns <1 month old (Group B strep, E coli, Group D strep, gram negatives, Listeria monocytogenes): Ampicillin and gentamicin or cefotaxime.
- -Ampicillin IV/IM: <7d: 150 mg/kg/day q8h; >7d: 200 mg/kg/day q6h.
- -Cefotaxime (Claforan) IV/IM: <7 days: 100 mg/kg/day q12h; >7 days: 150 mg/kg/day q8h.
- -Gentamicin (Garamycin) IV/IM: 5 mg/kg/day q12h.
- -Also see page 146.

Infant 1-2 months old (H. flu, strep pneumonia, N meningitidis, Group B strep):
- -Ampicillin 100 mg/kg/day IV/IM q6h **AND EITHER**
- -Cefotaxime (Claforan) 100 mg/kg/day IV/IM q6h **OR**
- -Ceftriaxone (Rocephin) 50-75 mg/kg/day IV/IM q12-24h **OR**
- -Gentamicin (Garamycin) 7.5 mg/kg/day IV/IM q8h

Children 2 months to 18 years old (S pneumonia, H flu, N. meningitidis):
- -Cefotaxime (Claforan) 100 mg/kg/day IV/IM q6h, max 12 gm/day **OR**
- -Ceftriaxone (Rocephin) 50-75 mg/kg/day IV/IM q 12-24h, max 4 gm/day.

Immunocompromised Patients (Gram negative bacilli, Pseudomonas, Staph, Strep viridans):
- -Ticarcillin (Ticar) 200-300 mg/kg/day IV/IM q6h, max 24 gm/day
- -Ticarcillin/clavulanate (Timentin) 200-300 mg/kg/day of ticarcillin IV/IM q6-8h, max 24gm/day **OR**
- -Piperacillin (Pipracil) 200-300 mg/kg/day IV/IM q6h, max 24 gm/day **OR**
- -Piperacillin/tazobactam (Zosyn) 240 mg/kg/day of piperacillin IV/IM q6-8h, max 12 gm/day **OR**
- -Ceftazidime (Fortaz) 100-150 mg/kg/day IV/IM q8h, max 12 gm/day **AND**
- -Tobramycin (Nebcin) or Gentamicin (Garamycin) (normal renal function):
  - <5 yr (except neonates): 7.5 mg/kg/day IV/IM q8h.
  - 5-10 yr: 6.0 mg/kg/day IV/IM q8h.
  - >10 yr: 5.0 mg/kg/day IV/IM q8h **AND (if gram positive infection strongly suspected)**
- -Vancomycin (Vancocin) (central line infection) 40-60 mg/kg/day IV q6-8h, max 4 gm/day

10. **Symptomatic Medications:**
    - -Ibuprofen (Advil) 5-10 mg/kg/dose PO q6h-8h prn temp >38°C **OR**
    - -Acetaminophen (Tylenol) 10-15 mg/kg PO/PR q4-6h prn temp >38°C or pain.
11. **Extras and X-rays:** CXR.
12. **Labs:** CBC, SMA 7. Blood culture and sensitivity x 2. UA, urine culture and sensitivity; antibiotic levels. Stool for Wright stain if diarrhea. Nasopharyngeal washings for direct fluorescent antibody (RSV, chlamydia).
    CSF Tube 1 - Gram stain, culture and sensitivity for bacteria, antigen screen (1-2 mL).
    CSF Tube 2 - Glucose, protein (1-2 mL).
    CSF Tube 3 - Cell count and differential (1-2 mL).

Meningitis

1. **Admit to:**
2. **Diagnosis:** Meningitis.
3. **Condition:** Guarded.
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Strict isolation precautions. Inputs and outputs, daily weights; cooling measures prn temp >38°C; consent for lumbar puncture. Monitor for signs of increased intracranial pressure.
7. **Diet:**
8. **IV Fluids:** Isotonic fluids at maintenance rate.
9. **Special Medications:**

Term Newborns <1 months old (Group B strep, E coli, gram negatives, Listeria):
- -Ampicillin, 0-7 d: 150 mg/kg/day IV/IM q8h; >7d: 200 mg/kg/day IV/IM q6h **AND**
- -Cefotaxime (Claforan): <7d: 100 mg/kg/day IV/IM q12h; >7 days: 150 mg/kg/day q8h IV/IM.

Infants 1-3 months old (H. flu, strep pneumonia, N. Meningitidis, group B strep, E coli):
- -Cefotaxime (Claforan) 200 mg/kg/day IV/IM q6h **OR**
- -Ceftriaxone (Rocephin) 100 mg/kg/day IV/IM q12-24h **AND**
- -Vancomycin (Vancocin) 40-60 mg/kg/day IV q6h.
- -Dexamethasone 0.6 mg/kg/day IV q6h x 4 days. Initiate before or with the first dose of parenteral antibiotic.

Children 3 months to 18 years old (S pneumonia, H flu, N. meningitidis):
- -Cefotaxime (Claforan) 200 mg/kg/day IV/IM q6h, max 12 gm/day or ceftriaxone (Rocephin) 100 mg/kg/day IV/IM q12-24h, max 4 gm/day **AND**
- -Vancomycin (Vancocin) 60 mg/kg/day IV q6h, max 4gm/day.
- -Dexamethasone 0.6 mg/kg/day IV q6h x 4 days. Initiate before or with the first dose of parenteral antibiotic.

10. **Symptomatic Medications:**

-Ibuprofen (Advil) 5-10 mg/kg/dose PO q6-8h prn **OR**
-Acetaminophen (Tylenol) 15 mg/kg PO/PR q4h prn temp >38°C or pain.

11. Extras and X-rays: CXR, MRI.

12. Labs: CBC, SMA 7. Blood culture and sensitivity x 2. UA, urine culture and sensitivity; urine specific gravity. Antibiotic levels. Urine and blood antigen testing.

Lumbar Puncture:

CSF Tube 1 - Gram stain, culture and sensitivity, bacterial antigen screen (1-2 mL).

CSF Tube 2 - Glucose, protein (1-2 mL).

CSF Tube 3 - Cell count and differential (1-2 mL).

Pneumonia

1. Admit to:

2. Diagnosis: Pneumonia

3. Condition:

4. Vital signs: Call MD if:

5. Activity:

6. Nursing: Pulse oximeter, inputs and outputs. Bronchial clearance techniques, vibrating vest.

7. Diet:

8. IV Fluids:

9. Special Medications:

-Humidified O_2 by NC at 2-4 L/min or 25-100% by mask, adjust to keep saturation >92%

Term Neonates <1 month:

-Ampicillin 100 mg/kg/day IV/IM q6h **AND**

-Cefotaxime (Claforan) <1 wk: 100 mg/kg/day IV/IM q12h; >1 wk: 150 mg/kg/day IV/IM q8h **OR**

-Gentamicin (Garamycin) 5 mg/kg/day IV/IM q12h.

Children 1 month-5 years old:

-Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h **OR**

-Ampicillin 100 mg/kg/day IV/IM q6h **AND**

-Gentamicin (Garamycin) or Tobramycin (Nebcin):
7.5 mg/kg/day IV/IM q8h (normal renal function).

-If chlamydia is strongly suspected, add erythromycin 40 mg/kg/day IV q6h.

Oral Therapy:

-Cefuroxime axetil (Ceftin)
tab: child: 125-250 mg PO bid; adult: 250-500 mg PO bid
susp: 30 mg/kg/day PO q12h, max 1000 mg/day
[susp: 125 mg/5 mL; tabs: 125, 250,500 mg] **OR**

-Loracarbef (Lorabid)
30 mg/kg/day PO q12h, max 800 mg/day
[cap: 200, 400 mg; susp: 100 mg/5 mL, 200 mg/5mL]

-Cefpodoxime (Vantin)
10 mg/kg/day PO q12h, max 800 mg/day
[susp: 50 mg/5 mL, 100 mg/5 mL; tabs: 100, 200 mg]

-Cefprozil (Cefzil)
30 mg/kg/day PO q12h, max 1000 mg/day
[susp: 125 mg/5 mL, 250 mg/5 mL; tabs: 250, 500 mg].

-Cefixime (Suprax)
8 mg/kg/day PO qd-bid, max 400 mg/day
[susp: 100 mg/5 mL; tabs: 200, 400 mg].

-Clarithromycin (Biaxin)
15-30 mg/kg/day PO bid, max 1000 mg/day
[susp: 125 mg/5 mL, 250 mg/5 mL; tabs: 250, 500 mg].

-Azithromycin (Zithromax)
Children ≥2 yrs: 12 mg/kg/day PO qd x 5 days, max 500 mg/day
≥16 yrs: 500 mg PO on day 1, 250 mg PO qd on days 2-5
[cap: 250 mg; susp: 100 mg/5mL, 200 mg/5mL; tabs: 250, 600 mg]

-Amoxicillin/clavulanate (Augmentin)
30-40 mg/kg/day of amoxicillin PO q8h , max 500 mg/dose
[elixir 125 mg/5 mL, 250 mg/5 mL; tabs: 250, 500 mg; tabs, chew: 125, 250 mg;]

-Amoxicillin/clavulanate (Augmentin BID)
30-40 mg/kg/day PO q12h, max 875 mg (amoxicillin)/dose
[susp 200 mg/5 mL, 400 mg/5 mL; tab: 875 mg; tabs, chew: 200, 400 mg]

Community Acquired Pneumonia 5-18 years old (viral, Mycoplasma pneumoniae, chlamydia pneumoniae, pneumococcus, legionella):

-Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h, max 9 gm/day **OR**

-Erythromycin estolate (Ilosone) 30-50 mg/kg/day PO q8-12h, max 2 gm/day
[caps: 125, 250 mg; drops: 100 mg/mL; susp: 125 mg/5 mL, 250 mg/5 mL; tab: 500 mg; tabs, chew: 125,250 mg]

-Erythromycin ethylsuccinate (EryPed, EES)
30-50 mg/kg/day PO q6-8h, max 2gm/day
[susp: 200 mg/5 mL, 400 mg/5 mL; tab: 400 mg; tab, chew: 200 mg]

-Erythromycin base (E-mycin, Ery-Tab, Eryc)
30-50 mg/kg/day PO q6-8h, max 2gm/day
[cap, DR: 250 mg; tabs: 250, 333, 500 mg]

-Erythromycin lactobionate
20-40 mg/kg/day IV q6h, max 4 gm/day
[inj: 500 mg, 1 gm]

-Clarithromycin (Biaxin)
15-30 mg/kg/day PO bid, max 1000 mg/day
[susp: 125 mg/5 mL, 250 mg/5 mL; tabs: 250, 500 mg].

10. Symptomatic Medications:
-Acetaminophen (Tylenol) 10-15 mg/kg PO/PR q4h prn temp >38°C or pain.

11. Extras and X-rays: CXR PA and LAT, PPD.

12. Labs: CBC, ABG, blood culture and sensitivity x 2. Sputum gram stain, culture and sensitivity, AFB. Antibiotic levels. Nasopharyngeal washings for direct fluorescent antibody (RSV, adenovirus, parainfluenza, influenza virus, chlamydia) and cultures for respiratory viruses. UA.

Specific Therapy for Pneumonia

Pneumococcal pneumonia:
-Erythromycin estolate (Ilosone)
30-50 mg/kg/day PO q8-12h, max 2 gm/day
[caps: 125, 250 mg; drops: 100 mg/mL; susp: 125 mg/5 mL, 250 mg/5 mL; tab: 500 mg; tabs, chew: 125,250 mg]
-Erythromycin ethylsuccinate (EryPed, EES)
30-50 mg/kg/day PO q6-8h, max 2gm/day
[susp: 200 mg/5 mL, 400 mg/5 mL; tab: 400 mg; tab, chew: 200 mg]
-Erythromycin base (E-Mycin, Ery-Tab, Eryc)
30-50 mg/kg/day PO q6-8h, max 2gm/day
[tab: 250, 333, 500 mg]
-Erythromycin lactobionate
20-40 mg/kg/day IV q6h, max 4 gm/day
[inj: 500 mg, 1 g m] **OR**
-Vancomycin (Vancocin) 40 mg/kg/day IV q6h, max 4 gm/day **OR**
-Cefotaxime (Claforan) 100-150 mg/kg/day IV/IM q6h, max 12 gm/day **OR**
-Penicillin G 150,000 U/kg/day IV/IM q4-6h, max 24 MU/day.
Staphylococcus aureus:
-Oxacillin (Bactocill, Prostaphlin) or Nafcillin (Nafcil) 150-200 mg/kg/day IV/IM q4-6h, max 12 gm/day **OR**
-Vancomycin (Vancocin) 40 mg/kg/day IV q6h, max 4 gm/day
Haemophilus influenzae (<5 yr of age):
-Cefotaxime (Claforan) 100-150 mg/kg/day IV/IM q8h, max 12 gm/day **OR**
-Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h (beta-lactamase pos), max 9 gm/day **OR**
-Ampicillin 100-200 mg/kg/day IV/IM q6h (beta-lactamase negative), max 12 gm/day
Pseudomonas aeruginosa:
-Tobramycin (Nebcin):
<5 yr (except neonates): 7.5 mg/kg/day IV/IM q8h.
5-10 yr: 6.0 mg/kg/day IV/IM q8h.
>10 yr: 5.0 mg/kg/day IV/IM q8h **AND**
-Piperacillin (Pipracil) or ticarcillin (Ticar) 200-300 mg/kg/day IV/IM q4-6h, max 24 gm/day **OR**
-Ceftazidime (Fortaz) 150 mg/kg/day IV/IM q8h, max 12 gm/day.
Mycoplasma pneumoniae:
-Clarithromycin (Biaxin) 15-30 mg/kg/day PO q12h, max 1 gm/day
[susp: 125 mg/5 mL, 250 mg/5 mL; tabs: 250, 500 mg].
-Erythromycin estolate (Ilosone)
30-50 mg/kg/day PO q8-12h, max 2 gm/day
[caps: 125, 250 mg; drops: 100 mg/mL; susp: 125 mg/5 mL, 250 mg/5 mL; tab: 500 mg; tabs, chew: 125,250 mg]
-Erythromycin ethylsuccinate (EryPed, EES)
30-50 mg/kg/day PO q6-8h, max 2gm/day
[susp: 200 mg/5 mL, 400 mg/5 mL; tab: 400 mg; tab, chew: 200 mg]
-Erythromycin base (E-Mycin, Ery-Tab, Eryc)
30-50 mg/kg/day PO q6-8h, max 2gm/day
[cap, DR: 250 mg; tabs: 250, 333, 500 mg]
-Erythromycin lactobionate (Erythrocin)
20-40 mg/kg/day IV q6h, max 4 gm/day
[inj: 500 mg, 1 gm]
-Tetracycline (Achromycin)
>8 yrs only
25-50 mg/kg/day PO q6h, max 2 gm/day
[caps: 100, 250, 500 mg; susp: 125 mg/5 mL; tabs: 250, 500 mg]
Moraxella catarrhalis:
-Clarithromycin (Biaxin)
15 mg/kg/day PO q12h, max 1 gm/day
[susp: 125 mg/5 mL, 250 mg/5 mL; tabs: 250, 500 mg] **OR**
-Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h, max 9 gm/day **OR**
-Erythromycin estolate (Ilosone)
30-50 mg/kg/day PO q8-12h, max 2 gm/day
[caps: 125, 250 mg; drops: 100 mg/mL; susp: 125 mg/5 mL, 250 mg/5 mL; tab: 500 mg; tabs, chew: 125,250 mg]
-Erythromycin ethylsuccinate (EryPed, EES)
30-50 mg/kg/day PO q6-8h, max 2gm/day
[susp: 200 mg/5 mL, 400 mg/5 mL; tab: 400 mg; tab, chew: 200 mg]
-Erythromycin base (E-Mycin, Ery-Tab, Eryc)
30-50 mg/kg/day PO q6-8h, max 2gm/day
[cap, DR: 250 mg; tabs: 250, 333, 500 mg]
-Erythromycin lactobionate (Erythrocin)
20-40 mg/kg/day IV q6h, max 4 gm/day
[inj: 500 mg, 1 gm] **OR**
-Trimethoprim/Sulfamethoxazole (Bactrim, Septra)
6-12 mg TMP/kg/day PO/IV q12h, max 320 mg TMP/day
[inj per mL: TMP 16 mg/SMX 80 mg; susp per 5 mL: TMP 40 mg/SMX 200 mg; tab DS: TMP 160 mg/SMX 800 mg; tab SS: TMP 80mg/SMX 400 mg]
Chlamydia pneumoniae (TWAR), psittaci, trachomatous:
-Erythromycin estolate (Ilosone)
30-50 mg/kg/day PO q8-12h, max 2 gm/day
[caps: 125, 250 mg; drops: 100 mg/mL; susp: 125 mg/5 mL, 250 mg/5 mL; tab: 500 mg; tabs, chew: 125,250 mg]
-Erythromycin ethylsuccinate (EryPed, EES)
30-50 mg/kg/day PO q6-8h, max 2gm/day
[susp: 200 mg/5 mL, 400 mg/5 mL; tab: 400 mg; tab, chew: 200 mg]
-Erythromycin base (E-Mycin, Ery-Tab, Eryc)
30-50 mg/kg/day PO q6-8h, max 2gm/day
[cap, DR: 250 mg; tabs: 250, 333, 500 mg]
-Erythromycin lactobionate (Erythrocin)
20-40 mg/kg/day IV q6h, max 4 gm/day
[inj: 500 mg, 1 gm] **OR**
-Azithromycin (Zithromax)
children >2 yrs: 12 mg/kg/day PO qd x 5 days, max 500 mg/day
>16 yrs: 500 mg PO on day one, then 250 mg PO qd on days 2-5
[cap: 250 mg; susp: 100 mg/5mL, 200 mg/5mL; tabs: 250, 600 mg]
Influenza Virus:
-Oseltamivir (Tamiflu)

>1 yr and <15 kg: 30 mg PO bid
15-23 kg: 45 mg PO bid
>23 - 40 kg: 60 mg PO bid
>40 kg: 75 mg PO bid
>18 yr: 75 mg PO bid
[cap: 75 mg; susp: 12 mg/mL]
Approved for treatment of uncomplicated influenza A or B when patient has been symptomatic no longer than 48 hrs. **OR**

-Rimantadine (Flumadine)
<10 yr: 5 mg/kg/day PO qd, max 150 mg/day
>10 yr: 100 mg PO bid
[syrup: 50 mg/5 mL; tab: 100 mg].
Approved for treatment or prophylaxis of Influenza A. Not effective against Influenza B. **OR**

-Amantadine (Symmetrel)
1-9 yr: 5 mg/kg/day PO qd-bid, max 150 mg/day
>9 yr: 5 mg/kg/day PO qd-bid, max 200 mg/day
[cap: 100 mg; syr: 50 mg/5 mL].
Approved for treatment or prophylaxis of Influenza A. Not effective against Influenza B.

Bronchiolitis

1. Admit to:
2. Diagnosis: Bronchiolitis
3. Condition:
4. Vital signs: Call MD if:
5. Activity:
6. Nursing: Pulse oximeter, peak flow rate. Respiratory isolation.
7. Diet:
8. IV Fluids:
9. Special Medications:

-Oxygen, humidified 1-4 L/min by NC or 40-60% by mask, keep sat >92%.

Nebulized Beta 2 Agonists:

-Albuterol (Ventolin, Proventil) (5 mg/mL sln) nebulized 0.2-0.5 mL in 2 mL NS (0.10-0.15 mg/kg) q1-4h prn.

Treatment of Respiratory Syncytial Virus (severe lung disease or underlying cardiopulmonary disease):

-Ribavirin (Virazole) therapy should be considered in high risk children <2 yrs with chronic lung disease or with history of premature birth less than 35 weeks gestational age. Ribavirin is administered as a 6 gm vial, aerosolized by SPAG nebulizer over 18-20h qd x 3-5 days or 2 gm over 2 hrs q8h x 3-5 days.

Prophylaxis Against Respiratory Syncytial Virus:

-Recommended use in high risk children <2 yrs with BPD who required medical management within the past six months, or with history of premature birth less than or equal to 28 weeks gestational age who are less than one year of age at start of RSV season, or with history of premature birth 29-32 weeks gestational age who are less than six months of age at start of RSV season.

-Palivizumab (Synagis) 15 mg/kg IM once a month throughout RSV season (usually October-March)

-RSV-IVIG (RespiGam) 750 mg/kg IV once a month throughout RSV season (usually from October to March**).**

Influenza A:

-Oseltamivir (Tamiflu)
>1 yr and <15 kg: 30 mg PO bid
15-23 kg: 45 mg PO bid
>23 - 40 kg: 60 mg PO bid
>40 kg: 75 mg PO bid
>18 yr: 75 mg PO bid
[cap: 75 mg; susp: 12 mg/mL]
Approved for treatment of uncomplicated influenza A or B when patient has been symptomatic no longer than 48 hrs. **OR**

-Rimantadine (Flumadine)
<10 yr: 5 mg/kg/day PO qd, max 150 mg/day
>10 yr: 100 mg PO bid
[syrup: 50 mg/5 mL; tab: 100 mg].
Approved for treatment or prophylaxis of Influenza A. Not effective against Influenza B. **OR**

-Amantadine (Symmetrel)
1-9 yr: 5 mg/kg/day PO qd-bid, max 150 mg/day
>9 yr: 5 mg/kg/day PO qd-bid, max 200 mg/day
[cap: 100 mg; syr: 50 mg/5 mL].
Approved for treatment or prophylaxis of Influenza A. Not effective against Influenza B.

Oral Beta 2 Agonists and Acetaminophen:

-Albuterol liquid (Proventil, Ventolin)
2-6 years: 0.1-0.2 mg/kg/dose PO q6-8h
6-12 years: 2 mg PO tid-qid
>12 years: 2-4 mg PO tid-qid
[soln: 2 mg/5 mL; tabs: 2,4 mg; tabs, SR: 4, 8 mg]

-Acetaminophen (Tylenol) 10-15 mg/kg PO/PR q4-6h prn temp >38°.

10. Extras and X-rays: CXR.
11. Labs: CBC, SMA 7, CBG/ABG, UA. Urine antigen screen. Nasopharyngeal washings for direct fluorescent antibody (RSV, adenovirus, parainfluenza, influenza virus, chlamydia), viral culture.

Viral Laryngotracheitis (Croup)

1. Admit to:
2. Diagnosis: Croup
3. Condition:
4. Vital signs: Call MD if:
5. Activity:
6. Nursing: Pulse oximeter, laryngoscope and endotracheal tube at bedside. Respiratory isolation, inputs and outputs.
7. Diet:
8. IV Fluids:
9. Special Medications:
-Oxygen, cool mist, 1-2 L/min by NC or 40-60% by mask, keep sat >92%.
-Racemic epinephrine (2.25% sln) 0.05 mL/kg/dose (max 0.5 mL)

in 2-3 mL saline nebulized q1-6h.
-Dexamethasone (Decadron) 0.25-0.5 mg/kg/dose IM/IV q6h prn, max dose 10 mg **OR**
-Prednisone 1-2 mg/kg/day PO q12-24h x 3-5 days [syr: 1mg/mL, 5 mg/mL;
tabs: 1, 2.5, 5, 10, 20, 50 mg]
-Prednisolone 1-2 mg/kg/day PO q12-24h x 3-5 days [5 mg/5 mL, Orapred 20.2mg/5mL, Prelone 15 mg/5 mL].

10. Extras and X-rays: CXR PA and LAT, posteroanterior x-ray of neck.
11. Labs: CBC, CBG/ABG, blood culture and sensitivity; UA, culture and sensitivity. Urine antigen screen.

Varicella Zoster Infections

Immunocompetent Patient

A. Therapy with oral acyclovir is not recommended routinely for the treatment of uncomplicated varicella in the otherwise healthy child <12 years of age.
B. Oral acyclovir may be given within 24 hours of the onset of rash. Administration results in a modest decrease in the duration and magnitude of fever and a decrease in the number and duration of skin lesions.
C. Acyclovir (Zovirax) 80 mg/kg/day PO q6h for five days, max 3200 mg/day [cap: 200 mg; susp: 200 mg/5 mL; tabs: 400, 800 mg]

Immunocompromised Patient

A. Intravenous acyclovir should be initiated early in the course of the illness. Therapy within 24 hours of rash onset maximizes efficacy. Oral acyclovir should not be used because of unreliable oral bioavailability.
Dose: 500 mg/m^2/dose IV q8h x 7-10 days
B. Varicella zoster immune globulin (VZIG) may be given shortly after exposure to prevent or modify the course of the disease. It is not effective once disease is established.
Dose: 125 U per 10 kg body weight, round up to nearest vial size to max of 625 U [vial: 125 U/1.25ml]. Must be administered IM.

Lower Urinary Tract Infection

1. Admit to:
2. Diagnosis: UTI
3. Condition:
4. Vital signs: Call MD if:
5. Activity:
6. Nursing: Inputs and outputs
7. Diet:
8. IV Fluids:
9. Special Medications:
Lower Urinary Tract Infection:
-Trimethoprim/sulfamethoxazole (Bactrim, Septra) 6-10 mg/kg/day TMP PO q12h, max 320 mg TMP/day [susp per 5 mL: TMP 40 mg, SMX 200 mg; tab, SS: 80 mg/400 mg; tab, DS: 160 mg/800 mg] **OR**
-Cefpodoxime (Vantin) 10 mg/kg/day PO q12h, max 800 mg/day [susp: 50 mg/5 mL, 100 mg/5 mL; tabs: 100, 200 mg] **OR**
-Cefprozil (Cefzil) 30 mg/kg/day PO q12h, max 1 gm/day [susp: 125 mg/5 mL, 250 mg/5 mL; tabs: 250, 500 mg] **OR**

Prophylactic Therapy:
-Trimethoprim/Sulfamethoxazole (Bactrim, Septra) 2 mg TMP/kg/day and 10 mg SMX/kg/day PO qhs [susp per 5 mL: TMP 40 mg/SMX 200 mg; tab DS: TMP 160 mg/SMX 800 mg; tab SS: TMP 80mg/SMX 400 mg] **OR**
-Sulfisoxazole (Gantrisin) 10-20 mg/kg/day PO q12h [syr: 500 mg/5 mL; tab: 500 mg].

10. Symptomatic Medications:
-Phenazopyridine (Pyridium), children 6-12 yrs: 12 mg/kg/day PO tid (max 200 mg/dose); >12 yrs: 100-200 mg PO tid x 2 days prn dysuria [tabs: 100, 200 mg]. Does not treat infection; acts only as an analgesic.
11. Extras and X-rays: Renal ultrasound. Voiding cystourethrogram 3 weeks after infection. Radiological work up on all children <1 year of age.
12. Labs: CBC, SMA 7. UA with micro, urine Gram stain, culture and sensitivity. Repeat urine culture and sensitivity 24-48 hours after therapy; blood culture and sensitivity.

Pyelonephritis

1. Admit to:
2. Diagnosis: Pyelonephritis
3. Condition:
4. Vital signs: Call MD if:
5. Activity:
6. Nursing: Inputs and outputs, daily weights
7. Diet:
8. IV Fluids:
9. Special Medications:
-If less than 1 week old, see suspected sepsis, pages 106, 146.
-Ampicillin 100 mg/kg/day IV/IM q6h, max 12 gm/day **AND**
-Gentamicin (Garamycin) or Tobramycin (Nebcin):
30 days-5 yr: 7.5 mg/kg/day IV/IM q8h.
5-10 yr: 6.0 mg/kg/day IV/IM q8h.
>10 yr: 5.0 mg/kg/day IV/IM q8h **OR**
-Cefotaxime (Claforan) 100 mg/kg/day IV/IM q8h, max 12 gm/day.

10. Symptomatic Medications:
-Acetaminophen (Tylenol) 10-15 mg/kg PO/PR q4-6h prn temp >38°.
11. Extras and X-rays: Renal ultrasound.
12. Labs: CBC, SMA-7. UA with micro, urine culture and sensitivity. Repeat urine culture and sensitivity 24-48 hours after initiation of therapy; blood culture and sensitivity x 2; drug levels.

Otitis Media

Acute Otitis Media (S pneumoniae, non-typable H flu, M catarrhalis, Staph a, group A strep):

- -Amoxicillin (Amoxil) 25-50 mg/kg/day PO q8h, max 3 gm/day
  [caps: 250, 500 mg; drops: 50 mg/mL; susp; 125 mg/5mL, 200 mg/5mL, 250 mg/5mL, 400 mg/5mL; tabs: 500, 875 mg; tabs, chew: 125, 200, 250, 400 mg] **OR**
- -Trimethoprim/Sulfamethoxazole (Bactrim, Septra) 6-8 mg/kg/day of TMP PO bid, max 320 mg TMP/day
  [susp per 5 mL: TMP 40 mg/SMX 200 mg; tab DS: TMP 160 mg/SMX 800 mg; tab SS: TMP 80mg/SMX 400 mg] **OR**
- -Erythromycin/sulfisoxazole (Pediazole) 1 mL/kg/day PO qid or 40 mg/kg/day of erythromycin PO qid, max 50 mL/day
  [susp per 5 mL: erythromycin 200 mg/sulfisoxazole 600 mg] **OR**
- -Amoxicillin/clavulanate (Augmentin) 40 mg/kg/day of amoxicillin PO q8h x 7-10d, max 500 mg/dose
  [susp per 5 mL: 125, 250 mg; tabs: 250, 500 mg; tab, chew: 125, 250 mg] **OR**
- -Amoxicillin/clavulanate (Augmentin BID)
  40 mg/kg/day PO q12h, max 875 mg of amoxicillin/dose
  [susp: 200 mg/5mL, 400 mg/5mL; tab: 875 mg; tab, chew: 200, 400 mg]
- -Azithromycin (Zithromax)
  Children ≥2 yrs: 12 mg/kg/day PO qd x 5 days, max 500 mg/day
  >16 yrs: 500 mg PO on day 1, 250 mg PO qd on days 2-5
  [cap: 250 mg; susp: 100 mg/5mL, 200 mg/5mL; tabs: 250, 600 mg]
  OR
- -Clarithromycin (Biaxin) 15-30 mg/kg/day PO bid, max 1 gm/day
  [susp: 125 mg/5 mL, 250 mg/5 mL; tabs: 250, 500 mg] **OR**
- -Cefixime (Suprax) 8 mg/kg/day PO bid-qd, max 400 mg/day
  [susp: 100 mg/5 mL; tabs: 200, 400 mg] **OR**
- -Cefuroxime axetil (Ceftin) tab: child: 125-250 mg PO bid; adult: 250-500 mg PO bid; susp: 30 mg/kg/day PO q12h, max 500 mg/day
  [susp: 125 mg/5 mL; tabs 125, 250, 500 mg] **OR**
- -Loracarbef (Lorabid) 30 mg/kg/day PO bid, max 400 mg/day
  [caps: 200, 400 mg; susp: 100 mg/5 mL, 200 mg/5mL] **OR**
- -Cefpodoxime (Vantin) 10 mg/kg/day PO bid, max 800 mg/day
  [susp: 50 mg/5 mL, 100 mg/5 mL; tabs: 100, 200 mg] **OR**
- -Cefprozil (Cefzil) 30 mg/kg/day PO bid, max 1gm/day
  [susp: 125 mg/5 mL, 250 mg/5 mL; tabs: 250 mg, 500 mg] **OR**
- -Ceftriaxone (Rocephin) 50 mg/kg IM x one dose, max 2000 mg

Acute Otitis Media (resistant strains of Strep pneumoniae):

- -Amoxicillin (Amoxil) 80-90 mg/kg/day PO q12h, max 3 gm/day
  [caps: 250, 500 mg; drops: 50 mg/mL; susp; 125 mg/5mL, 200 mg/5mL, 250 mg/5mL, 400 mg/5mL; tabs: 500, 875 mg; tabs, chew: 125, 200, 250, 400mg]
- -Amoxicillin/clavulanate (Augmentin BID) 80-90 mg/kg/day PO q12h.
  [susp 200 mg/5 mL, 400 mg/5 mL; tab: 875 mg; tab, chew: 200, 400 mg]

Prophylactic Therapy (≥3 episodes in 6 months):
Therapy reserved for control of recurrent acute otitis media, defined as three or more episodes per 6 months or 4 or more episodes per 12 months.

- -Sulfisoxazole (Gantrisin) 50 mg/kg/day PO qhs
  [tab 500 mg; susp 500 mg/5 mL] **OR**
- -Amoxicillin (Amoxil) 20 mg/kg/day PO qhs
  [caps: 250,500 mg; drops: 50 mg/mL; susp; 125 mg/5mL, 200 mg/5mL, 250 mg/5mL, 400 mg/5mL; tabs: 500, 875 mg; tabs, chew: 125, 200, 250, 400mg] **OR**
- -Trimethoprim/Sulfamethoxazole (Bactrim, Septra) 4 mg/kg/day of TMP PO qhs
  [susp per 5 mL: TMP 40 mg/SMX 200 mg; tab DS: TMP 160 mg/SMX 800 mg; tab SS: TMP 80mg/SMX 400 mg]

Symptomatic Therapy:

- -Ibuprofen (Advil) 5-10 mg/kg/dose PO q6-8 hrs prn fever
  [suspension: 100 mg/5 mL, tabs: 200, 300, 400, 600, 800 mg] **AND/OR**
- -Acetaminophen (Tylenol) 10-15 mg/kg/dose PO/PR q4-6h prn fever
  [tabs: 325, 500 mg; chewable tabs: 80 mg; caplets: 160 mg, 500 mg; drops: 80 mg/0.8 mL; elixir: 120 mg/5 mL, 130 mg/5 mL, 160 mg/5 mL, 325 mg/5 mL; caplet, ER: 650 mg; suppositories: 120, 325, 650 mg].
- -Benzocaine/antipyrine (Auralgan otic): fill ear canal with 2-4 drops; moisten cotton pledget and place in external ear; repeat every 1-2 hours prn pain [soln, otic: Antipyrine 5.4%, benzocaine 1.4% in 10 mL and 15 mL bottles]

Extras and X rays: Aspiration tympanocentesis, tympanogram; audiometry.

Otitis Externa

Otitis Externa (Pseudomonas, gram negatives, proteus):

- -Polymyxin B/neomycin/hydrocortisone (Cortisporin otic susp or solution) 2-4 drops in ear canal tid-qid x 5-7 days.
  [otic soln or susp per mL: neomycin sulfate 5 mg; polymyxin B sulfate 10,000 units; hydrocortisone 10 mg in 10 mL bottles)]. The suspension is preferred. The solution should not be used if the eardrum is perforated.

Malignant Otitis Externa in Diabetes (Pseudomonas):

- -Ceftazidime (Fortaz) 100-150 mg/kg/day IV/IM q8h, max 12gm/day **OR**
- -Piperacillin (Pipracil) or ticarcillin (Ticar) 200-300 mg/kg/day IV/IM q4-6h, max 24gm/day **OR**
- -Tobramycin (Nebcin)
  30 days-5 yr: 7.5 mg/kg/day IV/IM q8h.
  5-10 yr: 6.0 mg/kg/day IV/IM q8h.
  >10 yr: 5.0 mg/kg/day IV q8h.

Tonsillopharyngitis

Streptococcal Pharyngitis:
- -Penicillin V (Pen Vee K) 25-50 mg/kg/day PO qid x 10 days, max 3 gm/day [susp: 125 mg/5 mL, 250 mg/5 mL; tabs: 125, 250, 500 mg] **OR**
- -Penicillin G benzathine (Bicillin LA) 25,000-50,000 U/kg (max 1.2 MU) IM x 1 dose **OR**
- -Azithromycin (Zithromax) 12 mg/kg/day PO qd x 5 days, max 500 mg/day
  [cap: 250 mg; susp: 100 mg/5mL, 200 mg/5mL; tabs: 250, 600 mg] **OR**
- -Clarithromycin (Biaxin)15 mg/kg/day PO bid, max 1 gm/day
  [susp 125 mg/5 mL, 250 mg/5 mL; tabs: 250, 500 mg] **OR**
- -Erythromycin (penicillin allergic patients) 40 mg/kg/day PO qid x 10 days, max 2 gm/day
  Erythromycin ethylsuccinate (EryPed, EES)
  [susp: 200 mg/5 mL, 400 mg/5 mL; tab: 400 mg; tab, chew: 200 mg]
  Erythromycin base (E-Mycin, Ery-Tab, Eryc)
  [cap, DR: 250 mg; tabs: 250, 333, 500 mg]

Refractory Pharyngitis:
- -Amoxicillin/clavulanate (Augmentin)
  40 mg/kg/day of amoxicillin PO q8h x 7-10d, max 500 mg/dose
  [susp: 125 mg/5 mL, 250 mg/5 mL; tabs: 250, 500 mg; tabs, chew: 125, 250 mg] **OR**
- -Dicloxacillin (Dycill, Dynapen, Pathocil)
  50 mg/kg/day PO qid, max 2 gm/day
  [caps 125, 250, 500; elixir 62.5 mg/5 mL] **OR**
- -Cephalexin (Keflex)
  50 mg/kg/day PO qid-tid, max 4 gm/day
  [caps: 250, 500 mg; drops 100 mg/mL; susp 125 mg/5 mL, 250 mg/5 mL; tabs: 500 mg, 1 gm].

Prophylaxis (5 strep infections in 6 months):
- -Penicillin V Potassium (Pen Vee K)
  40 mg/kg/day PO bid, max 3 gm/day
  [susp 125 mg/5 mL, 250 mg/5 mL; tabs: 125, 250, 500 mg].

Retropharyngeal Abscess (strep, anaerobes, E corrodens):
- -Clindamycin (Cleocin) 25-40 mg/kg/day IV/IM q6-8h, max 4.8 gm/day **OR**
- -Nafcillin (Nafcil) or oxacillin (Bactocill, Prostaphlin) 100-150 mg/kg/day IV/IM q6h, max 12 gm/day **AND**
- -Cefuroxime (Zinacef) 75-100 mg/kg/day IV/IM q8h, max 9 gm/day

Labs: Throat culture, rapid antigen test; PA lateral and neck films; CXR. Otolaryngology consult for incision and drainage.

Epiglottitis

1. **Admit to:** Pediatric intensive care unit.
2. **Diagnosis:** Epiglottitis
3. **Condition:**
4. **Vital Signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Pulse oximeter. Keep head of bed elevated, allow patient to sit; curved blade laryngoscope, tracheostomy tray and oropharyngeal tube at bedside. Avoid excessive manipulation or agitation. Respiratory isolation.
7. **Diet:** NPO
8. **IV Fluids:**
9. **Special Medications:**
   -Oxygen, humidified, blow-by; keep sat >92%.

Antibiotics:

Most common causative organism is Haemophilus influenzae.
- -Ceftriaxone (Rocephin) 50 mg/kg/day IV/IM qd, max 2 gm/day **OR**
- -Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h, max 9 gm/day **OR**
- -Cefotaxime (Claforan) 100-150 mg/kg/day IV/IM q6-8h, max 12 gm/day

10. **Extras and X-rays:** CXR PA and LAT, lateral neck. Otolaryngology consult.
11. **Labs:** CBC, CBG/ABG. Blood culture and sensitivity, latex agglutination; UA, urine antigen screen.

Sinusitis

Treatment of Sinusitis (S. pneumoniae, H flu, M catarrhalis, group A strep, anaerobes):
- -Treat for 14-21 days.
- -Amoxicillin (Amoxil) 40 mg/kg/day PO tid, max 3 gm/day [caps: 250,500 mg; drops: 50 mg/mL; susp; 125 mg/5mL, 200 mg/5mL, 250 mg/5mL, 400 mg/5mL; tabs: 500, 875 mg; tabs, chew: 125, 200, 250 , 400mg] **OR**
- -Azithromycin (Zithromax)
  Children ≥2 yrs: 12 mg/kg/day PO qd x 5 days, max 500 mg/day
  >16 yrs: 500 mg PO on day 1, 250 mg PO qd on days 2-5
  [cap: 250 mg; susp: 100 mg/5mL, 200 mg/5mL; tab: 250, 600 mg] **OR**
- -Trimethoprim/sulfamethoxazole (Bactrim, Septra) 6-8 mg/kg/day of TMP PO bid, max 320 mg TMP/day
  [susp per 5 mL: TMP 40 mg/SMX 200 mg; tab DS: TMP 160 mg/SMX 800 mg; tab SS: TMP 80mg/SMX 400 mg] **OR**
- -Erythromycin/sulfisoxazole (Pediazole) 1 mL/kg/day PO qid or 40-50 mg/kg/day of erythromycin PO qid, max 2 gm erythromycin/day
  [susp per 5 mL: Erythromycin 200 mg, sulfisoxazole 600 mg] **OR**
- -Amoxicillin/clavulanate (Augmentin) 40 mg/kg/day of amoxicillin PO tid, max 500 mg/dose
  [elixir 125 mg/5 mL, 250 mg/5 mL; tabs: 250, 500 mg; tabs, chew: 125, 250 mg] **OR**
- -Amoxicillin/clavulanate (Augmentin BID)
  40 mg/kg/day PO bid, max 875 mg (amoxicillin)/dose

[susp: 200 mg/5 mL, 400 mg/5 mL; tab: 875 mg; tabs, chew: 200, 400 mg] **OR**
-Cefuroxime axetil (Ceftin)
tab: child: 125-250 mg PO bid; adult: 250-500 mg PO bid
susp: 30 mg/kg/day PO qid, max 500 mg/day
[susp: 125 mg/5 mL; tabs: 125, 250, 500 mg]
Labs: Sinus x-rays, MRI scan.

Active Pulmonary Tuberculosis

1. **Admit to:**
2. **Diagnosis:** Active Pulmonary Tuberculosis
3. **Condition:**
4. **Vital signs:**
5. **Activity:**
6. **Nursing:** Respiratory isolation.
7. **Diet:**
8. **Special Medications:**

Pulmonary Infection:
Six Month Regimen: Two months of isoniazid, rifampin and pyrazinamide daily, followed by 4 months of isoniazid and rifampin daily **OR**
Two months of isoniazid, rifampin and pyrazinamide daily, followed by 4 months of isoniazid and rifampin twice weekly.
Nine Month Regimen (for hilar adenopathy only): Nine months of isoniazid and rifampin daily **OR** one month of isoniazid and rifampin daily, followed by 8 months of isoniazid and rifampin twice weekly.

Anti-tuberculosis Agents

Drug	Daily Dose	Twice Weekly Dose	Dosage Forms
Isoniazid (Laniazid)	10-15 mg/kg/day PO qd, max 300 mg	20-30 mg/kg PO, max 900 mg	Tab: 50, 100, 300 mg Syr: 10 mg/mL
Rifampin (Rifadin)	10-20 mg/kg/day PO qd, max 600 mg	10-20 mg/kg, max 600 mg	Cap: 150, 300 mg Extemporaneous suspension
Pyrazinamide	20-40 mg/kg PO qd, max 2000 mg	50 mg/kg PO, max 2000 mg	Tab: 500 mg Extemporaneous suspension
Ethambutol (Myambutol)	15-25 mg/kg/day PO qd, max 2500 mg	50 mg/kg PO, max 2500 mg	Tab: 100, 400 mg
Streptomycin	20-40 mg/kg IM qd, max 1 gm	20-40 mg/kg IM, max 1 gm	Inj: 400 mg/mL, IM only

-Directly observed therapy should be considered for all patients. All household contacts should be tested.

Tuberculosis Prophylaxis for Skin Test Conversion:
-Isoniazid-susceptible: Isoniazid (Laniazid) 10 mg/kg/day (max 300 mg) PO qd x 6-9 months.
-Isoniazid-resistant: Rifampin (Rifadin) 10 mg/kg/day (max 600 mg) PO qd for 9 months.

9. **Extras and X-rays:** CXR PA, LAT, spinal series.
10. **Labs:** CBC, SMA7, liver panel, HIV antibody, ABG. First AM sputum for AFB x 3 (drug sensitivity tests on first isolate). Gastric aspirates for AFB qAM x 3. UA, urine AFB.

Cellulitis

1. **Admit to:**
2. **Diagnosis:** Cellulitis
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Keep affected extremity elevated; warm compresses tid prn. Monitor area of infection.
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**

Empiric Therapy for Extremity Cellulitis:
-Nafcillin (Nafcil) or oxacillin (Bactocill, Prostaphlin) 100-200 mg/kg/day/IV/IM q4-6h, max 12gm/day **OR**
-Cefazolin (Ancef) 75-100 mg/kg/day IV/IM q6-8h, max 6 gm/day **OR**
-Cefoxitin (Mefoxin) 100-160 mg/kg/day IV/IM q6h, max 12 gm/day **OR**
-Ticarcillin/clavulanate (Timentin) 200-300 mg/kg/day IV/IM q6-8h, max 24 gm/day **OR**
-Dicloxacillin (Dycill, Dynapen, Pathocil) 50-100 mg/kg/day PO qid, max 2 gm/day [caps: 125, 250, 500 mg; susp: 62.5 mg/5 mL].

Cheek/Buccal Cellulitis (H flu):
-Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h, max 9 gm/day **OR**
-Cefotaxime (Claforan) 100-150 mg/kg/day IV/IM q6-8h, max 12 gm/day.

10. **Symptomatic Medications:**
-Acetaminophen and codeine, 0.5-1 mg codeine/kg/dose PO q4-6h prn pain [elixir per 5 mL: codeine 12 mg, acetaminophen 120 mg].
11. **Extras and X-rays:** X-ray views of site.
12. **Labs:** CBC, SMA 7, blood culture and sensitivity. Leading edge aspirate, Gram stain, culture and sensitivity; UA, urine culture.

Impetigo, Scalded Skin Syndrome, and Staphylococcal Scarlet Fever

1. **Admit to:**
2. **Diagnosis:** Impetigo, scalded skin syndrome or staphylococcal scarlet fever
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Warm compresses tid prn.
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**
   - -Nafcillin (Nafcil) or oxacillin (Bactocill, Prostaphlin) 100-200 mg/kg/day IV/IM q4-6h, max 12 gm/day **OR**
   - -Dicloxacillin (Dycill, Dynapen, Pathocil) 25-50 mg/kg/day PO qid x 5-7days, max 2 gm/day [caps 125, 250, 500 mg; elixir 62.5 mg/5 mL] **OR**
   - -Cephalexin (Keflex) 25-50 mg/kg/day PO qid, max 4 gm/day [caps: 250, 500 mg; drops 100 mg/mL; susp 125 mg/5 mL, 250 mg/5 mL; tabs: 500 mg, 1 gm] **OR**
   - -Loracarbef (Lorabid) 30 mg/kg/day PO bid, max 800 mg/day [caps: 200, 400 mg; susp: 100 mg/5 mL, 200 mg/5mL] **OR**
   - -Cefpodoxime (Vantin) 10 mg/kg/day PO bid, max 800 mg/day [susp: 50 mg/5 mL, 100 mg/5 mL; tabs: 100 mg, 200 mg] **OR**
   - -Cefprozil (Cefzil) 30 mg/kg/day PO bid, max 1 gm/day [susp 125 mg/5 mL, 250 mg/5 mL; tabs: 250, 500 mg] **OR**
   - -Vancomycin (Vancocin) 40 mg/kg/day IV q6-8h, max 4 gm/day
   - -Mupirocin (Bactroban) ointment or cream, apply topically tid (cream/oint: 2% 15 gm). Extensive involvement requires systemic antibiotics.
10. **Symptomatic Medications:**
    - -Acetaminophen and codeine, 0.5-1 mg codeine/kg/dose PO q4-6h prn pain [elixir per 5 mL: codeine 12 mg, acetaminophen 120 mg].
11. **Labs:** CBC, SMA 7, blood culture and sensitivity. Drainage fluid for Gram stain, culture and sensitivity; UA.

Tetanus

History of One or Two Primary Immunizations or Unknown:
- Low risk wound - Tetanus toxoid 0.5 mL IM.
- Tetanus prone - Tetanus toxoid 0.5 mL IM, plus tetanus immunoglobulin (TIG) 250 U IM.

Three Primary Immunizations and 10 yrs or more Since Last Booster:
- Low risk wound - Tetanus toxoid, 0.5 mL IM.
- Tetanus prone - Tetanus toxoid, 0.5 mL IM.

Three Primary Immunizations and 5-10 yrs Since Last Booster:
- Low risk wound - None
- Tetanus prone - Tetanus toxoid 0.5 mL IM.

Three Primary Immunizations and ≤5 yrs Since Last Booster:
- Low risk wound - None
- Tetanus prone - None

Treatment of Clostridium Tetani Infection:
- -Tetanus immune globulin (TIG): single dose of 3,000 to 6,000 U IM (consider immune globulin intravenous if TIG is not available). Part of the TIG dose may be infiltrated locally around the wound. Keep wound clean and débrided.
- -Penicillin G 100,000 U/kg/day IV q4-6h, max 24 MU/day x 10-14 days **OR**
- -Metronidazole (Flagyl) 30 mg/kg/day PO/IV q6h, max 4 gm/day x 10-14 days

Pelvic Inflammatory Disease

1. **Admit to:**
2. **Diagnosis:** Pelvic Inflammatory Disease (PID)
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:**
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**

Adolescent Outpatients
- -Ofloxacin (Floxin, 400 mg PO twice daily) or levofloxacin (Levaquin, 500 mg once daily) with or without metronidazole (Flagyl, 500 mg twice daily) for 14 days. **OR**
- -Ceftriaxone (Rocephin, 250 mg IM), cefoxitin (Mefoxin, 2 g IM plus probenecid 1 g orally), or another parenteral third-generation cephalosporin, followed by doxycycline (100 mg orally twice daily) with or without metronidazole for 14 days. Quinolones are not recommended to treat gonorrhea acquired in California or Hawaii. If the patient may have acquired the disease in Asia, Hawaii, or California, cefixime or ceftriaxone should be used. **OR**
- -Azithromycin (Zithromax, 1 g PO for Chlamydia coverage) and amoxicillin-clavulanate (Amoxicillin, 875 mg PO) once by directly observed therapy, followed by amoxicillin-clavulanate (Amoxicillin, 875 mg PO BID) for 7 to 10 days.

Adolescent Inpatients
- -Cefotetan (Cefotan), 2 g IV Q12h, or cefoxitin (Mefoxin, 2 g IV Q6h) plus doxycycline (100 mg IV or PO Q12h) **OR**
- -Clindamycin (Cleocin), 900 mg IV Q8h, plus gentamicin (1-1.5 mg/kg IV q8h)
- -Ampicillin-sulbactam (Unasyn), 3 g IV Q6h plus doxycycline (100 mg IV or PO Q12h)
- -Parenteral administration of antibiotics should be continued for 24 hours after clinical response, followed by doxycycline (100 mg PO BID) or clindamycin (Cleocin, 450 mg PO QID) for a total of 14 days.
- -Levofloxacin (Levaquin), 500 mg IV Q24h, plus metronidazole (Flagyl, 500 mg IV Q8h). With this regimen, azithromycin (Zithromax, 1 g PO once) should be given as soon as the patient is tolerating oral intake.

Gonorrhea in Children less than 45 kg:
Uncomplicated Vulvovaginitis, Cervicitis, Urethritis, Proctitis, or Pharyngitis:
- -Ceftriaxone (Rocephin) 125 mg IM x 1 dose (uncomplicated disease only)
  AND
- -Erythromycin 50 mg/kg/day PO q6h, max 2gm/day x 7 days **OR**
- -Azithromycin (Zithromax) 20 mg/kg PO x 1 dose**,** max 1 gm

Disseminated Gonococcal Infection:
- -Ceftriaxone (Rocephin) 50 mg/kg/day (max 2gm/day) IV/IM q24h x 7 days **AND**
- -Azithromycin (Zithromax) 20 mg/kg (max 1gm) PO x 1 dose **OR**
- -Erythromycin 40 mg/kg/day PO q6h (max 2gm/day) x 7 days **OR**
- -Doxycycline 100 mg PO bid.

Gonorrhea in Children > 45 kg and >8 yrs:
Uncomplicated Vulvovaginitis, Cervicitis, Urethritis, Proctitis, or Pharyngitis:
- -Ceftriaxone (Rocephin) 125 mg IM x 1 dose **OR** cefixime (Suprax) 400 mg PO x 1 dose or ofloxacin (Floxin) 400 mg PO x 1 **dose**
  AND
- -Azithromycin (Zithromax) 1000 mg PO x 1 dose **OR**
- -Doxycycline 100 mg PO bid x 7 days**.**

Disseminated Gonococcal Infection:
- -Ceftriaxone (Rocephin) 1000 mg/day IV/IM q24h x 7 days OR cefotaxime (Claforan) 1000 mg IV q8h x 7 days **AND**
- -Azithromycin (Zithromax) 1000 mg PO x 1 dose **OR**
- -Doxycycline 100mg PO bid x 7 days.

10. Symptomatic Medications:
- -Acetaminophen (Tylenol) 10-15 mg/kg/dose PO/PR q4-6h prn.

11. Extras and X-rays: Pelvic ultrasound; social services consult.

12. Labs: beta-HCG pregnancy test, CBC, SMA 7 and 12. GC culture and chlamydia test, RPR or VDRL. UA with micro; urine pregnancy test.

Pediculosis

Pediculosis Capitis (head lice):
- -Permethrin (Nix) is the preferred treatment. Available in a 1% cream rinse that is applied to the scalp and hair for 10 minutes. A single treatment is adequate, but a second treatment may be applied 7-10 days after the first treatment [cream rinse: 1% 60 mL].
- -Pyrethrin (Rid, A-2000, R&C). Available as a shampoo that is applied to the scalp and hair for 10 minutes. A repeat application 7-10 days later may sometimes be necessary [shampoo (0.3% pyrethrins, 3% piperonyl butoxide): 60, 120, 240 mL].
- -For infestation of eyelashes, apply petrolatum ointment tid-qid for 8-10 days and mechanically remove the lice.

Pediculosis Corporis (body lice):
- -Treatment consists of improving hygiene and cleaning clothes. Infested clothing should be washed and dried at hot temperatures to kill the lice. Pediculicides are not necessary.

Pediculosis Pubis (pubic lice, "crabs"): Permethrin (Nix) or pyrethrin-based products may be used as described above for pediculosis capitis. Retreatment is recommended 7-10 days later.

Scabies

Treatment:
Bathe with soap and water; scrub and remove scaling or crusted detritus; towel dry. All clothing and bed linen contaminated within past 2 days should be washed in hot water for 20 min.

Permethrin (Elimite) - 5% cream: Adults and children: Massage cream into skin from head to soles of feet. Remove by washing after 8 to 14 hours. Treat infants on scalp, temple and forehead. One application is curative. [cream: 5% 60 gm]

Lindane (Kwell, Gamma benzene) - available as 1% cream or lotion: Use 1% lindane for adults and older children; not recommended in pregnancy, infants, or on excoriated skin. 1-2 treatments are effective. Massage a thin layer from neck to toes (including soles). In adults, 20-30 gm of cream or lotion is sufficient for 1 application. Bathe after 8 hours. May be repeated in one week if mites remain or if new lesions appear. Contraindicated in children <2 years of age. [lotion: 1% 60, 473 mL; shampoo:1%: 60, 473 mL].

Dermatophytoses

Diagnostic procedures:
(1) KOH prep of scales and skin scrapings for hyphae.
(2) Fungal cultures are used for uncertain cases.

Treat for at least 4 weeks.
Tinea corporis (ringworm), cruris (jock itch), pedis (athlete's foot):
- -Ketoconazole (Nizoral) cream qd [2%: 15, 30, 60 gm].
- -Clotrimazole (Lotrimin) cream bid [1%: 15, 30, 45 gm].
- -Miconazole (Micatin) cream bid [2%: 15, 30 gm].
- -Econazole (Spectazole) cream bid [1%: 15, 30, 85 gm].
- -Oxiconazole (Oxistat) cream or lotion qd-bid [1% cream: 15, 30, 60 gm; 1% lotion: 30 mL].
- -Sulconazole (Exelderm) cream or lotion qd-bid [1% cream: 15, 30, 60 gm; 1% lotion: 30 mL].
- -Naftifine (Naftin) cream or gel applied bid [1%: 15, 30 gm].
- -Terbinafine (Lamisil) cream or applied bid [1% cream: 15, 30 gm; 1% gel: 5, 15, 30 gm].

Tinea capitis:
- -Griseofulvin Microsize (Grisactin, Grifulvin V) 15-20 mg/kg/day PO qd, max 1000 mg/day [caps: 125, 250 mg; susp: 125 mg/5 mL; tabs: 250, 500 mg]
- -Griseofulvin Ultramicrosize (Fulvicin P/G, Grisactin Ultra, Gris-PEG) 5-10 mg/kg/day PO qd, max 750 mg/day [tabs: 125, 165, 250, 330 mg].
- -Give griseofulvin with whole-milk or fatty foods to increase

absorption. May require 4-6 weeks of therapy and should be continued for two weeks beyond clinical resolution.

Tinea Unguium (Fungal Nail Infection):

-Griseofulvin (see dosage above) is effective, but may require up to 4 months of therapy.

Tinea Versicolor:

-Cover body surface from face to knees with selenium sulfide 2.5% lotion or selenium sulfide 1% shampoo daily for 30 minutes for 1 week, then monthly x 3 to help prevent recurrences.

Gastrointestinal Disorders

Gastroenteritis

1. **Admit to:**
2. **Diagnosis:** Acute Gastroenteritis
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights, urine specific gravity.
7. **Diet:** Rehydralyte, Pedialyte or soy formula (Isomil DF), bland diet.
8. **IV Fluids:** See Dehydration, page 138.
9. **Special Medications:**

Severe Gastroenteritis with Fever, Gross Blood and Neutrophils in Stool (E coli, Shigella, Salmonella):

-Ceftriaxone (Rocephin) 50-75 mg/kg/day IV/IM q 12-24h, max 4 gm/day **OR**

-Cefixime (Suprax) 8 mg/kg/day PO bid-qd, max 400 mg/day [susp: 100 mg/5 mL; tabs: 200, 400 mg] **OR**

-Trimethoprim/Sulfamethoxazole (Bactrim, Septra) 10 mg of TMP component/kg/day PO bid x 5-7d, max 320 mg TMP/day [susp per 5 mL: TMP 40 mg/SMX 200 mg; tab DS: TMP 160 mg/SMX 800 mg; tab SS: TMP 80mg/SMX 400 mg].

Salmonella (treat infants and patients with septicemia):

-Ceftriaxone (Rocephin) 50-75 mg/kg/day IV/IM q12-24h, max 4 gm/day **OR**

-Cefixime (Suprax) 8 mg/kg/day PO bid-qd, max 400 mg/day [susp: 100 mg/5 mL; tabs: 200, 400 mg] **OR**

-Ampicillin 100-200 mg/kg/day IV q6h, max 12 gm/day or 50-100 mg/kg/day PO qid x 5-7d, max 4 gm/day [caps: 250, 500 mg; drops: 100 mg/mL; susp: 125 mg/5 mL, 250 mg/5 mL, 500 mg/5 mL] **OR**

-Trimethoprim/Sulfamethoxazole (Bactrim, Septra) 10 mg TMP/kg/day PO bid x 5-7d, max 320 mg TMP/day [susp per 5 mL: TMP 40 mg/SMX 200 mg; tab DS: TMP 160 mg/SMX 800 mg; tab SS: TMP 80mg/SMX 400 mg] OR

-If >18 yrs: Ciprofloxacin (Cipro) 250-750 mg PO q12h or 200-400 mg IV q12h [inj: 200, 400 mg; susp: 100 mg/mL; tabs: 100, 250, 500, 750 mg]

Antibiotic Associated Diarrhea and Pseudomembranous Colitis (Clostridium difficile):

-Treat for 7-10 days. Do not give antidiarrheal drugs.

-Metronidazole (Flagyl) 30 mg/kg/day PO/IV (PO preferred) q8h x 7 days, max 4 gm/day. [inj: 500 mg; tabs: 250, 500 mg; extemporaneous suspension] **OR**

-Vancomycin (Vancocin) 40 mg/kg/day PO qid x 7 days, max 2 gm/day [caps: 125, 250 mg; oral soln: 250 mg/5 mL, 500 mg/6 mL]. Vancomycin therapy is reserved for patients who are allergic to metronidazole or who have not responded to metronidazole therapy.

Rotavirus supportive treatment, see Dehydration page 138.

10. **Extras and X-rays:** Upright abdomen
11. **Labs:** SMA7, CBC; stool Wright stain for leukocytes, Rotazyme. Stool culture and sensitivity for enteric pathogens; C difficile toxin and culture, ova and parasites; occult blood. Urine specific gravity, UA, blood culture and sensitivity.

Specific Therapy for Gastroenteritis

Shigella Sonnei:

-Treat x 5 days. Oral therapy is acceptable except for seriously ill patients. For resistant strains, ciprofloxacin should be considered but is not recommended for use for persons younger than 18 years of age except in exceptional circumstances.

-Ampicillin (preferred over amoxicillin) 50-100 mg/kg/day PO q6h, max 3 gm/day [caps: 250, 500 mg; drops: 100 mg/mL; susp: 125 mg/5 mL, 250 mg/5 mL; 500 mg/5 mL] **OR**

-Trimethoprim/Sulfamethoxazole (Bactrim, Septra) 10 mg TMP/kg/day PO/IV q12h x 5 days [inj per mL: TMP 16mg/SMX 80mg; susp per 5 mL: TMP 40 mg/SMX 200 mg; tab DS: TMP 160 mg/SMX 800 mg; tab SS: TMP 80mg/SMX 400 mg] **OR**

-Ampicillin 50-80 mg/kg/day PO q6h, max 4 gm/day; or 100 mg/kg/day IV/IM q6h for 5-7 days, max 12 gm/day [caps: 250, 500 mg; susp: 125 mg/5 mL, 250 mg/5 mL] **OR**

-Ceftriaxone (Rocephin) 50-75 mg/kg/day IV/IM q 12-24h, max 4 gm/day **OR**

-Cefixime (Suprax) 8 mg/kg/day PO bid-qd, max 400 mg/day [susp: 100 mg/5 mL; tabs: 200, 400 mg].

Yersinia (sepsis):

-Most isolates are resistant to first-generation cephalosporins and penicillins.

-Trimethoprim/sulfamethoxazole (Bactrim, Septra) 10 mg/kg/day TMP PO q12h x 5-7days [susp per 5 mL: TMP 40 mg/SMX 200 mg; tab DS: TMP 160 mg/SMX 800 mg; tab SS: TMP 80mg/SMX 400 mg]

Campylobacter jejuni:

-Erythromycin 40 mg/kg/day PO q6h x 5-7 days, max 2 gm/day

Erythromycin ethylsuccinate (EryPed, EES)
[susp: 200 mg/5 mL, 400 mg/5 mL; tab: 400 mg; tab, chew: 200 mg]

Erythromycin base (E-Mycin, Ery-Tab, Eryc)
[cap, DR: 250 mg; tabs: 250, 333, 500 mg] **OR**

-Azithromycin (Zithromax)
10 mg/kg PO x 1 on day 1 (max 500 mg) followed by 5 mg/kg/day PO qd on days 2-5 (max 250 mg)
[cap: 250 mg; susp: 100 mg/5mL, 200 mg/5mL; tabs: 250, 600 mg]

Enteropathogenic E coli (Travelers Diarrhea):

-Trimethoprim/Sulfamethoxazole (Bactrim, Septra) 10 mg/kg/day TMP PO/IV bid [inj per mL: TMP 16 mg/SMX 80 mg; susp per 5 mL: TMP 40 mg/SMX 200 mg; tab DS: TMP 160 mg/SMX 800 mg; tab SS: TMP 80mg/SMX 400 mg].

-Patients older than 8 years old: Doxycycline (Vibramycin) 2-4 mg/kg/day PO q12-24h, max 200 mg/day [caps: 50, 100 mg;

susp: 25 mg/5mL; syrup: 50 mg/5mL; tabs 50, 100 mg].

Enteroinvasive E coli:

-Antibiotic selection should be based on susceptibility testing of the isolate. If systemic infection is suspected, parenteral antimicrobial therapy should be given.

Giardia Lamblia:

-Metronidazole is the drug of choice. A 5-7 day course of therapy has a cure rate of 80-95%. Furazolidone is 72-100% effective when given for 7-10 days. Albendazole is also an acceptable alternative when given for 5 days.

-Metronidazole (Flagyl) 15 mg/kg/day PO q8h x 5-7 days (max 4 gm/day) [tabs: 250, 500 mg; extemporaneous suspension] **OR**

-Furazolidone (Furoxone) 5-8.8 mg/kg/day PO qid for 7-10 days, max 400 mg/day [susp: 50 mg/15 mL; tab: 100 mg] **OR**

-Albendazole (Albenza): if > 2 yrs, 400 mg PO qd x 5 days [tab: 200mg; extemporaneous suspension]

Entamoeba Histolytica:

Asymptomatic cyst carriers:

-Iodoquinol (Yodoxin) 30-40 mg/kg/day PO q8h (max 1.95 gm/day) x 20 days [tabs: 210, 650 mg; powder for reconstitution] **OR**

-Paromomycin (Humatin) 25-35 mg/kg/day PO q8h x 7 days [cap: 250 mg] **OR**

-Diloxanide: 20 mg/kg/day PO q8h x 10 days, max 1500 mg/day. (Available only through CDC).

Mild-to-moderate intestinal symptoms with no dysentery:

-Metronidazole (Flagyl): 35-50 mg/kg/day PO q8h x 10 days, max 2250 mg/day [tabs: 250, 500 mg; extemporaneous suspension] followed by:

-Iodoquinol (Yodoxin) 30-40 mg/kg/day PO q8h (max 1.95 gm/day) x 20 days [tabs: 210, 650 mg; powder for reconstitution] **OR**

-Paromomycin (Humatin) 25-35 mg/kg/day PO q8h x 7 days [cap: 250 mg] **OR**

-Diloxanide: 20 mg/kg/day PO q8h x 10 days, max 1500 mg/day. (Available only through CDC).

Dysentery or extraintestinal disease (including liver abscess):

-Metronidazole (Flagyl): 35-50 mg/kg/day PO q8h x 10 days, max 2250 mg/day [tabs: 250, 500 mg; extemporaneous suspension] followed by:

-Iodoquinol (Yodoxin) 30-40 mg/kg/day PO q8h (max 1.95 gm/day) x 20 days [tabs: 210, 650 mg; powder for reconstitution] **OR**

-Paromomycin (Humatin) 25-35 mg/kg/day PO q8h x 7 days [cap: 250 mg] **OR**

-Diloxanide: 20 mg/kg/day PO q8h x 10 days, max 1500 mg/day. (Available only through CDC).

Hepatitis A

1. Admit to:
2. Diagnosis: Hepatitis A
3. Condition:
4. Vital signs: Call MD if:
5. Activity: Up ad lib
6. Nursing: Contact precautions.
7. Diet:
8. IV Fluids: D5NS IV at maintenance rate.
9. Symptomatic Medications:

-Trimethobenzamide (Tigan)
15 mg/kg/day IM/PO/PR q6-8h, max 100 mg/dose if <13.6 kg or 200 mg/dose if 13.6-41kg.
[caps: 100, 250 mg; inj: 100 mg/mL; supp: 100, 200 mg].

-Acetaminophen (Tylenol) 15 mg/kg PO/PR q4h prn temp >38° C or pain.

-Meperidine (Demerol) 1 mg/kg IV/IM q2-3h prn pain.

10. Special Medications:

-Hepatitis A immune globulin, 0.02 mL/kg IM (usually requires multiple injections at different sites), when given within 2 weeks after exposure to HAV, is 85% effective in preventing symptomatic infection.

-Hepatitis A vaccine (Havrix) if ≥2 yrs: 0.5 mL IM, repeat in 6-12 months.

11. Extras and X-rays: Abdominal x-ray series.
12. Labs: IgM anti-HAV antibody, HAV IgG, liver function tests, INR, PTT, stool culture for enteric pathogens.

Hepatitis B

1. Admit to:
2. Diagnosis: Hepatitis B.
3. Condition: Guarded.
4. Vital signs: Call MD if:
5. Activity:
6. Nursing: Standard precautions.
7. Diet: Low fat diet.
8. IV Fluids: Isotonic fluids at maintenance rate.
9. Symptomatic Medications:

-Trimethobenzamide (Tigan)
15 mg/kg/day IM/PO/PR q6-8h, max 100 mg/dose if <13.6 kg or 200 mg/dose if 13.6-41kg.
[caps: 100, 250 mg; inj: 100 mg/mL; supp: 100, 200 mg].

-Diphenhydramine (Benadryl) 1 mg/kg/dose IV/IM/IO/PO q6h prn pruritus or nausea, max 50 mg/dose **OR**

-Acetaminophen (Tylenol)15 mg/kg PO/PR q4h prn temp >38° C or pain.

-Meperidine (Demerol) 1 mg/kg IV/IM q2-3h prn pain.

Post exposure prophylaxis for previously unimmunized persons:

-Hepatitis B immune globulin 0.06 mL/kg (minimum 0.5 mL) IM x1 AND

-Hepatitis B vaccine 0.5 mL IM (complete three dose series with second dose in one month and third dose in six months)

10. Extras and X-rays:
11. Labs: IgM anti-HAV, IgM anti-HBc, HBsAg, anti-HCV; alpha-1-antitrypsin, ANA, ferritin, ceruloplasmin, urine copper, liver function tests, INR, PTT.

Parenteral Nutrition

1. Admit to:
2. Diagnosis:
3. Condition:
4. Vital signs: Call MD if:
5. Nursing: Daily weights, inputs and outputs; measure head circumference and height. Finger stick glucose bid.
6. Diet:
Total Parenteral Nutrition:
-Calculate daily protein solution fluid requirement less fluid from lipid and other sources. Calculate total amino acid requirement.
-Protein: Neonates and infants start with 0.5 gm/kg/day and increase to 2-3 gm/kg/day. For children and young adults, start with 1 gm/kg/day, and increase by 1.0 gm/kg/day (max 2-3 gm/kg/day). Calculate percent amino acid to be infused: amino acid requirement in grams divided by the volume of fluid from the dextrose/protein solution in mL x 100.
-Advance daily dextrose concentration as tolerated, while following blood glucose levels. Usual maximum concentration is D35W.

Total Parenteral Nutrition Requirements			
	Infants-25 kg	**25-45 kg**	**>45 kg**
Calories	90-120 kcal/kg/day	60-105 kcal/kg/day	40-75 kcal/kg/day
Fluid	120-180 mL/kg/day	120-150 mL/kg/day	50-75 mL/kg/day
Dextrose	4-6 mg/kg/min	7-8 mg/kg/min	7-8 mg/kg/min
Protein	2-3 gm/kg/day	1.5-2.5 gm/kg/day	0.8-2.0 gm/kg/day
Sodium	2-6 mEq/kg/day	2-6 mEq/kg/day	60-150 mEq/day
Potassium	2-5 mEq/kg/day	2-5 mEq/kg/day	70-150 mEq/day
Chloride	2-3 mEq/kg/day	2-3 mEq/kg/day	2-3 mEq/kg/day
Calcium	1-2 mEq/kg/day	1 mEq/kg/day	0.2-0.3 mEq/kg/day
Phosphate	0.5-1 mM/kg/day	0.5 mM/kg/day	7-10 mM/1000 cal
Magnesium	1-2 mEq/kg/day	1 mEq/kg/day	0.35-0.45 mEq/kg/day
Multi-Trace Element Formula	1 mL/day	1 mL/day	1 mL/day

Multivitamin (Peds MVI or MVC 9+3)	
<2.5 kg	2 mL/kg Peds MVI
2.5 kg -11 yr	5 mL/day Peds MVI
≥11 yrs	MVC 9+3 10 mL/day

Dextrose Infusion:
-Dextrose mg/kg/min = [% dextrose x rate (mL/hr) x 0.167] ÷ kg
-Normal Starting Rate: 6-8 mg/kg/min
Lipid Solution:
-Minimum of 5% of total calories should be from fat emulsion. Max of 40% of calories as fat (10% soln = 1 gm/10 mL = 1.1 kcal/mL; 20% soln = 2 gm/10 mL = 2.0 kcal/mL). 20% Intralipid is preferred in most patients.
-For neonates, begin fat emulsion at 0.5 gm/kg/day and advance to 0.5-1 gm/kg/day.
-For infants, children and young adults, begin at 1 gm/kg/day, advance as tolerated by 0.5-1 gm/kg/day; max 3 gm/kg/day or 40% of calories/day.
-Neonates - infuse over 20-24h; children and infants - infuse over 16-24h, max 0.15 gm/kg/hr.
-Check serum triglyceride 6h after infusion (maintain <200 mg/dL)
Peripheral Parenteral Supplementation:
-Calculate daily fluid requirement less fluid from lipid and other sources. Then calculate protein requirements: Begin with 1 gm/kg/day. Advance daily protein by 0.5-0.6 gm/kg/day to maximum of 3 gm/kg/day.
-Protein requirement in grams ÷ fluid requirement in mL x 100 = % amino acids.
-Begin with maximum tolerated dextrose concentration. (Dextrose concentration >12.5% requires a central line.)
-Calculate max fat emulsion intake (3 gm/kg/day), and calculate volume of 20% fat required (20 gm/100 mL = 20 %):
[weight (kg) x gm/kg/day] ÷ 20 x 100 = mL of 20% fat emulsion.
Start with 0.5-1.0 gm/kg/day lipid, and increase by 0.5-1.0 gm/kg/day until 3 gm/kg/day. Deliver over 18-24 hours.
-Draw blood 4-6h after end of infusion for triglyceride level.
8. Extras and X-rays: CXR, plain film for line placement, dietitian

consult.

9. Labs:

Daily labs: Glucose, Na, K, Cl, HCO_3, BUN, creatinine, osmolarity, CBC, cholesterol, triglyceride, urine glucose and specific gravity.

Twice weekly Labs: Calcium, phosphate, Mg, SMA-12

Weekly Labs: Protein, albumin, prealbumin, Mg, direct and indirect bilirubin, AST, GGT, alkaline phosphatase, iron, TIBC, transferrin, retinol-binding protein, PT/PTT, zinc, copper, B12, folate, 24h urine nitrogen and creatinine.

Gastroesophageal Reflux

A. Treatment:

-Thicken feedings; give small volume feedings; keep head of bed elevated 30 degrees.

-Metoclopramide (Reglan) 0.1-0.2 mg/kg/dose PO qid 20-30 minutes prior to feedings, max 1 mg/kg/day [concentrated soln: 10 mg/mL; syrup: 1 mg/mL; tab: 10 mg]

-Cimetidine (Tagamet) 20-40 mg/kg/day IV/PO q6h (20-30 min before feeding) [inj: 150 mg/mL; oral soln: 60 mg/mL; tabs: 200, 300, 400, 800 mg]

-Ranitidine (Zantac) 2-4 mg/kg/day IV q8h or 4-6 mg/kg/day PO q12h [inj: 25 mg/mL; liquid: 15 mg/mL; tabs: 75, 150, 300 mg]

-Erythromycin (used as a prokinetic agent not as an antibiotic) 2-3 mg/kg/dose PO q6-8h. [ethylsuccinate susp: 200 mg/5mL, 400 mg/5mL] Concomitant cisapride is contraindicated due to potentially fatal drug interaction.

-Cisapride (Propulsid) 0.15-0.3 mg/kg/dose PO tid-qid [susp: 1 mg/mL; tab, scored: 10 mg]. Available via limited-access protocol only (Janssen, 1-800-Janssen) due to risk of serious cardiac arrhythmias.

B. Extras and X-rays: Upper GI series, pH probe, gastroesophageal nuclear scintigraphy (milk scan), endoscopy.

Constipation

I. Management of Constipation in Infants

A. Glycerin suppositories are effective up to 6 months of age: 1 suppository rectally prn.Barley malt extract, 1-2 teaspoons, can be added to a feeding two to three times daily. Four to six ounces prune juice are often effective. After 6 months of age, lactulose 1 to 2 mL/kg/day is useful.

B. Infants that do not respond may be treated with emulsified mineral oil (Haley's MO) 2 mL/kg/dose PO bid, increasing as needed to 6-8 oz per day.

II. Management of Constipation in Children >2 years of Age

A. The distal impaction should be removed with hypertonic phosphate enemas (Fleet enema). Usually three enemas are administered during a 36 to 48 hour period.

B. Lactulose may also be used at 5 to 10 mL PO bid, increasing as required up to 45 mL PO bid.

C. Emulsified mineral oil (Haley's MO) may be begun at 2 mL/kg/dose PO bid and increased as needed up to 6 to 8 oz per day. Concerns about mineral oil interfering with absorption of fat-soluble vitamins have not been substantiated.

D. Milk of magnesia: Preschoolers are begun at 2 tsp PO bid, with adjustments made to reach a goal of one to three substantial stools a day over 1 to 2 weeks. Older children: 1-3 tablets (311mg magnesium hydroxide/chewable tablet) PO bid prn.

E. A bulk-type stool softener (e.g., Metamucil) should be initiated. Increase intake of high-residue foods (e.g. fruits, vegetables), bran, and whole grain products. Water intake should be increased.

III. Stool Softeners and Laxatives:

A. Docusate sodium (Colace):

<3y	20-40 mg/day PO q6-24h
3-6y	20-60 mg/day PO q6-24h
6-12y	40-150 mg/day PO q6-24h
>12y	50-400 mg/day PO q6-24h

[caps: 50,100, 250 mg; oral soln: 10 mg/mL, 50 mg/mL]

B. Magnesium hydroxide (Milk of Magnesia) 0.5 mL/kg/dose or 2-5 yr: 5-15 mL; 6-12y: 15-30 mL; >12y: 30-60 mL PO prn.

C. Hyperosmotic soln (CoLyte or GoLytely) 15-20 mL/kg/hr PO/NG.

D. Polyethylene glycol (MiraLax)
3-6 yr: 1 tsp powder dissolved in 3 ounces fluid PO qd-tid
6-12 yr: ½ tablespoon powder dissolved in 4 ounces fluid PO qd-tid
≥12 yr: one tablespoon powder dissolved in 8 ounces fluid PO qd-tid

E. Senna (Senokot, Senna-Gen) 10-20 mg/kg PO/PR qhs prn (max 872 mg/day) [granules: 362 mg/teaspoon; supp: 652 mg; syrup: 218 mg/5mL; tabs: 187, 217, 600 mg]

F. Sennosides (Agoral, Senokot, Senna-Gen), 2-6 yrs: 3-8.6 mg/dose PO qd-bid; 6-12 yrs: 7.15-15 mg/dose PO qd-bid; > 12 yrs: 12-25 mg/dose PO qd-bid [granules per 5 mL: 8.3, 15, 20 mg; liquid: 33 mg/mL; syrup: 8.8 mg/5 mL; tabs: 6, 8.6, 15, 17, 25 mg]

IV. Diagnostic Evaluation: Anorectal manometry, anteroposterior and lateral abdominal radiographs, lower GI study of unprepared colon.

Toxicology

Poisonings

Gastric Decontamination:
Ipecac Syrup:
<6 mos: not recommended
6-12 mos: 5-10 mL PO followed by 10-20 mL/kg of water
1-12 yrs: 15 mL PO followed by 10-20 mL/kg of water
>12 yrs: 30 mL PO followed by 240 mL of water
May repeat dose one time if vomiting does not occur within 20-30 minutes. Syrup of ipecac is contraindicated in corrosive or hydrocarbon ingestions or in patients without or soon to lose gag reflex.

Activated Charcoal: 1 gm/kg/dose (max 50 gm) PO/NG; the first dose should be given using product containing sorbitol as a cathartic. Repeat ½ of initial dose q4h if indicated.

Gastric Lavage: Left side down, with head slightly lower than body; place large-bore orogastric tube and check position by injecting air and auscultating. Normal saline lavage: 15 mL/kg boluses until clear (max 400 mL), then give activated charcoal or other antidote. Save initial aspirate for toxicological exam. Gastric lavage is contraindicated if corrosives, hydrocarbons, or sharp objects were ingested.

Cathartics:
-Magnesium citrate 6% sln:
<6 yrs: 2-4 mL/kg/dose PO/NG
6-12 yrs: 100-150 mL PO/NG
>12 yrs: 150-300 mL PO/NG

Antidotes to Common Poisonings

Narcotic or Propoxyphene Overdose:
-Naloxone (Narcan) 0.1 mg/kg/dose (max 4 mg) IV/IO/ET/IM, may repeat q2min.

Methanol or Ethylene Glycol Overdose:
-Ethanol 8-10 mL/kg (10% inj soln) IV in D5W over 30min, then 0.8-1.4 mL/kg/hr. Maintain ethanol level at 100-130 mg/dL.

Benzodiazepine Overdose:
-Flumazenil (Romazicon) 0.01 mg/kg IV (max 0.5 mg). Repeat dose if symptoms return.

Alcohol Overdose: Cardiorespiratory support
-Labs: Blood glucose; CBC, ABG, rapid toxicology screen.
-Treatment: Dextrose 0.5-1 gm/kg (2-4 mL/kg D25W or 5-10 mL/kg D10W), max 25 gm.
-Naloxone (Narcan) 0.1 mg/kg (max 2 mg) IV, repeat q2min prn to max dose 8-10 mg if drug overdose suspected. For extreme agitation, give diazepam 0.1-0.5 mg/kg IV (max 5 mg if < 5 yrs, 10 mg if ≥5 yrs).

Organophosphate Toxicity
-Atropine: 0.01-0.02 mg/kg/dose (minimum dose 0.1mg, maximum dose 0.5 mg in children and 1 mg in adolescents) IM/IV/SC. May repeat prn.
-Pralidoxime (2-PAM): 20-50 mg/kg/dose IM/IV. Repeat in 1-2 hrs if muscle weakness has not been relieved, then at 10-12 hr intervals if cholinergic signs recur.

Anticholinergic Toxicity
-Physostigmine (Antilirium): 0.01-0.03 mg/kg/dose IV; may repeat after 15-20 minutes to a maximum total dose of 2 mg.

Heparin Overdose
-Protamine sulfate dosage is determined by the most recent dosage of heparin and the time elapsed since the overdose.

Dosage of Protamine Sulfate	
Time Elapsed	**IV Dose of Protamine (mg) to Neutralize 100 units of Heparin**
Immediate	1-1.5
30-60 minutes	0.5-0.75
> 2 hrs	0.25-0.375

Warfarin Overdose
-Phytonadione (Vitamin K_1)
-If no bleeding and rapid reversal needed and patient will require further oral anticoagulation therapy, give 0.5-2 mg IV/SC
-If no bleeding and rapid reversal needed and patient will **not** require further oral anticoagulation therapy, give 2-5 mg IV/SC
-If significant bleeding but not life-threatening, give 0.5-2 mg IV/SC
-If significant bleeding and life-threatening, give 5 mg IV [inj: 2 mg/mL, 10 mg/mL]

Acetaminophen Overdose

1. **Admit to:**
2. **Diagnosis:** Acetaminophen overdose
3. **Condition:**
4. **Vital signs:** Call MD if
6. **Nursing:** ECG monitoring, inputs and outputs, pulse oximeter, aspiration precautions.
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**
-Gastric lavage with 10 mL/kg (if >5 yrs, use 150-200 mL) of normal saline by nasogastric tube if < 60 minutes after ingestion.
-Activated charcoal (if recent ingestion) 1 gm/kg PO/ NG q2-4h, remove via suction prior to acetylcysteine.

-N-Acetylcysteine (Mucomyst, NAC) loading dose 140 mg/kg PO/NG, then 70 mg/kg PO/NG q4h x 17 doses (20% sln diluted 1:4 in carbonated beverage); follow acetaminophen levels. Continue for full treatment course even if serum levels fall below nomogram.
-Phytonadione (Vitamin K) 1-5 mg PO/IV/IM/SQ (if INR >1.5).
-Fresh frozen plasma should be administered if INR >3.

10. **Extras and X-rays:** Portable CXR. Nephrology consult for charcoal hemoperfusion.
11. **Labs:** CBC, SMA 7, liver panel, amylase, INR/PTT; SGOT, SGPT, bilirubin, acetaminophen level now and q4h until nondetectable. Plot serum acetaminophen level on Rumack-Matthew nomogram to assess severity of ingestion unless sustained release Tylenol was ingested. Toxicity is likely with ingestion ≥150 mg/kg (or 7.5 gm in adolescents/adults).

Iron Overdose

1. **Admit to:**
2. **Diagnosis:** Iron overdose
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs
7. **Diet:**
8. **IV Fluids:** Maintenance IV fluids
9. **Special Medications:**

Toxicity likely if >60 mg/kg elemental iron ingested.
Possibly toxic if 20-60 mg/kg elemental iron ingested.
Induce emesis with ipecac if recent ingestion (<1 hour ago). Charcoal is not effective. Gastric lavage if greater than 20 mg/kg of elemental iron ingested or if unknown amount ingested.
If hypotensive, give IV fluids (10-20 mL/kg normal saline) and place the patient in Trendelenburg's position.
Maintain urine output of >2 mL/kg/h.
If peak serum iron is greater than 350 mcg/dL or if patient is symptomatic, begin chelation therapy.
-Deferoxamine (Desferal) 15 mg/kg/hr continuous IV infusion. Continue until serum iron is within normal range.
Exchange transfusion is recommended in severely symptomatic patients with serum iron >1,000 mcg/dL.

10. **Extras and X-rays:** KUB to determine if tablets are present in intestine.
11. **Labs:** Type and cross, CBC, electrolytes, serum iron, TIBC, INR/PTT, blood glucose, liver function tests, calcium.

Neurologic and Endocrinologic Disorders

Seizure and Status Epilepticus

1. **Admit to:** Pediatric intensive care unit.
2. **Diagnosis:** Seizure
3. **Condition:**
4. **Vital signs:** Neurochecks q2-6h; call MD if:
5. **Activity:**
6. **Nursing:** Seizure and aspiration precautions, ECG and EEG monitoring.
7. **Diet:** NPO
8. **IV Fluids:**
9. **Special Medications:**

Febrile Seizures: Control fever with antipyretics and cooling measures. Anticonvulsive therapy is usually not required.

Status Epilepticus:

1. Maintain airway, 100% O_2 by mask; obtain brief history, fingerstick glucose.
2. Start IV NS. If hypoglycemic, give 1-2 mL/kg D25W IV/IO (0.25-0.5 gm/kg).
3. **Lorazepam (Ativan)** 0.1 mg/kg (max 4 mg) IV/IM. Repeat q15-20 min x 3 prn.
4. **Phenytoin (Dilantin)** 15-18 mg/kg in normal saline at <1 mg/-kg/min (max 50 mg/min) IV/IO. Monitor BP and ECG (QT interval).
5. If seizures continue, **intubate** and give **phenobarbital** loading dose of 15-20 mg/kg IV or 5 mg/kg IV every 15 minutes until seizures are controlled or 30 mg/kg is reached.
6. If seizures are refractory, consider midazolam (Versed) infusion (0.1 mg/kg/hr) or general anesthesia with EEG monitoring.
7. Rectal Valium gel formulation
   < 2 yrs: not recommended
   2-5 yrs: 0.5 mg/kg
   6-11 yrs: 0.3 mg/kg
   ≥12 yrs: 0.2 mg/kg
   Round dose to 2.5, 5, 10, 15, and 20 mg/dose. Dose may be repeated in 4-12 hrs if needed. Do not use more than five times per month or more than once every five days.
   [rectal gel (Diastat): pediatric rectal tip - 5 mg/mL (2.5, 5, 10 mg size); adult rectal tip - 5 mg/mL (10, 15, 20 mg size)]

Generalized Seizures Maintenance Therapy:

-Carbamazepine (Tegretol):
<6 yr: initially 10-20 mg/kg/day PO bid, then may increase in 5-7 day intervals by 5 mg/kg/day; usual max dose 35 mg/kg/day PO q6-8h
6-12 yr: initially 100 mg PO bid (10 mg/kg/day PO bid), then may increase by 100 mg/day at weekly intervals; usual maintenance dose 400-800 mg/day PO bid-qid.
>12 yr: initially 200 mg PO bid, then may increase by 200 mg/day at weekly intervals; usual maintenance dose 800-1200 mg/day PO bid-tid
Dosing interval depends on product selected. Susp: q6-8h; tab: q8- 12h; tab, chew: q8-12h; tab, ER: q12h
[susp: 100 mg/5 mL; tab: 200 mg; tab, chewable: 100 mg; tab, ER: 100, 200, 400 mg] **OR**

-Divalproex sodium (Depakote, Valproic acid) PO: Initially 10-15 mg/kg/day bid-tid, then increase by 5-10 mg/kg/day weekly as needed; usual maintenance dose 30-60 mg/kg/day bid-tid. Up to 100 mg/kg/day tid-qid may be required if other enzyme-inducing anticonvulsants are used concomitantly. IV: total daily dose is equivalent to total daily oral dose but divide q6h and switch to oral therapy as soon as possible. PR: dilute syrup 1:1 with water for use as a retention enema, loading dose 17-20 mg/kg x 1 or maintenance 10-15 mg/kg/dose q8h
[cap: 250 mg; cap, sprinkle: 125 mg; inj: 100 mg/mL; syrup: 250 mg/5 mL; tab, DR: 125, 250, 500 mg] **OR**

-Phenobarbital (Luminal): Loading dose 10-20 mg/kg IV/IM/PO, then maintenance dose 3-5 mg/kg/day PO qd-bid
[cap: 16 mg; elixir: 15 mg/5mL, 4 mg/mL; inj: 30 mg/mL, 60 mg/mL, 65 mg/mL, 130 mg/mL; tabs: 8, 15, 16, 30, 32, 60, 65,100 mg] **OR**

-Phenytoin (Dilantin): Loading dose 15-18 mg/kg IV/PO, then maintenance dose 5-7 mg/kg/day PO/IV q8-24h (only sustained release capsules may be dosed q24h)
[caps: 30, 100 mg; elixir: 125 mg/5 mL; inj: 50 mg/mL; tab, chewable: 50 mg]

-Fosphenytoin (Cerebyx): > 5 yrs: loading dose 10-20 mg PE IV/IM, maintenance dose 4-6 mg/kg/day PE IV/IM q12-24h. Fosphenytoin 1.5 mg is equivalent to phenytoin 1 mg which is equivalent to fosphenytoin 1 mg PE (phenytoin equivalent unit). Fosphenytoin is a water-soluble pro-drug of phenytoin and must be ordered as mg of phenytoin equivalent (PE).
[inj: 150 mg (equivalent to phenytoin sodium 100 mg) in 2 mL vial; 750 mg (equivalent to phenytoin sodium 500 mg) in 10 mL vial]

Partial Seizures and Secondary Generalized Seizures:

-Carbamazepine (Tegretol), see above **OR**
-Phenytoin (Dilantin), see above
-Phenobarbital (Luminal), see above **OR**
-Valproic acid (Depacon, Depakote, Depakene), see above.
-Lamotrigine (Lamictal):

Adding to regimen containing valproic acid: 2-12 yrs: 0.15 mg/kg/day PO qd-bid weeks 1-2, then increase to 0.3 mg/kg/day PO qd-bid weeks 3-4, then increase q1-2 weeks by 0.3 mg/kg/day to maintenance dose 1-5 mg/kg/day (max 200 mg/day)
>12 yrs: 25 mg PO qOD weeks 1-2, then increase to 25 mg PO qd weeks 3-4, then increase q1-2 weeks by 25-50 mg/day to maintenance dose 100-400 mg/day PO qd-bid

Adding to regimen without valproic acid: 2-12 yrs: 0.6 mg/kg/day PO bid weeks 1-2, then increase to 1.2 mg/kg/day PO bid weeks 3-4, then increase q1-2 weeks by 1.2 mg/kg/day

to maintenance dose 5-15 mg/kg/day PO bid (max 400 mg/day) >12 yrs: 50 mg PO qd weeks 1-2, then increase to 50 mg PO bid weeks 3-4, then increase q1-2 weeks by 100 mg/day to maintenance dose 300-500 mg/day PO bid.
[tabs: 25, 100, 150, 200 mg]

-Primidone (Mysoline) PO: 8 yrs: 50-125 mg/day qhs, increase by 50-125 mg/day q3-7d; usual dose 10-25 mg/kg/day tid-qid ≥8 yrs: 125-250 mg qhs; increase by 125-250 mg/day q3-7d, usual dose 750-1500 mg/day tid-qid (max 2 gm/day).
[susp: 250 mg/5mL; tabs: 50, 250 mg]

10. **Extras and X-rays:** MRI with and without gadolinium, EEG with hyperventilation, CXR, ECG. Neurology consultation.
11. **Labs:** ABG/CBG, CBC, SMA 7, calcium, phosphate, magnesium, liver panel, VDRL, anticonvulsant levels, blood and urine culture. UA, drug and toxin screen.

Therapeutic Serum Levels	
Carbamazepine	4-12 mcg/mL
Clonazepam	20-80 ng/mL
Ethosuximide	40-100 mcg/mL
Phenobarbital	15-40 mcg/mL
Phenytoin	10-20 mcg/mL
Primidone	5-12 mcg/mL
Valproic acid	50-100 mcg/mL

New Onset Diabetes

1. **Admit to:**
2. **Diagnosis:** New Onset Diabetes Mellitus
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Record labs on a flow sheet. Fingerstick glucose at 0700, 1200, 1700, 2100, 0200; diabetic and dietetic teaching.
7. **Diet:** Diabetic diet with 1000 kcal + 100 kcal/year of age. 3 meals and 3 snacks (between each meal and qhs.)
8. **IV Fluids:** Hep-lock with flush q shift.
9. **Special Medications:**
   -Goal is preprandial glucose of 100-200 mg/dL

Total Daily Insulin Dosage		
<5 Years (U/kg)	**5-11 Years (U/kg)**	**12-18 Years (U/kg)**
0.6-0.8	0.75-0.9	0.8-1.5

-Divide 2/3 before breakfast and 1/3 before dinner. Give 2/3 of total insulin requirement as NPH and give 1/3 as lispro or regular insulin.

10. **Extras and X-rays:** CXR. Endocrine and dietary consult.
11. **Labs:** CBC, ketones; SMA 7 and 12, antithyroglobulin, antithyroid microsomal, anti-insulin, anti-islet cell antibodies. UA, urine culture and sensitivity; urine pregnancy test; urine ketones.

Diabetic Ketoacidosis

1. **Admit to:** Pediatric intensive care unit.
2. **Diagnosis:** Diabetic ketoacidosis
3. **Condition:** Critical
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** ECG monitoring; capillary glucose checks q1-2h until glucose level is <200 mg/dL, daily weights, inputs and outputs. O_2 at 2-4 L/min by NC. Record labs on flow sheet.
7. **Diet:** NPO
8. **IV Fluids:** 0.9% saline 10-20 mL/kg over 1h, then repeat until hemodynamically stable. Then give 0.45% saline, and replace ½ of calculated deficit plus insensible loss over 8h, replace remaining ½ of deficit plus insensible losses over 16-24h. Keep urine output >1.0 mL/kg/hour.
   Add KCL when potassium is <6.0 mEq/dL

Serum K+	**Infusate KCL**
<3	40-60 mEq/L
3-4	30
4-5	20
5-6	10
>6	0

   Rate: 0.25-1 mEq KCL/kg/hr, maximum 1 mEq/kg/h or 20 mEq/h.
9. **Special Medications:**

-Insulin Regular (Humulin) 0.05-0.1 U/kg/hr (50 U in 500 mL NS) continuous IV infusion. Adjust to decrease glucose by 50-100 mg/dL/hr.

-If glucose decreases at less than 50 mg/dL/hr, increase insulin to 0.14-0.2 U/kg/hr. If glucose decreases faster than 100 mg/dL/hr, continue insulin at 0.05-0.1 U/kg/h and add D5W to IV fluids.

-When glucose approaches 250-300 mg/dL, add D5W to IV. Change to subcutaneous insulin (lispro or regular) when bicarbonate is >15, and patient is tolerating PO food; do not discontinue insulin drip until one hour after subcutaneous dose of insulin.

10. **Extras and X-rays:** Portable CXR, ECG. Endocrine and dietary

consultation.

11. **Labs:** Dextrostixs q1-2h until glucose <200, then q3-6h. Glucose, potassium, phosphate, bicarbonate q3-4h; serum acetone, CBC. UA, urine ketones, culture and sensitivity.

Hematologic and Inflammatory Disorders

Sickle Cell Crisis

1. **Admit to:**
2. **Diagnosis:** Sickle Cell Anemia, Sickle Cell Crisis
3. **Condition:**
4. **Vital signs:** Call MD if
5. **Activity:**
6. **Nursing:** Age appropriate pain scale.
7. **Diet:**
8. **IV Fluids:** D5 ½ NS at 1.5-2.0 x maintenance.
9. **Special Medications:**
   -Oxygen 2-4 L/min by NC.
   -Morphine sulfate 0.1 mg/kg/dose (max 10-15 mg) IV/IM/SC q2-4h prn or follow bolus with infusion of 0.05-0.1 mg/kg/hr prn or 0.3-0.5 mg/kg PO q4h prn **OR**
   -Acetaminophen/codeine 0.5-1 mg/kg/dose (max 60 mg/dose) of codeine PO q4-6h prn [elixir: 12 mg codeine/5 mL; tabs: 15, 30, 60 mg codeine component] **OR**
   -Acetaminophen and hydrocodone [elixir per 5 mL: hydrocodone 2.5 mg, acetaminophen] 167 mg; tabs:
   Hydrocodone 2.5 mg, acetaminophen 500 mg;
   Hydrocodone 5 mg, acetaminophen 500 mg;
   Hydrocodone 7.5 mg, acetaminophen 500 mg,
   Hydrocodone 7.5 mg, acetaminophen 650 mg,
   Hydrocodone 10 mg, acetaminophen 500 mg,
   Hydrocodone 10 mg, acetaminophen 650 mg
   Children: 0.6 mg hydrocodone/kg/day PO q6-8h prn
   <2 yr: do not exceed 1.25 mg/dose
   2-12 yr: do not exceed 5 mg/dose
   >12 yr: do not exceed 10 mg/dose

Patient Controlled Analgesia

   -Morphine
   Basal rate 0.01-0.02 mg/kg/hr
   Intermittent bolus dose 0.01-0.03 mg/kg
   Bolus frequency ("lockout interval") every 6-15 minutes
   -Hydromorphone (Dilaudid)
   Basal rate 0.0015-0.003 mg/kg/hr
   Intermittent bolus dose 0.0015-0.0045 mg/kg
   Bolus frequency ("lockout interval") every 6-15 min

Adjunctive Therapy:

   -Hydroxyzine (Vistaril) 0.5-1 mg/kg/dose PO q6h (max 50 mg/dose)
   -Ibuprofen (Motrin) 10 mg/kg/dose PO q6h (max 800 mg/dose)

OR

   -Ketorolac (Toradol) 0.4 mg/kg/dose IV/IM q6h (max 30 mg/dose); maximum 3 days, then switch to oral ibuprofen

Maintenance Therapy:

   -Hydroxyurea (Hydrea): 15 mg/kg/day PO qd, may increase by 5 mg/kg/day q12 weeks to a maximum dose of 35 mg/kg/day. Monitor for myelotoxicity. [caps: 200, 300, 400, 500 mg]
   -Folic acid 1 mg PO qd (if >1 yr).
   -Transfusion PRBC 5 mL/kg over 2h, then 10 mL/kg over 2h, then check hemoglobin. If hemoglobin is less than 6-8 gm/dL, give additional 10 mL/kg.
   -Deferoxamine (Desferal) 15 mg/kg/hr x 48 hours (max 12 gm/day) concomitantly with transfusion or 1-2 gm/day SQ over 8-24 hrs
   -Vitamin C 100 mg PO qd while receiving deferoxamine
   -Vitamin E PO qd while receiving deferoxamine
   <1 yr: 100 IU/day
   1-6 yr: 200 IU/day
   >6 yr: 400 IU/day
   -Penicillin VK (Pen Vee K) (prophylaxis for pneumococcal infections): <3 yrs: 125 mg PO bid; ≥3 yrs: 250 mg PO bid [elixir: 125 mg/5 mL, 250 mg/5 mL; tabs: 125, 250, 500 mg]. If compliance with oral antibiotics is poor, use penicillin G benzathine 50,000 U/kg (max 1.2 million units) IM every 3 weeks. Erythromycin is used if penicillin allergic.

10. **Extras and X-rays:** CXR.
11. **Labs:** CBC, blood culture and sensitivity, reticulocyte count, type and cross, SMA 7, parvovirus titers, UA, urine culture and sensitivity.

Kawasaki's Syndrome

1. **Admit to:**
2. **Diagnosis:**
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:** Bedrest
6. **Nursing:** temperature at least q4h
7. **Diet:**
8. **Special Medications:**
   -Immunoglobulin (IVIG) 2 gm/kg/dose IV x 1 dose. Administer dose at 0.02 mL/kg/min over 30 min; if no adverse reaction, increase to 0.04 mL/kg/min over 30 min; if no adverse reaction, increase to 0.08 mL/kg/min for remainder of infusion. Defer measles vaccination for 11 months after receiving high dose IVIG. [inj: 50 mg/mL, 100 mg/mL]
   -Aspirin 100 mg/kg/day PO or PR q6h until fever resolves, then 8-10 mg/kg/day PO/PR qd [supp: 60, 120, 125, 130, 195, 200, 300, 325, 600, 650 mg; tabs: 325, 500, 650 mg; tab, chew: 81 mg].
   -Ambubag, epinephrine (0.1 mL/kg of 1:10,000), and diphenhydramine 1 mg/kg (max 50 mg) should be available for IV use if an anaphylactic reaction to immunoglobulin occurs.
9. **Extras and X-rays:** ECG, echocardiogram, chest X-ray. Rheumatology consult.

10. **Labs:** CBC with differential and platelet count. ESR, CBC, liver function tests, rheumatoid factor, salicylate levels, blood culture and sensitivity x 2, SMA 7.

Fluids and Electrolytes

Dehydration

1. **Admit to:**
2. **Diagnosis:** Dehydration
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights. Urine specific gravity q void.
7. **Diet:**
8. **IV Fluids:**

Maintenance Fluids:

<10 kg	100 mL/kg/24h
10-20 kg	1000 mL plus 50 mL/kg/24h for each kg >10 kg
>20 kg	1500 mL plus 20 mL/kg/24h for each kg >20 kg.

Electrolyte Requirements:
Sodium: 3-5 mEq/kg/day
Potassium: 2-3 mEq/kg/day
Chloride: 3 mEq/kg/day
Glucose: 5-10 gm/100 mL water required (D5W - D10W)

Estimation of Dehydration

Degree of Dehydration	Mild	Moderate	Severe
Weight Loss--Infants	5%	10%	15%
Weight Loss--Children	3%-4%	6%-8%	10%
Pulse	Normal	Slightly increased	Very increased
Blood Pressure	Normal	Normal to orthostatic, >10 mm Hg change	Orthostatic to shock
Behavior	Normal	Irritable	Hyperirritable to lethargic
Thirst	Slight	Moderate	Intense
Mucous Membranes	Normal	Dry	Parched
Tears	Present	Decreased	Absent, sunken eyes
Anterior Fontanelle	Normal	Normal to sunken	Sunken
External Jugular Vein	Visible when supine	Not visible except with supraclavicular pressure	Not visible even with supraclavicular pressure
Skin	Capillary refill <2 sec	Delayed capillary refill, 2-4 sec (decreased turgor)	Very delayed capillary refill (>4 sec), tenting; cool skin, acrocyanotic, or mottled
Urine Specific Gravity (SG)	>1.020	>1.020; oliguria	Oliguria or anuria
Approximate Fluid Deficit	<50 mL/kg	50-100 mL/kg	≥100 mL/kg

Electrolyte Deficit Calculation:

Na^+ deficit = (desired Na - measured Na in mEq/L) x 0.6 x weight in kg

K^+ deficit = (desired K - measured K in mEq/L) x 0.25 x weight in kg

Cl^- deficit= (desired Cl - measured Cl in mEq/L) x 0.45 x weight in kg

Free H_2O deficit in hypernatremic dehydration = 4 mL/kg for every mEq that serum Na >145 mEq/L.

Phase 1, Acute Fluid Resuscitation (Symptomatic Dehydration):

-Give NS 20-30 mL/kg IV at maximum rate; repeat fluid boluses of NS 20-30 mL/kg until adequate circulation.

Phase 2, Deficit and Maintenance Therapy (Asymptomatic dehydration):

Hypotonic Dehydration (Na^+ <125 mEq/L):

-Calculate total maintenance and deficit fluids and sodium deficit for 24h (minus fluids and electrolytes given in phase 1). If isotonic or hyponatremic dehydration, replace 50% over 8h and 50% over next 16h.
-Estimate and replace ongoing losses q6-8h.
-Add potassium to IV solution after first void.
-Usually D5 ½ NS or D5 1/4 NS saline with 10-40 mEq KCL/liter 60 mL/kg over 2 hours. Then infuse at 6-8 mL/kg/h for 12h.
-See hyponatremia, page 141.

Isotonic Dehydration (Na^+ 130-150 mEq/L):

-Calculate total maintenance and replacement fluids for 24h (minus fluids and electrolytes given in phase 1) and give half over first 8h, then remaining half over next 16 hours.
-Add potassium to IV solution after first void.
-Estimate and replace ongoing losses.
-Usually D5 ½ NS or D5 1/4 NS with 10-40 mEq KCL/L.

Hypertonic Dehydration (Na^+ >150 mEq/L):

-Calculate and correct free water deficit and correct slowly. Lower sodium by 10 mEq/L/day; do not reduce sodium by more than 15 mEq/L/24h or by >0.5 mEq/L/hr.
-If volume depleted, give NS 20-40 mL/kg IV until adequate

circulation, then give ½-1/4 NS in 5% dextrose to replace half of free water deficit over first 24h. Follow serial serum sodium levels and correct deficit over 48-72h.

-**Free water deficit:** 4 mL/kg x (serum Na^+ -145)

-Also see "hypernatremia" page 141.

-Add potassium to IV solution after first void as KCL.

-Usually D5 1/4 NS or D5W with 10-40 mEq/L KCL. Estimate and replace ongoing losses and maintenance.

Replacement of ongoing losses (usual fluids):

-Nasogastric suction: D5 ½ NS with 20 mEq KCL/L or ½ NS with KCL 20 mEq/L.

-Diarrhea: D5 1/4 NS with 40 mEq KCl/L

Oral Rehydration Therapy (mild-moderate dehydration <10%):

-Oral rehydration electrolyte solution (Rehydralyte, Pedialyte, Ricelyte, Revital Ice) deficit replacement of 60-80 mL/kg PO or via NG tube over 2h. Provide additional fluid requirement over remaining 18-20 hours; add anticipated fluid losses from stools of 10 mL/kg for each diarrheal stool.

Oral Electrolyte Solutions

Product	Na (mEq/L)	K (mEq/L)	Cl (mEq/L)
Rehydralyte	75	20	65
Ricelyte	50	25	45
Pedialyte	45	20	35

Hyperkalemia

1. **Admit to:** Pediatric ICU
2. **Diagnosis:** Hyperkalemia
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Continuous ECG monitoring, inputs and outputs, daily weights.
7. **Diet:**
8. **IV Fluids:**

Hyperkalemia (K^+ >7 or EKG Changes)

-Calcium gluconate 50-100 mg/kg (max 1 gm) IV over 5-10 minutes or calcium chloride 10-20 mg/kg (max 1 gm) IV over 10 minutes.

-Regular insulin 0.1 U/kg plus glucose 0.5 gm/kg IV bolus (as 10% dextrose).

-Sodium bicarbonate 1-2 mEq/kg IV over 3-5 min (give after calcium in separate IV), repeat in 10-15 min if necessary.

-Furosemide (Lasix) 1 mg/kg/dose (max 40 mg IV) IV q6-12h prn, may increase to 2 mg/kg/dose IV [inj: 10 mg/mL]

-Kayexalate resin 0.5-1 gm/kg PO/PR. 1 gm resin binds 1 mEq of potassium.

9. **Extras and X-rays:** ECG, dietetics, nephrology consults.
10. **Labs:** SMA7, Mg, calcium, CBC, platelets. UA; urine potassium.

Hypokalemia

1. **Admit to:** Pediatric ICU
2. **Diagnosis:** Hypokalemia
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** ECG monitoring, inputs and outputs, daily weights.
7. **Diet:**
8. **IV Fluids:**

If serum K >2.5 mEq/L and ECG changes are absent:

Add 20-40 mEq KCL/L to maintenance IV fluids. May give 1-4 mEq/kg/day to maintain normal serum potassium. May supplement with oral potassium.

K <2.5 mEq/L and ECG abnormalities:

Give KCL 1-2 mEq/kg IV at 0.5 mEq/kg/hr; max rate 1 mEq/kg/hr or 20 mEq/kg/hr in life-threatening situations (whichever is smaller). Recheck serum potassium, and repeat IV boluses prn; ECG monitoring required.

Oral Potassium Therapy:

-Potassium chloride (KCl) elixir 1-3 mEq/kg/day PO q8-24h [10% soln = 1.33 mEq/mL].

9. **Extras and X-rays:** ECG, dietetics, nephrology consults.
10. **Labs:** SMA7, Mg, calcium, CBC. UA, urine potassium.

Hypernatremia

1. **Admit to:**
2. **Diagnosis:** Hypernatremia
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights.
7. **Diet:**
8. **IV Fluids:**

If volume depleted or hypotensive, give NS 20-40 mL/kg IV until adequate circulation, then give D5 ½ NS IV to replace half of body water deficit over first 24h. Correct serum sodium slowly at 0.5-1 mEq/L/hr. Correct remaining deficit over next 48-72h.

Body water deficit (liter) = 0.6 x (weight kg) x (serum Na -140)

Hypernatremia with ECF Volume Excess:

-Furosemide (Lasix) 1 mg/kg IV.

-D5 1/4 NS to correct body water deficit.

9. **Extras and X-rays:** ECG.
10. **Labs:** SMA 7, osmolality, triglycerides. UA, urine specific gravity; 24h urine Na, K, creatinine.

Hyponatremia

1. **Admit to:**
2. **Diagnosis:** Hyponatremia
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights, neurochecks.
7. **Diet:**
8. **IV Fluids:**

Hyponatremia with Edema (Hypervolemia)(low osmolality <280, urine sodium <10 mM/L: nephrosis, CHF, cirrhosis; urine sodium >20: acute/chronic renal failure):

-Water restrict to half maintenance.

-Furosemide (Lasix) 1 mg/kg/dose IV over 1-2 min or 2-3 mg/kg/day PO q8-24h.

Hyponatremia with Normal Volume Status (low osmolality <280, urine sodium <10 mM/L: water intoxication; urine sodium >20 mM/L: SIADH, hypothyroidism, renal failure, Addison's disease, stress, drugs):

-0.9% saline with 20-40 mEq KCL/L infused to correct hyponatremia at rate of <0.5 mEq/L/hr) **OR** use 3% NS in severe hyponatremia [3% NS = 513 mEq/liter].

Hyponatremia with Hypovolemia (low osmolality <280; urine sodium <10 mM/L: vomiting, diarrhea, 3rd space/respiratory/skin loss; urine sodium >20 mM/L: diuretics, renal injury, renal tubular acidosis, adrenal insufficiency, partial obstruction, salt wasting):

-If volume depleted, give NS 20-40 mL/kg IV until adequate circulation.

-Gradually correct sodium deficit in increments of 10 mEq/L. Determine volume deficit clinically, and determine sodium deficit as below.

-Calculate 24 hour fluid and sodium requirement and give half over first 8 hours, then give remainder over 16 hours. 0.9% saline = 154 mEq/L

-Usually D5NS 60 mL/kg IV over 2h (this will increase extracellular sodium by 10 mEq/L), then infuse at 6-8 mL/kg/hr x 12h.

Severe Symptomatic Hyponatremia:

-If volume depleted, give NS 20-40 mL/kg until adequate circulation.

-Determine volume of 3% hypertonic saline (513 mEq/L) to be infused as follows:

Na(mEq) deficit = 0.6 x (wt kg) x (desired Na - actual Na)

Volume of soln (L) = Sodium to be infused (mEq) ÷ mEq/L in solution

-Correct half of sodium deficit slowly over 24h.

-For acute correction, the serum sodium goal is 125 mEq/L; max rate for acute replacement is 1 mEq/kg/hr. Serum Na should be adjusted in increments of 5 mEq/L to reach 125 mEq/L. The first dose is given over 4 hrs. For further correction for serum sodium to above 125 mEq/L, calculate mEq dose of sodium and administer over 24-48h.

9. **Extras and X-rays:** CXR, ECG.
10. **Labs:** SMA 7, osmolality, triglyceride. UA, urine specific gravity. Urine osmolality, Na, K; 24h urine Na, K, creatinine.

Hypophosphatemia

Indications for Intermittent IV Administration:

1. Serum phosphate <1.0 mg/dL or
2. Serum phosphate <2.0 mg/dL and patient symptomatic or
3. Serum phosphate <2.5 mg/dL and patient on ventilator

Treatment of Hypophosphatemia		
Dosage of IV Phosphate		**Serum Phosphate**
Low dose	0.08 mM/kg IV over 6 hrs	>1 mg/dL
Intermediate dose	0.16 mM/kg IV over 6 hrs 0.24 mM/kg IV over 4 hrs	0.5-1 mg/dL
High Dose	0.36 mM/kg IV over 6 hrs	<0.5 mg/dL

IV Phosphate Cations:

Sodium phosphate: Contains sodium 4 mEq/mL, phosphate 3 mM/mL

Potassium phosphate: Contains potassium 4.4 mEq/mL, phosphate 3 mM/mL

Max rate 0.06 mM/kg/hr

Oral Phosphate Replacement

1-3 mM/kg/day PO bid-qid

Potassium Phosphate:

Powder (Neutra-Phos-K): phosphorus 250 mg [8 mM] and potassium 556 mg [14.25 mEq] per packet; Tab (K-Phos Original): phosphorus 114 mg [3.7 mM], potassium 144 mg [3.7 mEq]

Sodium Phosphate: Phosphosoda Soln per 100 mL: sodium phosphate 18 gm and sodium biphosphate 48 gm [contains phosphate 4 mM/mL]

Sodium and Potassium Phosphate: Powd Packet: phosphorus 250 mg [8 mM], potassium 278 mg [7.125 mEq], sodium 164 mg [7.125 mEq];

Tabs:

K-Phos MF: phosphorus 125.6 mg [4 mM], potassium 44.5 mg [1.1 mEq], sodium 67 mg [2.9 mEq]

K-Phos Neutral: phosphorus 250 mg [8 mM], potassium 45 mg

[1.1 mEq], sodium 298 mg [13 mEq]
K-Phos No 2: phosphorus 250 mg [8 mM], potassium 88 mg [2.3 mEq], sodium 134 mg [5.8 mEq]
Uro-KP-Neutral: phosphorus 250 mg [8 mM], potassium 49.4 mg [1.27 mEq], sodium 250.5 mg [10.9 mEq]

Hypomagnesemia

Indications for Intermittent IV Administration:

1. Serum magnesium <1.2 mg/dL
2. Serum magnesium <1.6 mg/dL and patient symptomatic
3. Calcium resistant tetany

Magnesium Sulfate, Acute Treatment:

-25-50 mg/kg/dose (0.2-0.4 mEq/kg/dose) IV every 4-6 hrs x 3-4 doses as needed (max 2000 mg = 16 mEq/dose); max rate 1 mEq/kg/hr (125 mg/kg/hr).

Magnesium sulfate IV maintenance dose: 1-2 mEq/kg/day (125-250 mg/kg/day) in maintenance IV solution.

Magnesium PO Maintenance Dose: 10-20 mg/kg/dose **elemental magnesium** PO qid.

Magnesium Chloride (Slow-Mag): mg salt (mEq elemental magnesium; mg elemental magnesium)

Tab, SR: 535 mg (5.2 mEq; 63 mg).

Magnesium Gluconate (Magonate): mg salt (mEq elemental magnesium; mg elemental magnesium)

Liq: 1000 mg/5mL (4.8 mEq/5mL; 54 mg).

Tab: 500 mg (2.4 mEq; 27 mg).

Magnesium Oxide: mg salt (mEq elemental magnesium; mg elemental magnesium).

Tabs: 400 mg (20 mEq; 242 mg), 420 mg (21 mEq; 254 mg), 500 mg (25 mEq; 302 mg).

Caps: 140 mg (7 mEq; 84 mg).

Magnesium Sulfate: mg salt (mEq elemental magnesium; mg elemental magnesium)

Soln: 500 mg/mL (4.1 mEq/mL; 49.3 mg/mL).

Newborn Care

Neonatal Resuscitation

APGAR Score			
Sign	**0**	**1**	**2**
Heart rate per minute	Absent	Slow (<100)	>100
Respirations	Absent	Slow, irregular	Good, crying
Muscle tone	Limp	Some flexion	Active motion
Reflex irritability	No response	Grimace	Cough or sneeze
Color	Blue or pale	Pink body with blue extremities	Completely pink
Assess APGAR score at 1 minute and 5 minutes, then continue assessment at 5 minute intervals until APGAR is greater than 7.			

General Measures:
1. Review history, check equipment, oxygen, masks, laryngoscope, ET tubes, medications.

Vigorous, Crying Infant: Provide routine delivery room care for infants with heart rate >100 beats per minute, spontaneous respirations, and good color and tone: warmth, clearing the airway, and drying.

Meconium in Amniotic Fluid:
1. Deliver the head and suction meconium from the hypopharynx on delivery of the head. If the newly born infant has absent or depressed respirations, heart rate <100 bpm, or poor muscle tone, perform direct tracheal suctioning to remove meconium from the airway.
2. If no improvement occurs or if the clinical condition deteriorates, bag and mask ventilate with intermittent positive pressure using 100% FiO_2; stimulate vigorously by drying. Initial breath pressure: 30-40 cm H_2O for term infants, 20-30 cm H_2O for preterm infants. Ventilate at 15-20 cm H_20 at 30-40 breaths per minute. Monitor bilateral breath sounds and expansion.
3. If spontaneous respirations develop and heart rate is normal, gradually reduce ventilation rate until using onlycontinuous positive airway pressure (CPAP). Wean to blow-by oxygen, but continue blow-by oxygen if the baby remains dusky.
4. Consider intubation if the heart rate remains <100 beats per minute and is not rising, or if respirations are poor and weak.

Resuscitation:
1. Provide assisted ventilation with attention to oxygen delivery, inspiratory time, and effectiveness as judged by chest rise if stimulation does not achieve prompt onset of spontaneous respirations or the heart rate is <100 bpm.
2. Provide chest compressions if the heart rate is absent or remains <60 bpm despite adequate assisted ventilation for 30 seconds. Coordinate chest compressions with ventilations at a ratio of 3:1 and a rate of 120 events per minute to achieve approximately 90 compressions and 30 breaths per minute.
3. Chest compressions should be done by two thumb-encircling hands in newly born infants and older infants. The depth of chest compression should be one third of the anterior-posterior diameter of the chest. Chest compressions should be sufficiently deep to generate a palpable pulse.
4. If condition worsens or if there is no change after 30 seconds, or if mask ventilation is difficult: use laryngoscope to suction oropharynx and trachea and intubate. Apply positive pressure ventilation. Check bilateral breath sounds and chest expansion. Check and adjust ET tube position if necessary. Continue cardiac compressions if heart rate remains depressed. Check CXR for tube placement.

Hypotension or Bradycardia or Asystole: Epinephrine 0.1-0.3 mL/kg [0.01-0.03 mg/kg (0.1 mg/mL = 1:10,000)] IV or ET q3-5min. Dilute ET dose to 2-3 mL in NS. If infant fails to respond, consider increasing dose to 0.1 mg/kg (0.1 mL/kg of 1 mg/mL = 1:1000).

Hypovolemia: Insert umbilical vein catheter and give O negative blood, plasma, 5% albumin, Ringer's lactate, or normal saline 10 mL/kg IV over 5-10 minutes. Repeat as necessary to correct hypovolemia.

Severe Birth Asphyxia, Mixed Respiratory/Metabolic Acidosis (not responding to ventilatory support; pH <7.2): Give sodium Bicarbonate 1 mEq/kg, dilute 1:1 in sterile water IV q5-10min as indicated.

Narcotic-Related Depression:
1. Naloxone (Narcan) 0.1 mg/kg = 0.25 mL/kg (0.4 mg/mL concentration) or 0.1 mL/kg (1 mg/mL concentration) ET/IV/IM/SC, may repeat q2-3 min. May cause drug withdrawal and seizures in the infant if the mother is a drug abuser.
2. Repeat administration may be necessary since the duration of action of naloxone may be shorter than the duration of action of the narcotic.

Endotracheal Tube Sizes			
Weight (gm)	**Gestational Age (weeks)**	**Tube Size (mm)**	**Depth of Insertion from Upper Lip (cm)**
< 1000	<28	2.5	6.5-7
1000-2000	28-34	3	37079
2000-3000	34-38	3.5	37111
> 3000	>38	3.5-4.0	>9

Suspected Neonatal Sepsis

1. **Admit to:**
2. **Diagnosis:** Suspected sepsis
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights, cooling measures prn temp >38°C, consent for lumbar puncture.
7. **Diet:**
8. **IV Fluids:** IV fluids at 1-1.5 times maintenance.
9. **Special Medications:**

Newborn Infants <1 month old (group B strep, E coli, or group D strep, gram negatives, Listeria monocytogenes):

-Ampicillin and gentamicin **OR** ampicillin and cefotaxime as below.

-Add vancomycin as below if >7 days old and a central line is present.

Neonatal Dosage of Ampicillin:

<1200 gm 0-4 weeks: 100 mg/kg/day IV/IMq12h
1200-2000 gm:
≤7d: 100 mg/kg/day IV/IM q12h
≥7d: 150 mg/kg/day IV/IM q8h
>2000 gm:
≤7d: 150 mg/kg/day IV/IM q8h
≥7d: 200 mg/kg/day IV/IM q6h

Cefotaxime (Claforan):

<1200 grams: 0-4 wks: 100 mg/kg/day IV/IM q12h
≥ 1200 grams: 0-7 days: 100 mg/kg/day IV/IM q12h
>7 days: 150 mg/kg/day IV/IM q8h

Gentamicin (Garamycin)/Tobramycin (Nebcin):

<1200 gm 0-4 weeks: 2.5 mg/kg/dose IV/IMq24h
1200-2000 gm:
≤7d: 2.5 mg/kg/dose IV/IM q12-24h
≥7d: 2.5 mg/kg/dose IV/IM q12-24h
>2000 gm:
≤7d: 2.5 mg/kg/dose IV/IM q12-24h
≥7d: 2.5 mg/kg/dose IV/IM q12h

Neonatal Vancomycin (Vancocin) Dosage:

<1200 gm 0-4 weeks: 15 mg/kg/dose IV q24h
1200-2000 gm:
≤7d: 10 mg/kg/dose IV q12-18h
≥7d: 10 mg/kg/dose IV q8-12h
>2000 gm:
≤7d: 10 mg/kg/dose IV q12h
≥7d: 10 mg/kg/dose IV q8-12h

Nafcillin (Nafcil):

<1200 gm:
0-4 weeks 50 mg/kg/day IV/IM q12h
1200-2000 gm:
≤7 days: 50 mg/kg/day IV/IM q12h
≥7 days: 75 mg/kg/day IV/IM q8h
>2000 gm:
≤7 days: 75 mg/kg/day IV/IM q8h
≥7 days: 100 mg/kg/day IV/IM q6h

Mezlocillin (Mezlin):

<1200 gm:
0-4 weeks 150 mg/kg/day IV/IM q12h
1200-2000 gm:
≤7 days: 150 mg/kg/day IV/IM q12h
≥7 days: 225 mg/kg/day IV/IM q8h
>2000 gm:
≤7 days: 150 mg/kg/day IV/IM q12h
≥7 days: 225 mg/kg/day IV/IM q8h

Amikacin:

<1200 gm 0-4 weeks: 10 mg/kg/dose IV/IM q24h
1200-2000 gm:
≤7d: 10 mg/kg/dose IV/IM q12-24h
≥7d: 10 mg/kg/dose IV/IM q12-24h
>2000 gm:
≤7d: 10 mg/kg/dose IV/IM q12-24h
≥7d: 10 mg/kg/dose IV/IM q12h

10. **Extras and X-rays:** CXR
11. **Laboratory Studies:** CBC, SMA 7, blood culture and sensitivity; UA, culture and sensitivity, antibiotic levels.

CSF Tube 1 - Gram stain, bacterial culture and sensitivity, antigen screen (1-2 mL).
CSF Tube 2 - Glucose protein (1-2 mL).
CSF Tube 3 - Cell count and differential (1-2 mL).

Respiratory Distress Syndrome

1. **Provide mechanical ventilation** as indicated.
2. **Exogenous surfactant**:
   Prophylactic Therapy: Infants at risk for developing RDS with a birth weight <1250gm.
   Rescue Therapy: Treatment of infants with RDS based on respiratory distress not attributable to any other causes and chest radiographic findings consistent with RDS.
   -Beractant (Survanta): 4 mL/kg of birth weight via endotracheal tube then q6h up to 4 doses total [100 mg (4 mL), 200 mg (8 mL)]
   -Colfosceril (Exosurf): 5 mL/kg of birth weight via endotracheal tube then q12h for 2-3 doses total [108 mg (10 mL)]
   -Poractant alfa (Curosurf): first dose 2.5 mL/kg (200 mg/kg/dose) of birthweight via endotracheal tube, may repeat with 1.25 mL/kg/dose (100 mg/kg/dose) at 12-hour intervals for up to two additional doses [120 mg (1.5 mL), 240 mg (3 mL)]
   -Calfactant (Infasurf): 3 mL/kg via endotracheal tube, may repeat q12h up to a total of 3 doses [6 mL]

Chronic Lung Disease

1. **Admit to:**
2. **Diagnosis:** Chronic lung disease.
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights
7. **Diet:**
8. **IV Fluids:** Isotonic fluids at maintenance rate.
9. **Special Medications:**

Diuretics:
   -Furosemide (Lasix) 1 mg/kg/dose PO/IV/IM q6-24h prn [inj: 10 mg/mL; oral soln: 10 mg/mL, 40 mg/5mL]
   -Chlorothiazide (Diuril) 2-8 mg/kg/day IV q12-24h or 20-40 mg/kg/day PO q12h [inj: 500 mg; susp: 250 mg/5mL]
   -Spironolactone (Aldactone) 2-3 mg/kg/day PO q12-24h [tabs: 25, 50, 100 mg; extemporaneous suspension]

Steroids:
   -Dexamethasone (Decadron) 0.5-1 mg/kg/day IV/IM q6-12h
   -Prednisone 1-2 mg/kg/day PO q12-24h [soln: 1 mg/mL, 5 mg/mL]

11. **Extras and X-rays:** CXR
12. **Labs:** CBC, SMA 7.

Hyperbilirubinemia

1. **Admit to:**
2. **Diagnosis:** Hyperbilirubinemia.
3. **Condition:** Guarded.
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights, monitor skin color, monitor for lethargy and hypotonia
7. **Diet:**
8. **IV Fluids:** Isotonic fluids at maintenance rate (100-150 mL/kg/day). Encourage enteral feedings if possible.
9. **Special Medications:**
   -Phenobarbital 5 mg/kg/day PO/IV q12-24h [elixir: 15 mg/5mL, 20 mg/5mL; inj: 30 mg/mL, 60 mg/mL, 65 mg/mL, 130 mg/mL]
   -Phototherapy
   -Exchange transfusion for severely elevated bilirubin
10. **Symptomatic Medications:**
11. **Extras and X-rays:**
12. **Labs:** Total bilirubin, indirect bilirubin, albumin, SMA 7. Blood group typing of mother and infant, a direct Coombs' test. Complete blood cell count, reticulocyte count, blood smear. In infants of Asian or Greek descent, glucose-6-phosphate dehydrogenase (G6PD) should be measured.

GYNECOLOGY

Surgical Documentation for Gynecology

Gynecologic Surgical History

Identifying Data. Age, gravida (number of pregnancies), para (number of deliveries).
Chief Compliant. Reason given by patient for seeking surgical care.
History of Present Illness (HPI). Describe the course of the patient's illness, including when it began, character of the symptoms; pain onset (gradual or rapid), character of pain (constant, intermittent, cramping, radiating); other factors associated with pain (urination, eating, strenuous activities); aggravating or relieving factors. Other related diseases; past diagnostic testing.
Obstetrical History. Past pregnancies, durations and outcomes, preterm deliveries, operative deliveries.
Gynecologic History: Last menstrual period, length of regular cycle.
Past Medical History (PMH). Past medical problems, previous surgeries, hospitalizations, diabetes, hypertension, asthma, heart disease.
Medications. Cardiac medications, oral contraceptives, estrogen.
Allergies. Penicillin, codeine.
Family History. Medical problems in relatives.
Social History. Alcohol, smoking, drug usage, occupation.
Review of Systems (ROS):

- **General:** Fever, fatigue, night sweats.
- **HEENT:** Headaches, masses, dizziness.
- **Respiratory:** Cough, sputum, dyspnea.
- **Cardiovascular:** Chest pain, extremity edema.
- **Gastrointestinal:** Vomiting, abdominal pain, melena (black tarry stools), hematochezia (bright red blood per rectum).
- **Genitourinary:** Dysuria, hematuria, discharge.
- **Skin:** Easy bruising, bleeding tendencies.

Gynecologic Physical Examination

General:
Vital Signs: Temperature, respirations, heart rate, blood pressure.
Eyes: Pupils equally round and react to light and accommodation (PERRLA); extraocular movements intact (EOMI).
Neck: Jugular venous distention (JVD), thyromegaly, masses, lymphadenopathy.
Chest: Equal expansion, rales, breath sounds.
Heart: Regular rate and rhythm (RRR), first and second heart sounds, murmurs.
Breast: Skin retractions, masses (mobile, fixed), erythema, axillary or supraclavicular node enlargement.
Abdomen: Scars, bowel sounds, masses, hepatosplenomegaly, guarding, rebound, costovertebral angle tenderness, hernias.
Genitourinary: Urethral discharge, uterus, adnexa, ovaries, cervix.
Extremities: Cyanosis, clubbing, edema.
Neurological: Mental status, strength, tendon reflexes, sensory testing.
Laboratory Evaluation: Electrolytes, glucose, liver function tests, INR/PTT, CBC with differential; X-rays, ECG (if >35 yrs or cardiovascular disease), urinalysis.
Assessment and Plan: Assign a number to each problem. Discuss each problem, and describe surgical plans for each numbered problem, including preoperative testing, laboratory studies, medica-

tions, and antibiotics.

Discharge Summary

Patient's Name:
Chart Number:
Date of Admission:
Date of Discharge:
Admitting Diagnosis:
Discharge Diagnosis:
Name of Attending or Ward Service:
Surgical Procedures:
History and Physical Examination and Laboratory Data: Describe the course of the disease up to the time the patient came to the hospital, and describe the physical exam and laboratory data on admission.
Hospital Course: Describe the course of the patient's illness while in the hospital, including evaluation, treatment, outcome of treatment, and medications given.
Discharged Condition: Describe improvement or deterioration in condition.
Disposition: Describe the situation to which the patient will be discharged (home, nursing home).
Discharged Medications: List medications and instructions.
Discharged Instructions and Follow-up Care: Date of return for follow-up care at clinic; diet, exercise instructions.
Problem List: List all active and past problems.
Copies: Send copies to attending physician, clinic, consultants and referring physician.

Surgical Progress Note

Surgical progress notes are written in “SOAP” format.

Surgical Progress Note

Date/Time:
Post-operative Day Number:
Problem List: Antibiotic day number and hyperalimentation day number if applicable. List each surgical problem separately (eg, status-post appendectomy, hypokalemia).
Subjective: Describe how the patient feels in the patient's own words, and give observations about the patient. Indicate any new patient complaints, note the adequacy of pain relief, and passing of flatus or bowel movements. Type of food the patient is tolerating (eg, nothing, clear liquids, regular diet).
Objective:
- **Vital Signs:** Maximum temperature (T_{max}) over the past 24 hours. Current temperature, vital signs.
- **Intake and Output:** Volume of oral and intravenous fluids, volume of urine, stools, drains, and nasogastric output.
- **Physical Exam:**
  - **General appearance:** Alert, ambulating.
  - **Heart:** Regular rate and rhythm, no murmurs.
  - **Chest:** Clear to auscultation.
  - **Abdomen:** Bowel sounds present, soft, nontender.
  - **Wound Condition:** Comment on the wound condition (eg, clean and dry, good granulation, serosanguinous drainage). Condition of dressings, purulent drainage, granulation tissue, erythema; condition of sutures, dehiscence. Amount and color of drainage
  - **Lab results:** White count, hematocrit, and electrolytes, chest x-ray

Assessment and Plan: Evaluate each numbered problem separately. Note the patient's general condition (eg, improving), pertinent developments, and plans (eg, advance diet to regular, chest x-ray). For each numbered problem, discuss any additional orders and plans for discharge or transfer.

Procedure Note

A procedure note should be written in the chart when a procedure is performed. Procedure notes are brief operative notes.

Procedure Note

Date and time:
Procedure:
Indications:
Patient Consent: Document that the indications, risks and alternatives to the procedure were explained to the patient. Note that the patient was given the opportunity to ask questions and that the patient consented to the procedure in writing.
Lab tests: Electrolytes, INR, CBC
Anesthesia: Local with 2% lidocaine
Description of Procedure: Briefly describe the procedure, including sterile prep, anesthesia method, patient position, devices used, anatomic location of procedure, and outcome.
Complications and Estimated Blood Loss (EBL):
Disposition: Describe how the patient tolerated the procedure.
Specimens: Describe any specimens obtained and laboratory tests which were ordered.

Discharge Note

The discharge note should be written in the patient's chart prior to discharge.

Discharge Note

Date/time:
Diagnoses:
Treatment: Briefly describe treatment provided during hospitalization, including surgical procedures and antibiotic therapy.
Studies Performed: Electrocardiograms, CT scans, CXR.
Discharge Medications:
Follow-up Arrangements:

Postoperative Check

A postoperative check should be completed on the evening after surgery. This check is similar to a daily progress note.

Example Postoperative Check

Date/time:
Postoperative Check
Subjective: Note any patient complaints, and note the adequacy of pain relief.
Objective:
- **General appearance:**
- **Vitals:** Maximum temperature in the last 24 hours (T_{max}), current temperature, pulse, respiratory rate, blood pressure.
- **Urine Output:** If urine output is less than 30 cc per hour, more fluids should be infused if the patient is hypovolemic.
- **Physical Exam:**
- **Chest and lungs:**
- **Abdomen:**
- **Wound Examination:** The wound should be examined for excessive drainage or bleeding, skin necrosis, condition of drains.
- **Drainage Volume:** Note the volume and characteristics of drainage from Jackson-Pratt drain or other drains.
- **Labs:** Post-operative hematocrit value and other labs.

Assessment and Plan: Assess the patient's overall condition and status of wound. Comment on abnormal labs, and discuss treatment and discharge plans.

Total Abdominal Hysterectomy and Bilateral Salpingo-oophorectomy Operative Report

Preoperative Diagnosis: 45 year old female, gravida 3 para 3, with menometrorrhagia unresponsive to medical therapy.
Postoperative Diagnosis: Same as above
Operation: Total abdominal hysterectomy and bilateral salpingo-oophorectomy
Surgeon:
Assistant:
Anesthesia: General endotracheal
Findings At Surgery: Enlarged 10 x 12 cm uterus with multiple fibroids. Normal tubes and ovaries bilaterally. Frozen section revealed benign tissue. All specimens sent to pathology.
Description of Operative Procedure: After obtaining informed consent, the patient was taken to the operating room and placed in the supine position, given general anesthesia, and prepped and draped in sterile fashion.

A Pfannenstiel incision was made 2 cm above the symphysis pubis and extended sharply to the rectus fascia. The fascial incision was bilaterally incised with curved Mayo scissors, and the rectus sheath was separated superiorly and inferiorly by sharp and blunt dissection. The peritoneum was grasped between two Kelly clamps, elevated, and incised with a scalpel. The pelvis was examined with the findings noted above. A Balfour retractor was placed into the incision, and the bowel was packed away with moist laparotomy sponges. Two Kocher clamps were placed on the cornua of the uterus and used for retraction.

The round ligaments on both sides were clamped, sutured with #0 Vicryl, and transected. The anterior leaf of the broad ligament was incised along the bladder reflection to the midline from both sides, and the bladder was gently dissected off the lower uterine segment and cervix with a sponge stick.

The retroperitoneal space was opened and the ureters were identified bilaterally. The infundibulopelvic ligaments on both sides were then doubly clamped, transected, and doubly ligated with #O Vicryl. Excellent hemostasis was observed. The uterine arteries were skeletonized bilaterally, clamped with Heaney clamps, transected, and sutured with #O Vicryl. The uterosacral ligaments were clamped bilaterally, transected, and suture ligated in a similar fashion.

The cervix and uterus was amputated, and the vaginal cuff angles were closed with figure-of-eight stitches of #O Vicryl, and then were transfixed to the ipsilateral cardinal and uterosacral ligament. The vaginal cuff was closed with a series of interrupted #O Vicryl, figure-of-eight sutures. Excellent hemostasis was obtained.

The pelvis was copiously irrigated with warm normal saline, and all sponges and instruments were removed. The parietal peritoneum was closed with running #2-O Vicryl. The fascia was closed with running #O Vicryl. The skin was closed with stables. Sponge, lap, needle, and instrument counts were correct times two. The patient was taken to the recovery room, awake and in stable condition.
Estimated Blood Loss (EBL): 150 cc
Specimens: Uterus, tubes, and ovaries
Drains: Foley to gravity
Fluids: Urine output - 100 cc of clear urine

Complications: None
Disposition: The patient was taken to the recovery room in stable condition.

Endometrial Sampling and Dilation and Curettage

The endometrial cavity is frequently evaluated because of abnormal uterine bleeding, pelvic pain, infertility, or pregnancy complications. The most common diagnostic indications for obtaining endometrial tissue include abnormal uterine bleeding, postmenopausal bleeding, endometrial dating, endometrial cells on Papanicolaou smear, and follow-up of women undergoing medical therapy for endometrial hyperplasia.

I. Endometrial biopsy

- **A.** The office endometrial biopsy offers a number of advantages to D&C because it can be done with minimal to no cervical dilation, anesthesia is not required, and the cost is approximately one-tenth of a hospital D&C.
- **B.** Numerous studies have shown that the endometrium is adequately sampled with these techniques.
- **C. Pipelle endometrial sampling device** is the most popular method for sampling the endometrial lining. The device is constructed of flexible polypropylene with an outer sheath measuring 3.1 mm in diameter.
- **D.** The device is placed in the uterus through an undilated cervix. The piston is fully withdrawn to create suction and, while the device is rotated 360 degrees, the distal port is brought from the fundus to the internal os to withdraw a sample. The device is removed and the distal aspect of the instrument is severed, allowing for the expulsion of the sample into formalin.
- **E.** The detection rates for endometrial cancer by Pipelle in postmenopausal and premenopausal women are 99.6 and 91 percent, respectively.
- **F.** D&C should be considered when the endometrial biopsy is nondiagnostic, but a high suspicion of cancer remains (eg, hyperplasia with atypia, presence of necrosis, or pyometra).

II. Dilation and curettage

- **A.** Dilation and curettage is performed as either a diagnostic or therapeutic procedure. Indications for diagnostic D&C include:
  1. A nondiagnostic office biopsy in women who are at high risk of endometrial carcinoma.
  2. Insufficient tissue for analysis on office biopsy.
  3. Cervical stenosis prevents the completion of an office biopsy.
- **B.** Diagnostic D&Cs are usually performed with hysteroscopy to obtain a visual image of the endometrial cavity, exclude focal disease, and prevent missing unsuspected polyps.
- **C. Examination under anesthesia**. After anesthesia has been administered, the size, shape, and position of the uterus are noted, with particular attention to the axis of the cervix and flexion of the fundus. The size, shape, and consistency of the adnexa are determined. The perineum, vagina, and cervix are then prepared with an aseptic solution and vaginal retractors are inserted into the vagina.
- **D. Operative technique**. A D&C is performed with the woman in the dorsal lithotomy position.
  1. **Endocervical curettage** (ECC) is performed before dilation of the cervix. A Kevorkian-Younge curette is introduced into the cervical canal up to the internal os. Curetting of all four quadrants of the canal should be conducted and the specimen placed on a Telfa pad.
  2. **Sounding and dilation.** Traction is applied to align the axis of the cervix and the uterine canal. The uterus should be sounded to document the size and confirm the position. The sound should be held between the thumb and the index finger to avoid excessive pressure.
  3. **Cervical dilation** is then performed. The dilator is grasped in the middle of the instrument with the thumb and index finger. The cervix is gradually dilated beginning with the #13 French Pratt dilator. The dilator should be inserted through the internal os, without excessively entering the uterine cavity.
  4. **Sharp curettage** is performed systematically beginning at the fundus and applying even pressure on the endometrial surface along the entire length of the uterus to the internal cervical os. The endometrial tissue is placed on a Telfa pad placed in the vagina. Moving around the uterus in a systematic fashion, the entire surface of the endometrium is sampled. The curettage procedure is completed when the "uterine cry" (grittiness to palpation) is appreciated on all surfaces of the uterus. Curettage is followed by blind extraction with Randall polyp forceps to improve the rate of detection of polyps.

Management of the Abnormal Papanicolaou Smear

The Papanicolaou (Pap) smear is the standard screening test for cervical cancer and premalignant lesions. Refinements in processing (eg, ThinPrep) have improved sensitivity and specificity. The Pap smear functions to screen for cellular abnormalities that are associated with an increased risk. Treatment decisions are then made based upon diagnostic results from histologic examination, usually from colposcopically directed biopsies.

I. Clinical evaluation

A. Pap smear report

1. A description of specimen type. Conventional Pap smear, liquid based cytology, or other.

2. A description of specimen adequacy.

3. A general categorization (optional). Negative, epithelial cell abnormality, or other (see interpretation below).

4. An interpretation/result. Either the specimen is negative for intraepithelial lesions and malignancy (although organisms or reactive changes may be present) or there is an epithelial cell abnormality or there is another finding.

5. A description of any ancillary testing or automated review that was performed (eg, human papillomavirus [HPV], AutoPap).

6. Educational notes and suggestions by the pathologist.

B. Specimen adequacy. The adequacy of the Pap smear specimen is typically reported as follows.

1. Unsatisfactory. Smears that are "unsatisfactory for evaluation" may have scanty cellular material or may be obscured by inflammation, blood, or debris so that more than 75 percent of the cells are uninterpretable. Unsatisfactory Pap smears should always be repeated in two to four months. If the cells are obscured by inflammation, an attempt should be made to clear the inflammatory process (eg, treat cervicitis or vaginitis) prior to repeating the smear.

2. Endocervical cells not present. The presence of metaplastic and endocervical cells indicates adequate sampling of the transformation zone of the cervix, the area at risk for neoplasia. Most women without an endocervical/transformation zone component present should be screened with a repeat Pap test in 12 months. However, repeat testing in six months is advised in the following situations:

a. A previous Pap smear result of ASC-US or worse without three subsequent negative Pap smears.

b. A previous Pap smear with an unexplained glandular abnormality.

c. An HPV test result positive for a high-risk type within the previous 12 months.

d. Inability to clearly visualize or sample the endocervical canal.

e. Immunosuppression.

f. Insufficient frequency of previous screening (eg, failure to be screened at least biennially).

3. Blood or inflammation present. Women with partially obscuring blood or inflammation should have a repeat test in six months if they meet any of the above criteria.

4. Intraepithelial abnormalities

a. Squamous epithelial cell abnormalities

(1) Atypical squamous cells (ASC) may be of undetermined significance (ASC-US) or suspicious for HSIL (ASC-H)

(2) Low-grade intraepithelial lesions (LSIL)

(3) High-grade intraepithelial lesions (HSIL)

b. Glandular cell abnormalities

(1) Atypical glandular cells (AGC): may be endocervical, endometrial, or other glandular cells

(2) Endocervical adenocarcinoma in situ (AIS)

(3) Adenocarcinoma

c. The LSIL category includes changes consistent with human papillomavirus (HPV), mild dysplasia, or CIN I (grade 1 cervical intraepithelial neoplasia). HSIL includes changes consistent with moderate or severe dysplasia, CIN II or III, and carcinoma in situ (CIS).

5. Hyperkeratosis or parakeratosis on an otherwise negative Pap smear is not a marker for significant CIN and may be related to infection or trauma with inflammation, such as from use of a diaphragm. The Pap smear should be repeated in 6 to 12 months.

Interpretation Result
Negative for intraepithelial lesion or malignancy
Infection (Trichomonas vaginalis, Candida spp., shift in flora suggestive of bacterial vaginosis, Actinomyces spp., cellular changes consistent with Herpes simplex virus)
Other Non-neoplastic Findings:
Reactive cellular changes associated with inflammation (includes typical repair) radiation, intrauterine contraceptive device (IUD)
Glandular cells status post-hysterectomy
Atrophy
Other
Endometrial cells (in a woman ≥40 years of age)
Epithelial Cell Abnormalities
Squamous Cell
Atypical squamous cells
-of undetermined significance (ASC-US)
-cannot exclude HSIL (ASC-H)
Low-grade squamous intraepithelial lesion (LSIL) encompassing: HPV/mild dysplasia/CIN 1
High-grade squamous intraepithelial lesion (HSIL) encompassing: moderate and severe dysplasia, CIS/CIN 2 and CIN 3 with features suspicious for invasion (if invasion is suspected)
Squamous cell carcinoma
Glandular Cell
Atypical
-Endocervical cells (not otherwise specified or specify in comments)
-Glandular cell (not otherwise specified or specify in comments)
-Endometrial cells (not otherwise specified or specify in comments)
-Glandular cells (not otherwise specified or specify in comments)
Atypical
-Endocervical cells, favor neoplastic
-Glandular cells, favor neoplastic
Endocervical adenocarcinoma in situ
Adenocarcinoma (endocervical, endometrial, extrauterine, not otherwise specified (not otherwise specified)
Other Malignant Neoplasms (specify)

Management of the Abnormal Papanicolaou Smear

Result	Action
Specimen adequacy	
Satisfactory for evaluation	Routine follow-up
Unsatisfactory for evaluation	Repeat smear
No endocervical cells	Follow-up in one year for low-risk women with a previously normal smear; repeat in 4-6 months for high-risk women
Atypical cells	
Atypical squamous cells of undetermined significance (ASC-US)	HPV testing with referral to colposcopy if positive for high-risk HPV type; if negative for high-risk HPV type, then repeat cytology in 12 months
Special circumstances	Postmenopausal women with atrophic epitheliium may be treated with topical estrogen followed by repeat cervical cytology one week after completing treatment
ASC-H	Immediate referral to colposcopy
Atypical glandular cells (AGS)	Immediate referral to colposcopy with sampling of the endocervical canal. Women over age 35 and any woman with unexplained vaginal bleeding should also have an endometrial biopsy
Intraepithelial neoplasia	
High grade	Immediate referral for colposcopy
Low grade	Immediate referral for colposcopy, except adolescents and postmenopausal women
Endometrial cells	Endometrial biopsy in selected cases
Other malignant cells	Referral to a gynecologic oncologist

II. Atypical squamous cells (ASC) is divided into ASC-US, which are qualified as "of undetermined significance," and ASC-H, in which a high-grade squamous intraepithelial lesion (HSIL) cannot be excluded.

A. ASC requires further evaluation, but it does not require treatment. This cytologic diagnosis is common and frequently associated with spontaneously resolving, self-limited disease. The risk of invasive cancer is low, 0.1 to 0.2 percent. However, 5 to 17 percent of patients with ASC and 24 to 94 percent of those with ASC-H will have CIN II or III at biopsy; therefore, further investigation is necessary to determine if underlying high-grade dysplasia is present.

B. Evaluation of ASC-US. Reflex HPV testing is the preferred approach. Reflex testing refers to concurrent collection of cytology and HPV samples with actual testing for HPV only if indicated by cytology results. If liquid-based cytology is used, reflex HPV testing can be performed on the same specimen.

1. Women with a positive test for high- (including intermedi-

ate) risk type HPV DNA are evaluated by colposcopy. The sensitivity of this approach for detection of CIN II/III is 83 to 100 percent.

2. Women who test negative for high-risk HPV DNA can be followed with a repeat cervical cytology in 12 months.

Management of Women with Combined Test Screening	
Results of cytology/HPV	**Recommended follow-up**
Negative/Negative Negative/Negative ASCUS/Negative ASCUS/Positive Greater than ASCUS/ Positive or negative	Routine screening in 3 years Repeat combined test in 6-12 months* Repeat cytology in 12 months** Colposcopy Colposcopy
*If Negative/Negative, then resume screening in 3 years If ASCUS/Negative, then repeat combined test in 12 months If greater than ASCUS/Negative, then colposcopy If any cytology result/Positive, the colposcopy	
**Follow-up depends on cytology results	
HPV = Human Papillomarvirus. Positive means high-risk types are present. Negative means high-risk types are not present	

C. Special circumstances

1. **Infection or reactive changes.** When an infectious organism is identified, the patient should be contacted to determine if she is symptomatic. Antibiotic therapy is indicated for symptomatic infection. Asymptomatic trichomonas infection should be treated. Most patients with only reactive changes due to inflammation will not have an organism identified on Pap smear. The Pap smear does not need to be repeated unless the patient is HIV positive.
2. **Atrophic epithelium** (a normal finding in postmenopausal women) is often characterized by nuclear enlargement, which meets one of the pathologic criteria for ASC. Administration of estrogen (eg, 0.3 mg conjugated estrogen applied as vaginal cream nightly for four weeks [1/8th of the applicator]) causes atypical atrophic epithelium to mature into normal squamous epithelium.
   a. Hormonal therapy given for vaginal atrophy should be followed by repeat cervical cytology one week after completing treatment. If negative, cytology should be repeated again in four to six months. If both tests are negative, the woman can return to routine screening intervals, but if either test is positive for ASC-US or greater, she should be referred for colposcopy.
3. **Immunosuppressed women,** including all women who are HIV positive, with ASC-US should be referred for immediate colposcopy.

D. Management after colposcopy/biopsy. Colposcopy/biopsy of women with ASC-US will either yield a histologic abnormality (eg, CIN II or III), which should be treated as appropriate or show no abnormal findings. In the latter case, if HPV testing was not performed or showed a low-risk type, then follow-up cytological testing in 12 months is recommended.

1. Management of women who test positive for high-risk HPV types, but have CIN I or less on colposcopy/biopsy consists of HPV testing at 12 months postprocedure with repeat colposcopic referral if the HPV results are positive for high-risk types.

E. Women with ASC-H on cytological examination should be referred for colposcopy. Biopsy proven CIN is treated. If no lesion is identified, the cytology sample, colposcopy, and any biopsy specimens should be reviewed. If review of cytology confirms ASC-H, follow-up HPV DNA testing in 12 months is acceptable. Colposcopy should be repeated for ASC-US or greater on cytology or a positive test for high-risk HPV DNA.

III. Low- and high-grade intraepithelial neoplasia. All women who present with lower genital tract intraepithelial lesions should be offered HIV testing because of the high incidence of neoplasia in this population.

A. Low-grade squamous intraepithelial lesions

1. Immediate referral for colposcopy is the recommended management for LSIL (see exceptions for postmenopausal women, adolescents, and pregnant women below).
2. Endocervical curettage should be done in nonpregnant women in whom: the transformation zone cannot be fully visualized, the lesion extends into the endocervical canal, or no lesion is identified on colposcopy. It is also an acceptable procedure in nonpregnant women in whom a lesion is identified in the transformation zone.

B. Special circumstances

1. **Postmenopausal women** may forgo immediate colposcopy and be managed by HPV DNA testing at 12 months with referral to colposcopy for positive results (high- risk HPV DNA types). Women with LSIL who have clinical or cytologic evidence of atrophy may be treated with intravaginal estrogen, followed by repeat cytology seven days after completion of therapy, with referral to colposcopy if an abnormality persists. If repeat cytology is normal, then another cytology test should be obtained in four to six months. The woman can return to routine surveillance if both tests are normal, but should be referred for colposcopy if either test is ASC-US or worse.
2. **Adolescents.** Initial colposcopy may be deferred in adolescents. Instead, they may be managed with HPV DNA testing at 12 months with referral to colposcopy for positive results (high-risk HPV DNA types).
3. **Pregnant women** with LSIL are managed in a similar fashion to those with HSIL (see below). Colposcopy should be performed, with biopsy and endocervical curettage performed for any lesion suspicious for HSIL or more severe disease.

C. **High-grade squamous intraepithelial lesions**
   1. HSIL may also be referred to as CIN II or III, severe dysplasia, or carcinoma in situ (CIS). All women with HSIL should be referred for colposcopy and endocervical curettage.
   2. If colposcopy reveals no lesion or only biopsy proven CIN I, then cytology, colposcopy, and biopsies should be reviewed. A cytological diagnosis of HSIL without colposcopic or histologic confirmation of significant dysplasia (CIN II or above) requires a diagnostic excisional procedure in nonpregnant women.

IV. Atypical glandular cells

A. A report of atypical glandular cells (AGC) indicates the presence of glandular cells that could originate from the endocervical or endometrial region. AGC is divided into two subcategories:
   1. AGC (specify endocervical, endometrial, or glandular cells not otherwise specified [NOS]).
   2. AGC, favor neoplastic (specify endocervical or NOS).

B. Additional categories for glandular cell abnormalities are:
   1. Endocervical adenocarcinoma in situ (AIS).
   2. Adenocarcinoma.

C. **Significance.** A smear with adenocarcinoma in situ is associated with a premalignant or malignant lesion of the endocervix or endometrium in 10 to 39 percent of cases.

D. **Evaluation**
   1. All women with atypical endocervical or glandular cells or AIS should be referred for colposcopy and sampling of the endocervical canal. Women over age 35 and younger women with AGC and unexplained or anovulatory bleeding also need an endometrial biopsy.
   2. Women with only atypical endometrial cells on cytology can be initially evaluated with endometrial biopsy only, rather than colposcopy.
   3. **Positive findings,** such as any grade of CIN on biopsy, should be managed as appropriate.
   4. **Negative colposcopy/endocervical curettage**
      a. **AGC not otherwise specified.** Women with AGC NOS who have a normal initial colposcopic evaluation and endocervical biopsy can be followed with cervical cytology at four to six month intervals until four consecutive tests are negative for intraepithelial lesions or malignancy. They are then followed with routine surveillance.
      b. **AGC favor neoplasia or AIS.** A cold-knife conization is the best procedure for subsequent evaluation of AGC lesions at high risk of associated adenocarcinoma, such as AGC favor neoplasia or AIS.
   5. **Endocervical adenocarcinoma in situ** (AIS) and adenocarcinoma are separate categories of glandular cell abnormality. Colposcopy with directed biopsy is required. A diagnostic excisional procedure is also needed.
   6. **Endometrial cells**. Occasionally, normal appearing endometrial cells will be reported on a Pap smear. The presence of these cells is reported only in women ≥40 years of age. In these cases, endometrial biopsy should be performed.

E. **Follow-up after treatment.** Follow-up Pap smears are recommended every three to four months for the first year after any treatment for dysplasia. Women with cervical dysplasia present at the LEEP or cone margin or in the concomitant endocervical curettage also need follow-up colposcopy with endocervical sampling every six months for one year. Routine surveillance can be resumed if there is no recurrence after the first year. Surveillance consists of Pap smears on a yearly basis for most women and on a twice-yearly basis for high-risk women (ie, HIV positive).

References: See page 311.

Cervical Intraepithelial Neoplasia

Cervical intraepithelial abnormalities are usually first detected by cytology screening. Treatment of cervical intraepithelial abnormalities is typically undertaken after a histologic abnormality has been proven by tissue biopsy.

I. Atypical squamous cells (ASC) is a cytological screening diagnosis that does not require treatment. ASC does require further evaluation to exclude the presence of higher- grade disease that might require treatment. Treatment may be initiated if there is biopsy proven dysplasia.

II. Low-grade lesions. Low-grade precursors of cervical cancer have been called low-grade squamous intraepithelial lesions (LSIL), low-grade cervical intraepithelial neoplasia (CIN I), and mild dysplasia.

A. Management
   1. Expectant management is preferred for the reliable patient with biopsy-confirmed CIN I in whom the entire lesion and limits of the transformation zone are completely visualized (ie, satisfactory colposcopic examination). If treatment is desired, ablative or excisional modalities are appropriate. An excisional procedure is the preferred diagnostic/therapeutic approach in all women if colposcopic examination is unsatisfactory.
   2. **Expectant management** of women with biopsy confirmed CIN I and satisfactory colposcopy requires follow-up HPV testing at 12 months. In addition:
      a. Colposcopy should be repeated if repeat cytology shows ASC or greater or HPV DNA testing is positive for a high-risk type.
      b. After a negative HPV DNA test, annual screening may be resumed.
   3. A lesion that persists after 1 to 2 years or any progression during the follow-up period suggests the need for treatment. Close follow-up should be continued for persistent CIN I; treatment should be provided if there is evidence of disease progression. Ablation and excision are both

acceptable treatment modalities for women with satisfactory colposcopic examinations. Endocervical sampling is recommended before ablation and excision for recurrent disease after ablation.

III. **High-grade lesions.** High-grade squamous intraepithelial lesions (HSIL) include CIN II or III, moderate and severe dysplasia, and carcinoma in situ. Forty-three percent of CIN II lesions regress if left untreated, while 22 percent progress to carcinoma in situ or invasive cancer. For CIN III, the spontaneous regression rate is 32 percent, and 14 percent progress to invasive cancer if untreated.
   - **A. Management**
     1. The entire transformation zone should be removed. An assessment should be made as to whether a patient qualifies for ablative therapy or if she requires conization as an excisional procedure for further diagnostic work-up. In many cases conization also provides the appropriate treatment.
     2. **Ablative therapy.** The most commonly used ablative treatment techniques are cryotherapy and laser ablation. Requirements for ablative treatment are:
        - **a.** Accurate histologic diagnosis/no discrepancy between cytology/colposcopy/histology.
        - **b.** No evidence of microinvasion/invasion.
        - **c.** No evidence of a glandular lesion (adenocarcinoma in situ or invasive adenocarcinoma).
        - **d.** Satisfactory colposcopy (the transformation zone is fully visualized).
        - **e.** The lesion is limited to the ectocervix and seen in its entirety.
        - **f.** There is no evidence of endocervical involvement as determined by colposcopy/ECC
     3. **Excisional therapy.** Indications for excisional therapy are:
        - **a.** Suspected microinvasion
        - **b.** Unsatisfactory colposcopy (the transformation zone is not fully visualized).
        - **c.** Lesion extending into the endocervical canal.
        - **d.** ECC revealing dysplasia
        - **e.** Lack of correlation between the Pap smear and colposcopy/biopsies.
        - **f.** Suspected adenocarcinoma in situ.
        - **g.** Colposcopist unable to rule out invasive disease.
        - **h.** Recurrence after an ablative procedure.
     4. Excisional treatment can be performed by cold-knife conization using a scalpel, laser conization, or the loop electrosurgical excision procedure (LEEP). A diagnostic excisional procedure and sampling of the endocervical canal in women in whom the complete transformation is not visualized is important to exclude cancer.

IV. **Adenocarcinoma in situ**
   - **A.** The Bethesda 2001 system classifies glandular cell abnormalities into four subcategories:
     1. Atypical glandular cells (AGC): endocervical, endometrial, or glandular cells not otherwise specified (NOS).
     2. AGC, favor neoplastic, endocervical, endometrial, or NOS.
     3. Endocervical adenocarcinoma in situ (AIS).
     4. Adenocarcinoma.
   - **B.** Cold-knife conization is the best method for diagnosis of AIS. Adenocarcinoma in situ (AIS) of the cervix is characterized by endocervical glands lined by atypical columnar epithelial cells.
   - **C.** If conization margins are positive, repeat conization should be performed in patients who wish to maintain fertility and who understand the risk of leaving residual disease. Repeat conizations should also be considered if cone margins are negative in the setting of a positive ECC. If fertility is not desired, hysterectomy should be performed.

V. **Recommendations for initial management of cervical intraepithelial lesions**
   - **A. CIN I.** Expectant management is recommended for the reliable patient in whom the entire lesion and limits of the transformation zone are completely visualized. Expectant management consists of repeat cytology at 6 and 12 months or HPV testing at 12 months.
   - **B. CIN II, III, squamous carcinoma in situ.** Loop electrosurgical excision procedure (LEEP) is the preferred technique. Ablative procedures are limited to the patient with biopsy confirmed CIN and satisfactory colposcopy.
   - **C. Adenocarcinoma in situ,** suspected microinvasion, unsatisfactory colposcopy, lesion extending into the endocervical canal: Cold- knife cone biopsy is the preferred technique.

References: See page 311.

Colposcopy

The colposcope provides an illuminated, magnified view of the cervix, vagina, and vulva. Malignant and premalignant epithelium has a characteristic contour, color, and vascular pattern. The goal of colposcopy is to identify precancerous and cancerous lesions.

I. **Indications for colposcopy**
   - **A.** Abnormal cytological abnormalities:
     1. Persistent atypical squamous cells of undetermined significance (ASCUS) or ASCUS with positive high-risk HPV subtypes.
     2. ASCUS suggestive of high-grade lesion (ASC-H).
     3. Atypical glandular cells (AGC).
     4. Low-grade squamous intraepithelial lesion (LSIL).
     5. High-grade squamous intraepithelial lesion (HSIL).
   - **B.** Evaluation of an abnormal appearing cervix, vagina, or vulva.

II. **Contraindications.** Active cervicitis should be treated before the examination. Biopsies are relatively contraindicated in patients on anticoagulations, who have a known bleeding disorder, or who are pregnant.

III. **Procedure.** The medical history is obtained, including age, gravity, parity, last menstrual period, use and type of contraception, prior cervical cytology results, allergies, significant medical history including HIV status and history of any immunosuppressive

conditions or medications, other medications, prior cervical procedures, and smoking history. If there is any possibility of pregnancy, a pregnancy test is obtained.

A. Repeat cervical cytology. If the patient has not had cervical cytology in the last six weeks, a repeat assessment of cervical cytology is done.

B. Visualization. The cervix and vagina are examined with a bright light, and then with the colposcope. Cotton soaked in saline is used to cleanse the cervix. Pigmented areas and obvious lesions are noted. The cervix is examined for areas of erosion, true leukoplakia, pigmented lesions, or areas of obvious ulceration or exophytic growth. Three to 5 percent acetic acid is applied to the cervix using cotton swabs and the cervix is reexamined. A green-filter examination is performed to accentuate abnormal vasculature. Iodine solution (Lugol's or Schiller's) is used to improve visualization of abnormal areas.

C. The clinician first identifies the squamocolumnar junction or transformation zone (TZ) . The clinician should differentiate between the grey-pink appearing ectocervix and the pink-red appearing endocervix. The region where the two cell types meet, termed the squamocolumnar junction, defines the "transformation" zone. The ability to see the transformation zone dictates whether the colposcopic exam is adequate (ie, the entire squamocolumnar junction is visible circumferentially around the os) or unsatisfactory.

D. The upper one-third of the vagina, in particular the lateral fornices, is also inspected.

E. Biopsies are obtained from the most abnormal appearing areas. Biopsies should be taken from inferior to superior to avoid bleeding over the target sites.

F. Endocervical curettage is performed in patients with HSIL, AGUS, adenocarcinoma in situ (AIS) on the endocervical margin following cone biopsy, LSIL but no visible lesion, and those with an unsatisfactory colposcopic examination. A long straight curette is used to scrape the four quadrants of the endocervical canal and an endocervical brush is employed to remove any exfoliated tissue. Endocervical curettage in not performed in pregnant women.

References: See page 311.

Contraception

Approximately 31 percent of births are unintended; about 22 percent were "mistimed," while 9 percent were "unwanted."

I. Hormonal contraceptive methods other than oral contraceptives

A. Contraceptive vaginal ring (NuvaRing) delivers 15 µg ethinyl estradiol and 120 µg of etonogestrel daily.

1. Advantages of the ring include rapid return to ovulation after discontinuation, lower doses of hormones, ease and convenience, and improved cycle control. Benefits, risks, and contraindications to use are similar to those with combined oral contraceptive pills, except for the convenience of monthly administration.

2. In women who have not used hormonal contraception in the past month, the ring is inserted on or before day 5 of the menstrual cycle, even if bleeding is not complete, and an additional form of contraception should be used for the following 7 days. New rings should be inserted at approximately the same time of day the ring was removed the previous week.

3. If the ring accidentally falls out, it may be rinsed with cool or warm water and replaced within 3 hours. If it is out of place for more than 3 hours contraceptive effectiveness decreases, so an additional form of contraception should be used until the ring has been inserted for 7 continuous days. If the ring remains in place more than 3 but ≤4 weeks, it is removed and a new one is inserted after a 1-week ring-free interval; if the ring is left in place for >4 weeks, backup contraception is recommended until a new ring has been in place for 7 days.

4. Despite the low ethinyl estradiol dose, in a study in 16 women the contraceptive vaginal ring resulted in equivalent suppression of serum gonadotropin concentrations and ovulation as a combined oral contraceptive containing ethinyl estradiol (30 mcg) and desogestrel (150 mcg).

5. In a multicenter study, including 2322 women, the Pearl Index of efficacy in compliant patients was 0.8. Irregular bleeding was uncommon (5.5% of cycles), and withdrawal bleeding occurred in 98.5% of cycles. Compliance was 86%, with 15% of women discontinuing treatment because of an adverse event, most commonly device-related discomfort, headache, or vaginal discharge/vaginitis. Only 2.5% of discontinuations were device related.

B. Transdermal contraceptive patch

1. Ortho Evra is a transdermal contraceptive patch, which is as effective as oral contraceptives. Ortho Evra delivers 20 µg of ethinyl estradiol and 150 µg of norelgestromin daily for 6 to 13 months. Compliance is better with the patch. The patch is applied at the beginning of the menstrual cycle. A new patch is applied each week for 3 weeks; week 4 is patch-free. It is sold in packages of 3 patches. Effectiveness is similar to oral contraceptives.

2. Breakthrough bleeding during the first two cycles, dysmenorrhea, and breast discomfort are more common in women using the patch. A reaction at the site of application of the patch occurs in 1.9 percent of the women. Contraceptive efficacy may be slightly lower in women weighing more than 90 kg.

C. Depot medroxyprogesterone acetate (DMPA, Depo-Provera) is an injectable contraceptive. Deep intramuscular injection of 150 mg results in effective contraception for three to four months. Effectiveness is 99.7 percent.

D. Women who receive the first injection after the seventh day of the menstrual cycle should use a second method of contraception for seven days. The first injection should be administered within five days after the onset of menses, in which case

alternative contraception is not necessary.

E. Ovulation is suppressed for at least 14 weeks after injection of a 150 mg dose of DMPA. Therefore, injections should repeated every three months. A pregnancy test must be administered to women who are more than two weeks late for an injection.

F. Return of fertility can be delayed for up to 18 months after cessation of DMPA. DMPA is not ideal for women who may wish to become pregnant soon after cessation of contraception.

G. Amenorrhea, irregular bleeding, and weight gain (typically 1 to 3 kg) are the most common adverse effects of DMPA. Adverse effects also include acne, headache, and depression. Fifty percent of women report amenorrhea by one year. Persistent bleeding may be treated with 50 µg of ethinyl estradiol for 14 days.

H. Medroxyprogesterone acetate/estradiol cypionate (MPA/E2C, Lunelle) is a combined (25 mg MPA and 5 mg E2C), injectable contraceptive.

1. Although monthly IM injections are required, MPA/E2C has several desirable features:

a. It has nearly 100 percent effectiveness in preventing pregnancy.

b. Fertility returns within three to four months after it is discontinued.

c. Irregular bleeding is less common than in women given MPA alone.

2. Weight gain, hypertension, headache, mastalgia, or other nonmenstrual complaints are common.

3. Lunelle should be considered for women who forget to take their birth control pills or those who want a discreet method of contraception. The initial injection should be given during the first 5 days of the menstrual cycle or within 7 days of stopping oral contraceptives. Lunelle injections should be given every 28 to 30 days; 33 days at the most.

II. Oral contraceptives

A. Combined (estrogen-progestin) oral contraceptives are reliable, and they have noncontraceptive benefits, which include reduction in dysmenorrhea, iron deficiency, ovarian cancer, endometrial cancer.

Combination Oral Contraceptives

Drug	Progestin, mg	Estrogen
Monophasic combinations		
Ortho-Novum 1 /35 21, 28	Norethindrone (1)	Ethinyl estradiol (35)
Ovcon 35 21, 28	Norethindrone (0.4)	Ethinyl estradiol (35)
Brevicon 21, 28	Norethindrone (0.5)	Ethinyl estradiol (35)
Modicon 28	Norethindrone (0.5)	Ethinyl estradiol (35)
Necon 0.5/35E 21, 28	Norethindrone (0.5)	Ethinyl estradiol (35)
Nortrel 0.5/35 28	Norethindrone (0.5)	Ethinyl estradiol (35)
Necon 1 /35 21, 28	Norethindrone (1)	Ethinyl estradiol (35)
Norinyl 1 /35 21, 28	Norethindrone (1)	Ethinyl estradiol (35)
Nortrel 1 /35 21, 28	Norethindrone (1)	Ethinyl estradiol (35)
Loestrin 1 /20 21, 28	Norethindrone acetate (1)	Ethinyl estradiol (20)
Microgestin 1 /20 28	Norethindrone acetate (1)	Ethinyl estradiol (20)
Loestrin 1.5/30 21, 28	Norethindrone acetate (1.5)	Ethinyl estradiol (30)
Microgestin 1.5/30 28	Norethindrone acetate (1.5)	Ethinyl estradiol (30)
Alesse 21, 28	Levonorgestrel (0.1)	Ethinyl estradiol (20)
Aviane 21, 28	Levonorgestrel (0.1)	Ethinyl estradiol (20)
Lessina 28	Levonorgestrel (0.1)	Ethinyl estradiol (20)
Levlite 28	Levonorgestrel (0.1)	Ethinyl estradiol (20)
Necon 1/50 21, 28	Norethindrone (1)	Mestranol (50)
Norinyl 1150 21, 28	Norethindrone (1)	Mestranol (50)
Ortho-Novum 1/50 28	Norethindrone (1)	Mestranol (50)
Ovcon 50 28	Norethindrone (1)	Ethinyl estradiol (50)
Cyclessa 28	Desogestrel (0.1)	Ethinyl estradiol (25)
Apri 28	Desogestrel (0.15)	Ethinyl estradiol (30)
Desogen 28	Desogestrel (0.15)	Ethinyl estradiol (30)
Ortho-Cept 21, 28	Desogestrel (0.15)	Ethinyl estradiol (30)
Yasmin 28	Drospirenone (3)	Ethinyl estradiol (30)
Demulen 1 /35 21, 28	Ethynodiol diacetate (1)	Ethinyl estradiol (35)

Drug	Progestin, mg	Estrogen
Zovia 1 /35 21, 28	Ethynodiol diacetate (1)	Ethinyl estradiol (35)
Demulen 1/50 21, 28	Ethynodiol diacetate (1)	Ethinyl estradiol (50)
Zovia 1 /50 21, 28	Ethynodiol diacetate (1)	Ethinyl estradiol (50)
Levlen 21, 28	Levonorgestrel (0.15)	Ethinyl estradiol (30)
Levora 21, 28	Levonorgestrel (0.15)	Ethinyl estradiol (30)
Nordette 21, 28	Levonorgestrel (0.15)	Ethinyl estradiol (30)
Ortho-Cyclen 21, 28	Norgestimate (0.25)	Ethinyl estradiol (35)
Lo/Ovral 21, 28	Norgestrel (0.3)	Ethinyl estradiol (30)
Low-Ogestrel 21, 28	Norgestrel (0.3)	Ethinyl estradiol (30)
Ogestrel 28	Norgestrel (0.5)	Ethinyl estradiol (50)
Ovral 21, 28	Norgestrel (0.5)	Ethinyl estradiol (50)
Seasonale	Levonorgestrel (0.15)	Ethinyl estradiol (0.03)
Multiphasic Combinations		
Kariva 28	Desogestrel (0.15)	Ethinyl estradiol (20, 0, 10)
Mircette 28	Desogestrel (0.15)	Ethinyl estradiol (20, 0, 10)
Tri-Levlen 21, 28	Levonorgestrel (0.05, 0.075, 0.125)	Ethinyl estradiol (30, 40, 30)
Triphasil 21, 28	Levonorgestrel (0.05, 0.075, 0.125)	Ethinyl estradiol (30, 40, 30)
Trivora 28	Levonorgestrel (0.05, 0.075, 0.125)	Ethinyl estradiol (30, 40, 30)
Necon 10/11 21, 28	Norethindrone (0.5, 1)	Ethinyl estradiol (35)
Ortho-Novum 10/11 28	Norethindrone (0.5, 1)	Ethinyl estradiol (35)
Ortho-Novum 7/7/7 21, 28	Norethindrone (0.5, 0.75, 1)	Ethinyl estradiol (35)
Tri-Norinyl 21, 28	Norethindrone (0.5, 1, 0.5)	Ethinyl estradiol (35)
Estrostep 28	Norethindrone acetate (1)	Ethinyl estradiol (20, 30, 35)
Ortho Tri-Cyclen 21, 28	Norgestimate (0.18, 0.215, 0.25)	Ethinyl estradiol (35)

B. Pharmacology

1. Ethinyl estradiol is the estrogen in virtually all OCs.

2. Commonly used progestins include norethindrone, norethindrone acetate, and levonorgestrel. Ethynodiol diacetate is a progestin, which also has significant estrogenic activity. New progestins have been developed with less androgenic activity; however, these agents may be associated with deep vein thrombosis.

C. Mechanisms of action

1. The most important mechanism of action is estrogen-induced inhibition of the midcycle surge of gonadotropin secretion, so that ovulation does not occur.

2. Another potential mechanism of contraceptive action is suppression of gonadotropin secretion during the follicular phase of the cycle, thereby preventing follicular maturation.

3. Progestin-related mechanisms also may contribute to the contraceptive effect. These include rendering the endometrium is less suitable for implantation and making the cervical mucus less permeable to penetration by sperm.

D. Contraindications

1. Absolute contraindications to OCs:

a. Previous thromboembolic event or stroke

b. History of an estrogen-dependent tumor

c. Active liver disease

d. Pregnancy

e. Undiagnosed abnormal uterine bleeding

f. Hypertriglyceridemia

g. Women over age 35 years who smoke heavily (greater than 15 cigarettes per day)

2. Screening requirements. Hormonal contraception can be safely provided after a careful medical history and blood pressure measurement. Pap smears are not required before a prescription for OCs.

E. Efficacy. When taken properly, OCs are a very effective form of contraception. The actual failure rate is 2 to 3 percent due primarily to missed pills or failure to resume therapy after the seven-day pill-free interval.

Noncontraceptive Benefits of Oral Contraceptive Pills	
Dysmenorrhea Mittelschmerz Metrorrhagia Premenstrual syndrome Hirsutism Ovarian and endometrial cancer	Functional ovarian cysts Benign breast cysts Ectopic pregnancy Acne Endometriosis

F. Drug interactions. The metabolism of OCs is accelerated by phenobarbital, phenytoin and rifampin. The contraceptive efficacy of an OC is likely to be decreased in women taking these drugs. Other antibiotics (with the exception of rifampin) do not affect the pharmacokinetics of ethinyl estradiol.

G. Preparations

1. There are two types of oral contraceptive pills: combination pills that contain both estrogen and progestin, and the progestin-only pill ("mini-pill"). Progestin-only pills, which are associated with more breakthrough bleeding than combination pills, are rarely prescribed except in lactating women. Combination pills are packaged in 21-day or 28-day cycles. The last seven pills of a 28-day pack are placebo pills.
2. Monophasic combination pills contain the same dose of estrogen and progestin in each of the 21 hormonally active pills. Current pills contain on average 30 to 35 µg. Pills containing less than 50 µg of ethinyl estradiol are "low-dose" pills.
3. **20 µg preparations.** Several preparations containing only 20 µg of ethinyl estradiol are now available (Lo-Estrin 1/20, Mircette, Alesse, Aviane). These are often used for perimenopausal women who want contraception with the lowest estrogen dose possible. These preparations provide enough estrogen to relieve vasomotor flashes. Perimenopausal women often experience hot flashes and premenstrual mood disturbances during the seven-day pill-free interval. Mircette, contains 10 µg of ethinyl estradiol on five of the seven "placebo" days, which reduces flashes and mood symptoms.
4. **Seasonale** is a 91-day oral contraceptive. Tablets containing the active hormones are taken for 12 weeks (84 days), followed by 1 week (7 days) of placebo tablets. Seasonale contains levonorgestrel (0.15 mg) and ethinyl estradiol (0.03 mg). Many women, especially in the first few cycles, have more spotting between menstrual periods. Seasonale is as effective and safe as traditional birth control pills.
5. **Yasmin** contains 30 mcg of ethinyl estradiol and drospirenone. Drospirenone has anti-mineralocorticoid activity. It can help prevent bloating, weight gain, and hypertension, but it can increase serum potassium. Yasmin is contraindicated in patients at risk for hyperkalemia due to renal, hepatic, or adrenal disease. Yasmin should not be combined with other drugs that can increase potassium, such as ACE inhibitors, angiotensin receptor blockers, potassium-sparing diuretics, potassium supplements, NSAIDs, or salt substitutes.
6. **Third-generation progestins**
   - **a.** More selective progestins include norgestimate, desogestrel, and gestodene. They have some structural modifications that lower their androgen activity. Norgestimate (eg, Ortho-Cyclen or Tri-Cyclen) and desogestrel (eg, Desogen or Ortho-Cept) are the least androgenic compounds in this class. The new progestins are not much less androgenic than norethindrone.
   - **b.** The newer OCs are more effective in reducing acne and hirsutism in hyperandrogenic women. They are therefore an option for women who have difficulty tolerating older OCs. There is an increased risk of deep venous thrombosis with the use of these agents, and they should not be routinely used.

H. Recommendations for oral contraceptives

1. Monophasic OCs containing the second generation progestin, norethindrone (Ortho-Novum 1/35) are recommended when starting a patient on OCs for the first time. This progestin has very low androgenicity when compared to other second generation progestins, and also compares favorably to the third generation progestins in androgenicity.
2. The pill should be started on the first day of the period to provide the maximum contraceptive effect in the first cycle. However, most women start their pill on the first Sunday after the period starts. Some form of back-up contraception is needed for the first month if one chooses the Sunday start, because the full contraceptive effect might not be provided in the first pill pack.

Factors to Consider in Starting or Switching Oral Contraceptive Pills

Objective	Action	Products that achieve the objective
To minimize high risk of thrombosis	Select a product with a lower dosage of estrogen.	Alesse, Aviane, Loestrin 1/20, Levlite, Mircette
To minimize nausea, breast tenderness or vascular headaches	Select a product with a lower dosage of estrogen.	Alesse, Aviane, Levlite, Loestrin 1/20, Mircette
To minimize spotting or breakthrough bleeding	Select a product with a higher dosage of estrogen or a progestin with greater potency.	Lo/Ovral, Nordette, Ortho-Cept, Ortho-Cyclen, Ortho Tri-Cyclen

Objective	Action	Products that achieve the objective
To minimize androgenic effects	Select a product containing a low-dose norethindrone or ethynodiol diacetate.	Brevicon, Demulen 1/35, Modicon, Ovcon 35
To avoid dyslipidemia	Select a product containing a low-dose norethindrone or ethynodiol diacetate.	Brevicon, Demulen 1/35, Modicon, Ovcon 35

Instructions on the Use of Oral Contraceptive Pills

Initiation of use (choose one):
The patient begins taking the pills on the first day of menstrual bleeding.
The patient begins taking the pills on the first Sunday after menstrual bleeding begins.
The patient begins taking the pills immediately if she is definitely not pregnant and has not had unprotected sex since her last menstrual period.

Missed pill
If it has been less than 24 hours since the last pill was taken, the patient takes a pill right away and then returns to normal pill-taking routine.
If it has been 24 hours since the last pill was taken, the patient takes both the missed pill and the next scheduled pill at the same time.
If it has been more than 24 hours since the last pill was taken (ie, two or more missed pills), the patient takes the last pill that was missed, throws out the other missed pills and takes the next pill on time. Additional contraception is used for the remainder of the cycle.

Additional contraceptive method
Use an additional contraceptive method for the first 7 days after initially starting oral contraceptive pills.
Use an additional contraceptive method for 7 days if more than 12 hours late in taking an oral contraceptive pill.
Use an additional contraceptive method while taking an interacting drug and for 7 days thereafter.

III. Barrier methods

A. Barrier methods of contraception, such as the condom, diaphragm, cervical cap, and spermicides, have fewer side effects than hormonal contraception.

B. The diaphragm and cervical cap require fitting by a clinician and are only effective when used with a spermicide. They must be left in the vagina for six to eight hours after intercourse; the diaphragm needs to be removed after this period of time, while the cervical cap can be left in place for up to 24 hours. These considerations have caused them to be less desirable methods of contraception. A major advantage of barrier contraceptives is their efficacy in protecting against sexually transmitted diseases and HIV infection.

IV. Intrauterine devices

A. The currently available intrauterine devices (IUDs) are safe and effective methods of contraception:

1. **Copper T380 IUD** induces a foreign body reaction in the endometrium. It is effective for 8 to 10 years.
2. **Progesterone-releasing IUDs** inhibit sperm survival and implantation. They also decrease menstrual blood loss and relieve dysmenorrhea. **Paragard** is replaced every 10 years. **Progestasert** IUDs must be replaced after one year.
3. **Levonorgestrel IUD (Mirena)** provides effective contraception for five years.

B. Infection

1. Women who are at low risk for sexually transmitted diseases do not have a higher incidence of pelvic inflammatory disease with use of an IUD. An IUD should not be inserted in women at high risk for sexually transmitted infections, and women should be screened for the presence of sexually transmitted diseases before insertion.
2. **Contraindications to IUDs:**
   - **a.** Women at high risk for bacterial endocarditis (eg, rheumatic heart disease, prosthetic valves, or a history of endocarditis).
   - **b.** Women at high risk for infections, including those with AIDS and a history of intravenous drug use.
   - **c.** Women with uterine leiomyomas which alter the size or shape of the uterine cavity.

V. Lactation

A. Women who breast-feed have a delay in resumption of ovulation postpartum. It is probably safest to resume contraceptive use in the third postpartum month for those who breast-feed full time, and in the third postpartum week for those who do not breast-feed.

B. A nonhormonal contraceptive or progesterone-containing hormonal contraceptive can be started at any time; an estrogen-containing oral contraceptive pill should not be started before the third week postpartum because women are still at increased risk of thromboembolism prior to this time. Oral contraceptive pills can decrease breast milk, while progesterone-containing contraceptives may increase breast milk.

VI. Progestin-only agents

A. Progestin-only agents are slightly less effective than combination oral contraceptives. They have failure rates of 0.5 percent compared with the 0.1 percent rate with combination oral contraceptives.

B. Progestin-only oral contraceptives (Micronor, Nor-QD, Ovrette) provide a useful alternative in women who cannot take estrogen. Progestin-only contraception is recommended for nursing mothers. Milk production is unaffected by use of progestin-only agents.

C. If the usual time of ingestion is delayed for more than three hours, an alternative form of birth control should be used for the following 48 hours. Because progestin-only agents are taken continuously, without hormone-free periods, menses

may be irregular, infrequent or absent.

VII. Postcoital contraception

A. Emergency postcoital contraception consists of administration of drugs within 72 hours to women who have had unprotected intercourse (including sexual assault), or to those who have had a failure of another method of contraception (eg, broken condom).

B. Preparations

1. Menstrual bleeding typically occurs within three days after administration of most forms of hormonal postcoital contraception. A pregnancy test should be performed if bleeding has not occurred within four weeks.

2. Preven Emergency Contraceptive Kit includes four combination tablets, each containing 50 µg of ethinyl estradiol and 0.25 mg of levonorgestrel, and a pregnancy test to rule out pregnancy before taking the tablets. Instructions are to take two of the tablets as soon as possible within 72 hours of coitus, and the other two tablets twelve hours later.

3. An oral contraceptive such as Ovral (two tablets twelve hours apart) or Lo/Ovral (4 tablets twelve hours apart) can also be used.

4. Nausea and vomiting are the major side effects. Meclizine 50 mg, taken one hour before the first dose, reduces nausea and vomiting but can cause some sedation.

5. Plan B is a pill pack that contains two 0.75 mg tablets of levonorgestrel to be taken twelve hours apart. The cost is comparable to the Preven kit ($20). This regimen may be more effective and better tolerated than an estrogen-progestin regimen.

6. Copper T380 IUD. A copper intrauterine device (IUD) placed within 120 hours of unprotected intercourse can also be used as a form of emergency contraception. An advantage of this method is that it provides continuing contraception after the initial event.

Emergency Contraception

1. Consider pretreatment one hour before each oral contraceptive pill dose, using one of the following orally administered antiemetic agents:
   Prochlorperazine (Compazine), 5 to 10 mg
   Promethazine (Phenergan), 12.5 to 25 mg
   Trimethobenzamide (Tigan), 250 mg
   Meclizine (Antivert) 50 mg
2. Administer the first dose of oral contraceptive pill within 72 hours of unprotected coitus, and administer the second dose 12 hours after the first dose. Brand name options for emergency contraception include the following:
   Preven Kit – two pills per dose (0.5 mg of levonorgestrel and 100 µg of ethinyl estradiol per dose)
   Plan B – one pill per dose (0.75 mg of levonorgestrel per dose)
   Ovral – two pills per dose (0.5 mg of levonorgestrel and 100 µg of ethinyl estradiol per dose)
   Nordette – four pills per dose (0.6 mg of levonorgestrel and 120 µg of ethinyl estradiol per dose)
   Triphasil – four pills per dose (0.5 mg of levonorgestrel and 120 µg of ethinyl estradiol per dose)

VIII. Sterilization

A. Sterilization is the most common and effective form of contraception. While tubal ligation and vasectomy may be reversible, these procedures should be considered permanent.

B. Essure microinsert sterilization device is a permanent, hysteroscopic, tubal sterilization device which is 99.9 percent effective. The coil-like device is inserted in the office under local anesthesia into the fallopian tubes where it is incorporated by tissue. After placement, women use alternative contraception for three months, after which hysterosalpingography is performed to assure correct placement. Postoperative discomfort is minimal.

C. Tubal ligation is usually performed as a laparoscopic procedure in outpatients or in postpartum women in the hospital. The techniques used are unipolar or bipolar coagulation, silicone rubber band or spring clip application, and partial salpingectomy.

D. Vasectomy (ligation of the vas deferens) can be performed in the office under local anesthesia. A semen analysis should be done three to six months after the procedure to confirm azoospermia.

References: See page 311.

Ectopic Pregnancy

Ectopic pregnancy causes 15% of all maternal deaths. Once a patient has had an ectopic pregnancy, there is a 7- to 13-fold increase in the risk of recurrence.

I. Clinical manifestations

A. Symptoms of ectopic pregnancy include abdominal pain, amenorrhea, and vaginal bleeding. However, over 50 percent of women are asymptomatic before tubal rupture.

B. Symptoms of pregnancy (eg, breast tenderness, frequent urination, nausea) are often present. In cases of rupture, lightheadedness or shock may occur. EP should be suspected in any women of reproductive age with abdominal pain, especially those who have risk factors for an extrauterine pregnancy.

Risk Factors for Ectopic Pregnancy
Greatest Risk Previous ectopic pregnancy Previous tubal surgery or sterilization Diethylstilbestrol exposure in utero Documented tubal pathology (scarring) Use of intrauterine contraceptive device
Greater Risk Previous genital infections (eg, PID) Infertility (In vitro fertilization) Multiple sexual partners
Lesser Risk Previous pelvic or abdominal surgery Cigarette smoking Vaginal douching Age of 1st intercourse <18 years

Presenting Signs and Symptoms of Ectopic Pregnancy	
Symptom	**Percentage**
Abdominal pain Amenorrhea Vaginal bleeding Dizziness, fainting Urge to defecate Pregnancy symptoms Passage of tissue	80-100% 75-95% 50-80% 20-35% 5-15% 10-25% 5-10%
Adnexal tenderness	75-90%
Abdominal tenderness	80-95%
Adnexal mass	50%
Uterine enlargement	20-30%
Orthostatic changes	10-15%
Fever	5-10%

C. Physical examination. Vital signs may reveal orthostatic changes and, occasionally, fever. Findings include adnexal and/or abdominal tenderness, an adnexal mass, and uterine enlargement.

II. Diagnostic evaluation

A. Women with moderate- or high-risk factors for EP and those who conceived after in-vitro fertilization (IVF) should be evaluated for EP as soon as their first missed menses.

B. Transvaginal ultrasound is most useful for identifying an intrauterine gestation. An extrauterine pregnancy will be visualized in only 16 to 32 percent of cases, thus a pelvic ultrasound showing "no intrauterine or extrauterine gestation" does not exclude the diagnosis of EP.

1. The identification of an intrauterine pregnancy effectively excludes the possibility of an ectopic in almost all cases. However, pregnancies conceived with assisted reproductive technology are an exception, since the incidence of combined intrauterine and extrauterine pregnancy may be as high as 1/100 pregnancies.

2. An early intrauterine pregnancy is identified sonographically by the presence of a true gestational sac. Using TVS, the gestational sac is usually visible at 4.5 to 5 weeks of gestation with the double decidual sign at 5.5 to 6 weeks, the yolk sac appears at 5 to 6 weeks and remains until 10 weeks, and a fetal pole with cardiac activity is first detected at 5.5 to 6 weeks.

C. beta-hCG concentration. The gestational sac is usually identified at beta-hCG concentrations above 1500 to 2000 IU/L. The absence of an intrauterine gestational sac at beta-hCG concentrations above 2000 IU/L strongly suggests an EP.

D. Progesterone concentrations are higher in intrauterine than ectopic pregnancies. A concentration of greater than 25 ng/mL is usually (98 to 99 percent) associated with a viable intrauterine pregnancy, with lower concentrations in ectopic and intrauterine pregnancies that are destined to abort. A concentration less than 5 ng/mL almost always (99.8 percent) means the pregnancy is nonviable. However, there is no difference in the progesterone concentration between ectopic and arrested pregnancies. Progesterone measurements are useful only to confirm diagnostic impressions already obtained by hCG measurements and transvaginal sonography.

III. Clinical decision making

A. Beta-hCG concentration greater than 1500 IU/L. The interpretation of a beta-hCG at this level depends upon the findings on TVS.

1. Positive ultrasound. Presence of an intrauterine pregnancy almost always excludes the presence of an EP. Fetal cardiac activity or a gestational sac with a clear fetal pole or yolk sac in an extrauterine location is diagnostic of an EP; treatment of EP should be initiated.

2. Negative ultrasound

a. An EP is very likely in the absence of an intrauterine pregnancy on TVS when the serum beta-hCG concentration is greater than 1500 IU/L. The next step is to confirm the diagnostic impression by repeating the TVS examination and beta-hCG concentration two days later. The diagnosis of EP is certain at this time if an intrauterine pregnancy is not observed on TVS and the serum beta-hCG concentration is increasing or plateaued. Treatment of EP should be initiated.

b. A falling beta-hCG concentration is most consistent with

a failed pregnancy (eg, arrested pregnancy, blighted ovum, tubal abortion, spontaneously resolving EP). Weekly beta-hCG concentrations should be monitored until the result is negative for pregnancy.

B. Beta-hCG concentration greater than 1500 IU/L and an adnexal mass. An extrauterine pregnancy is almost certain when the serum beta-hCG concentration is greater than 1500 IU/L, a nonspecific adnexal mass is present, and no intrauterine pregnancy is observed on TVS. Treatment of EP should be initiated.

C. Beta-hCG less than 1500 IU/L

1. A serum beta-hCG concentration less than 1500 IU/L with a TVS examination that is negative should be followed by repetition of both of these tests in three days to follow the rate of rise of the hCG. Beta-hCG concentrations usually double every 1.5 to two days until six to seven weeks of gestation in viable intrauterine pregnancies (and in some ectopic gestations). A beta-hCG concentration that does not double over 72 hours associated with a repeat TVS examination that does not show an intrauterine gestation means that the pregnancy is nonviable, such as an ectopic gestation or intrauterine pregnancy that is destined to abort. A normal intrauterine pregnancy is not present and medical treatment of EP can be initiated.
2. A normally rising beta-hCG concentration should be evaluated with TVS until an intrauterine pregnancy or an ectopic pregnancy can be demonstrated.
3. A falling beta-hCG concentration is most consistent with a failed pregnancy (eg, arrested pregnancy, blighted ovum, tubal abortion, spontaneously resolving EP). Weekly beta-hCG concentrations should be monitored until the result is negative for pregnancy.

IV. Methotrexate therapy for ectopic pregnancy

A. Medical treatment of ectopic pregnancy (EP) with methotrexate (MTX) has supplanted surgical therapy in most cases. The success rate is 86 to 94 percent.

B. Methotrexate is a folic acid antagonist, which inhibits DNA synthesis and cell reproduction.

Criteria for Receiving Methotrexate

Absolute indications
Hemodynamically stable without active bleeding or signs of hemoperitoneum
Nonlaparoscopic diagnosis
Patient desires future fertility
General anesthesia poses a significant risk
Patient is able to return for follow-up care
Patient has no contraindications to methotrexate

Relative indications
Unruptured mass <3.5 cm at its greatest dimension
No fetal cardiac motion detected
Patients whose bet-hCG level does not exceed 6,000-15,000 mIU/mL

Contraindications to Methotrexate Therapy

Absolute contraindications
Breast feeding
Overt or laboratory evidence of immunodeficiency
Alcoholism, alcoholic liver disease, or other chronic liver disease
Preexisting blood dyscrasias, such as bone marrow hypoplasia, leukopenia, thrombocytopenia, or significant anemia
Known sensitivity to methotrexate
Active pulmonary disease
Peptic ulcer disease
Hepatic, renal, or hematologic dysfunction

Relative contraindications
Gestational sac >3.5 cm
Embryonic cardiac motion

C. Contraindications to medical treatment

1. Women who are hemodynamically unstable, not likely to be compliant with post-therapeutic monitoring, and who do not have timely access to a medical institution should be treated surgically.
2. The presence of fetal cardiac activity is a relative contraindication to medical treatment.
3. Women with a high baseline hCG concentration (>5000 mIU/mL) are more likely to experience treatment failure; they may be better served by conservative laparoscopic surgery.

D. Protocol

1. **Single dose therapy.** A single intramuscular dose of methotrexate (50 mg per square meter of body surface area) is given. The body surface area (BSA) may be calculated based upon height and weight.
2. **RhoGAM** should be administered if the woman is Rh(D)-negative and the blood group of her male partner is Rh(D)-positive or unknown.

E. Adverse reactions to MTX are usually mild and self-limiting. The most common are stomatitis and conjunctivitis. Rare side effects include gastritis, enteritis, dermatitis, pleuritis, alopecia, elevated liver enzymes, and bone marrow suppression.

F. Post-therapy monitoring and evaluation. Serum beta-hCG concentration and ultrasound examination should be evaluated weekly. An increase in beta-hCG levels in the three days following therapy (ie, up to day 4) and mild abdominal pain of short duration (one to two days) are common. The pain can be controlled with nonsteroidal antiinflammatory drugs.

G. A second dose of methotrexate should be administered if the serum beta-hCG concentration on Day 7 has not declined by at least 25 percent from the Day 0 level. Approximately 20 percent of women will require a second dose of MTX.

H. The beta-hCG concentration usually declines to less than 15 mIU/mL by 35 days post-injection, but may take as long as 109 days. Weekly assays should be obtained until this level is reached.

Side Effects Associated with Methotrexate Treatment	
Increase in abdominal pain (occurs in up to two-thirds of patients) Nausea Vomiting Stomatitis Diarrhea	Gastric distress Dizziness Vaginal bleeding or spotting Severe neutropenia (rare) Reversible alopecia (rare) Pneumonitis

Signs of Treatment Failure and Tubal Rupture
Significantly worsening abdominal pain, regardless of change in beta-hCG levels Hemodynamic instability Levels of beta-hCG that do not decline by at least 15% between day 4 and day 7 postinjection Increasing or plateauing beta-hCG levels after the first week of treatment

V. Operative management can be accomplished by either laparoscopy or laparotomy. Linear salpingostomy or segmental resection is the procedure of choice if the fallopian tube is to be retained. Salpingectomy is the procedure of choice if the tube requires removal.

References: See page 311.

Acute Pelvic Pain

I. Clinical evaluation

A. Assessment of acute pelvic pain should determine the patient's age, obstetrical history, menstrual history, characteristics of pain onset, duration, and palliative or aggravating factors.

B. Associated symptoms may include urinary or gastrointestinal symptoms, fever, abnormal bleeding, or vaginal discharge.

C. Past medical history. Contraceptive history, surgical history, gynecologic history, history of pelvic inflammatory disease, ectopic pregnancy, sexually transmitted diseases should be determined. Current sexual activity and practices should be assessed.

D. Method of contraception

1. Sexual abstinence in the months preceding the onset of pain lessons the likelihood of pregnancy-related etiologies.

2. The risk of acute PID is reduced by 50% in patients taking oral contraceptives or using a barrier method of contraception. Patients taking oral contraceptives are at decreased risk for an ectopic pregnancy or ovarian cysts.

E. Risk factors for acute pelvic inflammatory disease. Age between 15-25 years, sexual partner with symptoms of urethritis, prior history of PID.

II. Physical examination

A. Fever, abdominal or pelvic tenderness, and peritoneal signs should be sought.

B. Vaginal discharge, cervical erythema and discharge, cervical and uterine motion tenderness, or adnexal masses or tenderness should be noted.

III. Laboratory tests

A. Pregnancy testing will identify pregnancy-related causes of pelvic pain. Serum beta-HCG becomes positive 7 days after conception. A negative test virtually excludes ectopic pregnancy.

B. Complete blood count. Leukocytosis suggest an inflammatory process; however, a normal white blood count occurs in 56% of patients with PID and 37% of patients with appendicitis.

C. Urinalysis. The finding of pyuria suggests urinary tract infection. Pyuria can also occur with an inflamed appendix or from contamination of the urine by vaginal discharge.

D. Testing for Neisseria gonorrhoeae and Chlamydia trachomatis are necessary if PID is a possibility.

E. Pelvic ultrasonography is of value in excluding the diagnosis of an ectopic pregnancy by demonstrating an intrauterine gestation. Sonography may reveal acute PID, torsion of the adnexa, or acute appendicitis.

F. Diagnostic laparoscopy is indicated when acute pelvic pain has an unclear diagnosis despite comprehensive evaluation.

III. Differential diagnosis of acute pelvic pain

A. Pregnancy-related causes. Ectopic pregnancy, spontaneous, threatened or incomplete abortion, intrauterine pregnancy with corpus luteum bleeding.

B. Gynecologic disorders. PID, endometriosis, ovarian cyst hemorrhage or rupture, adnexal torsion, Mittelschmerz, uterine leiomyoma torsion, primary dysmenorrhea, tumor.

C. Nonreproductive tract causes

1. Gastrointestinal. Appendicitis, inflammatory bowel disease, mesenteric adenitis, irritable bowel syndrome, diverticulitis.

2. Urinary tract. Urinary tract infection, renal calculus.

IV. Approach to acute pelvic pain with a positive pregnancy test

A. In a female patient of reproductive age, presenting with acute pelvic pain, the first distinction is whether the pain is pregnancy-related or non-pregnancy-related on the basis of a serum pregnancy test.

B. In the patient with acute pelvic pain associated with pregnancy, the next step is localization of the tissue responsible for the hCG production. Transvaginal ultrasound should be performed to identify an intrauterine gestation. Ectopic pregnancy is characterized by a noncystic adnexal mass and fluid in the cul-de-sac.

V. Approach to acute pelvic pain in non-pregnant patients with a negative HCG

A. Acute PID is the leading diagnostic consideration in patients with acute pelvic pain unrelated to pregnancy. The pain is usually bilateral, but may be unilateral in 10%. Cervical motion tenderness, fever, and cervical discharge are common findings.

B. Acute appendicitis should be considered in all patients presenting with acute pelvic pain and a negative pregnancy

test. Appendicitis is characterized by leukocytosis and a history of a few hours of periumbilical pain followed by migration of the pain to the right lower quadrant. Neutrophilia occurs in 75%. A slight fever exceeding 37.3°C, nausea, vomiting, anorexia, and rebound tenderness may be present.

C. **Torsion of the adnexa** usually causes unilateral pain, but pain can be bilateral in 25%. Intense, progressive pain combined with a tense, tender adnexal mass is characteristic. There is often a history of repetitive, transitory pain. Pelvic sonography often confirms the diagnosis. Laparoscopic diagnosis and surgical intervention are indicated.

D. **Ruptured or hemorrhagic corpus luteal cyst** usually causes bilateral pain, but it can cause unilateral tenderness in 35%. Ultrasound aids in diagnosis.

E. **Endometriosis** usually causes chronic or recurrent pain, but it can occasionally cause acute pelvic pain. There usually is a history of dysmenorrhea and deep dyspareunia. Pelvic exam reveals fixed uterine retrodisplacement and tender uterosacral and cul-de-sac nodularity. Laparoscopy confirms the diagnosis.

References: See page 311.

Chronic Pelvic Pain

Chronic pelvic pain (CPP) is menstrual or nonmenstrual pain of at least six months' duration, located below the umbilicus and severe enough to cause functional disability or require treatment. Gynecologic conditions account for 90 percent of cases of CPP. Gastrointestinal diseases, such as irritable bowel syndrome, are the next most common category.

I. Differential diagnosis

A. **Endometriosis** is the most common etiology of CPP in populations with a low prevalence of sexually transmitted infections. Endometriosis is found in up to 70 percent of patients with CPP.

B. **Chronic pelvic inflammatory disease (PID)** is one of the most common gynecologic conditions causing CPP in practices with a high prevalence of sexually transmitted diseases.

C. **Mental-health issues.** Somatization disorder, drug seeking behavior and narcotic dependency, physical and sexual abuse, and depression are commonly diagnosed in women with CPP.

D. **Fibromyalgia.** Women with fibromyalgia sometimes present with CPP. Two criteria must be present for diagnosing fibromyalgia: The patient reports pain in all four quadrants of the body, and detection of at least 11 separate areas (eg, knees, shoulders, elbows, neck) that are tender to physical pressure.

E. **Irritable bowel syndrome (IBS)** is a gastrointestinal syndrome characterized by chronic abdominal pain and altered bowel habits in the absence of any organic cause.

F. **Interstitial cystitis** is characterized by urinary urgency, bladder discomfort, and a sense of inadequate emptying of the bladder. Dyspareunia is often present. Cystoscopy is diagnostic.

Some Causes of Chronic Pelvic Pain by System

Gynecologic	Systemic diseases
Endometriosis Adenomyosis Leiomyomata Adhesions Ovarian cyst/mass Pelvic inflammatory disease Endosalpingiosis Cervical stenosis Pelvic relaxation	Fibromyalgia Depression Somatization Substance abuse
Urologic	**Gastrointestinal**
Interstitial cystitis Urethral disorders	Irritable bowel Diverticulitis Inflammatory bowel disease Constipation Hernia

II. History

A. **Characteristics** of the pain should be noted, including location, intensity quality, duration, temporal pattern, precipitating factors (eg, exertion, sexual activity, menses, pregnancy), relationship to urination and defecation, and radiation.

B. **Hormonal versus nonhormonal**

1. Pelvic pain associated with severe dysmenorrhea and/or pain at the time of ovulation is likely due to endometriosis or adenomyosis. Women with endometriosis report premenstrual spotting, dyspareunia, dyschezia, poor relief of symptoms with nonsteroidal anti-inflammatory drugs, progressively worsening symptoms, inability to attend work or school during menses, and the presence of pelvic pain unrelated to menses more often than women with primary dysmenorrhea.
2. Nonhormonally responsive diseases should be considered for pain that is not related to menses, including chronic pelvic inflammatory disease, adhesions/inflammation from previous pelvic surgery, irritable bowel syndrome, diverticulitis, fibromyalgia, and interstitial cystitis.

III. Physical examination

A. Surgical scars, hernias, and masses should be sought. Pelvic examination should include an evaluation for physical findings consistent with endometriosis, adenomyosis, or leiomyomata. Tender areas should be identified.

B. **Physical findings characteristic of endometriosis** are uterosacral ligament abnormalities (eg, nodularity or thicken-

ing, focal tenderness), lateral displacement of the cervix caused by endometriosis, and cervical stenosis.

C. Adnexal enlargement may be palpable if an endometrioma is present.

D. Nongynecologic physical findings that are observed more frequently among women with endometriosis are red hair color, scoliosis, and dysplastic nevi.

E. Adenomyosis and leiomyomata. Women with adenomyosis can have a slightly enlarged, globular, tender uterus. Uterine myomas are characterized by enlarged, mobile uterus with an irregular contour.

F. Chronic pelvic inflammatory disease is characterized by uterine tenderness or cervical motion tenderness. Adhesions resulting from a surgical procedure can cause pain, especially with movement of viscera. An adnexal mass suggests an ovarian neoplasm. Adnexa tenderness suggests an inflammatory process. In women with uterine prolapse, the cervix/uterus may be observed protruding from the vagina.

Physical Examination in Women with Chronic Pelvic Pain
Pelvic Examination
Tenderness present? Nodularity present? Pelvic mass?
Abdominal examination
Abdominal distension? Tenderness present?
Straight leg raising test
Does leg rasing induce pain in the right or left lower quadrant?

IV. Laboratory and imaging tests for women with CPP include:

A. Complete blood count with differential and erythrocyte sedimentation rate

B. Pregnancy test.

C. Urinalysis.

D. Pelvic ultrasound**.**

E. Additional evaluations include testing for chlamydia and gonorrhea infection and CA-125 (if ascites present).

F. Pelvic ultrasound is highly sensitive for detecting pelvic masses, including both ovarian cysts and uterine leiomyomas.

V. Pharmacologic treatment

A. High probability of endometriosis

1. Nonsteroidal anti-inflammatory medications should be prescribed at doses in the upper end of the dose range (eg, ibuprofen 800 mg orally every six hours). If the first NSAID tried is not effective, another should be given.

2. Oral contraceptive pills (OCPs) prescribed as monthly cycles.

3. OCPs prescribed as "long cycles," with three to four months of continuous dosing of the active pill followed by one week off the pill are effective in women who fail cyclic therapy.

4. OCPs and NSAIDS can be prescribed individually or in combination.

Summary of Recommendations for Treatment of Chronic Pelvic Pain American College of Obstetricians and Gynecologists

Intervention	**Indication**
Combined oral contraceptive pills	Primary dysmenorrhea
GnRH agonists	Endometriosis, irritable bowel syndrome (may be given empirically in women with symptoms consistent with endometriosis)
Nonsteroidal anti-inflammatory drugs	Dysmenorrhea, moderate pain
Progestins (daily, high dose)	Endometriosis, pelvic congestion syndrome
Laparoscopic ablation/resection of endometriosis	Stage I-III endometriosis
Presacral neurectomy	Centrally located dysmenorrhea
Uterine nerve ablation	Centrally located dysmenorrhea
Adjunctive psychotherapy	CPP

B. Second-line agents consist of one of the following:

1. Continuous progestin treatment. Medroxyprogesterone acetate (50 mg orally daily), norethindrone acetate (eg, Aygestin 5 mg orally daily), norgestrel (eg, Ovrette 0.075 mg orally daily), or norethindrone (eg, Micronor, Nor-QD 0.35 mg orally daily) for a two-month trial.

2. Danazol 200 to 400 mg/day in two divided doses initially, may be increased to 800 mg/day in two divided doses to achieve amenorrhea. Therapy may be continued up to nine months.

3. Empiric use of a gonadotropin-releasing hormone (GnRH) agonist analogue (eg, leuprolide [3.75 mg intramuscularly every four weeks] or nafarelin [200 µg

intranasally twice daily]) for 2 months. An add-back regimen should be considered.

4. Surgical intervention, such as laparoscopy or cystoscopy, can be considered if medical interventions are not successful or as an initial procedure to exclude neoplasia or an endometrioma.

C. Low probability of endometriosis. Women in whom a particular disease process is suspected, such as adenomyosis, uterine leiomyomata, irritable bowel syndrome, interstitial cystitis, diverticulitis, or fibromyalgia should undergo further diagnostic testing and disease-specific treatment.

1. Women with suspected pelvic inflammatory disease infection can be treated with doxycycline 100 mg orally twice daily for 14 days.
2. NSAIDs can be prescribed at doses in the upper end of the dose range (eg, ibuprofen 800 mg orally every six hours).
3. Antidepressants, opioids, anticonvulsants, and psychotherapy are used for treatment of chronic pain.

VI. Surgical approach

A. Many causes of CPP, such as endometriosis, chronic pelvic inflammatory disease, and of a pelvic mass, require a surgical procedure to determine a definitive diagnosis. In addition to providing a diagnosis of endometriosis, surgical excision of the endometriosis implants can be performed during the laparoscopy.

B. Hysterectomy is effective in relieving chronic pelvic pain in some women, who have completed child bearing.

C. Presacral neurectomy refers to interruption of the sympathetic innervation of the uterus. The procedure can be performed via laparoscopy or laparotomy. PSN is most effective for relieving midline pelvic pain.

References: See page 311.

Endometriosis

Endometriosis is characterized by the presence of endometrial tissue on the ovaries, fallopian tubes or other abnormal sites, causing pain or infertility. Women are usually 25 to 29 years old at the time of diagnosis. Approximately 24 percent of women who complain of pelvic pain are subsequently found to have endometriosis. The overall prevalence of endometriosis is estimated to be 5 to 10 percent.

I. Clinical evaluation

A. Endometriosis should be considered in any woman of reproductive age who has pelvic pain. The most common symptoms are dysmenorrhea, dyspareunia, and low back pain that worsens during menses. Rectal pain and painful defecation may also occur. Other causes of secondary dysmenorrhea and chronic pelvic pain (eg, upper genital tract infections, adenomyosis, adhesions) may produce similar symptoms.

Differential Diagnosis of Endometriosis

Generalized pelvic pain Pelvic inflammatory disease Endometritis Pelvic adhesions Neoplasms, benign or malignant Ovarian torsion Sexual or physical abuse Nongynecologic causes **Dysmenorrhea** Primary Secondary (adenomyosis, myomas, infection, cervical stenosis)	**Dyspareunia** Musculoskeletal causes (pelvic relaxation, levator spasm) Gastrointestinal tract (constipation, irritable bowel syndrome) Urinary tract (urethral syndrome, interstitial cystitis) Infection Pelvic vascular congestion Diminished lubrication or vaginal expansion because of insufficient arousal **Infertility** Male factor Tubal disease (infection) Anovulation Cervical factors (mucus, sperm antibodies, stenosis) Luteal phase deficiency

B. Infertility may be the presenting complaint for endometriosis. Infertile patients often have no painful symptoms.

C. Physical examination. The physician should palpate for a fixed, retroverted uterus, adnexal and uterine tenderness, pelvic masses or nodularity along the uterosacral ligaments. A rectovaginal examination should identify uterosacral, cul-de-sac or septal nodules. Most women with endometriosis have normal pelvic findings.

II. Treatment

A. Confirmatory laparoscopy is usually required before treatment is instituted. In women with few symptoms, an empiric trial of oral contraceptives or progestins may be warranted to assess pain relief.

B. Medical treatment

1. Initial therapy also should include a nonsteroidal anti-inflammatory drug.
   - **a.** Naproxen (Naprosyn) 500 mg followed by 250 mg PO tid-qid prn [250, 375,500 mg].
   - **b.** Naproxen sodium (Aleve) 200 mg PO tid prn.
   - **c.** Naproxen sodium (Anaprox) 550 mg, followed by 275 mg PO tid-qid prn.
   - **d.** Ibuprofen (Motrin) 800 mg, then 400 mg PO q4-6h prn.
   - **e.** Mefenamic acid (Ponstel) 500 mg PO followed by 250 mg q6h prn.
2. **Progestational agents.** Progestins are similar to combination OCPs in their effects on FSH, LH and endometrial tissue. They may be associated with more bothersome adverse effects than OCPs. Progestins are effective in reducing the symptoms of endometriosis. Oral progestin regimens may include once-daily administration of medroxyprogesterone at the lowest effective dosage (5 to 20 mg). Depot medroxyprogesterone may be given

intramuscularly every two weeks for two months at 100 mg per dose and then once a month for four months at 200 mg per dose.

3. **Oral contraceptive pills (OCPs)** suppress LH and FSH and prevent ovulation. Combination OCPs alleviate symptoms in about three quarters of patients. Oral contraceptives can be taken continuously (with no placebos) or cyclically, with a week of placebo pills between cycles. The OCPs can be discontinued after six months or continued indefinitely.
4. **Danazol (Danocrine)** has been highly effective in relieving the symptoms of endometriosis, but adverse effects may preclude its use. Adverse effects include headache, flushing, sweating and atrophic vaginitis. Androgenic side effects include acne, edema, hirsutism, deepening of the voice and weight gain. The initial dosage should be 800 mg per day, given in two divided oral doses. The overall response rate is 84 to 92 percent.

Medical Treatment of Endometriosis

Drug	Dosage	Adverse effects
Danazol (Danocrine)	800 mg per day in 2 divided doses	Estrogen deficiency, androgenic side effects
Oral contraceptives	1 pill per day (continuous or cyclic)	Headache, nausea, hypertension
Medroxyprogesterone (Provera)	5 to 20 mg orally per day	Same as with other oral progestins
Medroxyprogesterone suspension (Depo-Provera)	100 mg IM every 2 weeks for 2 months; then 200 mg IM every month for 4 months or 150 mg IM every 3 months	Weight gain, depression, irregular menses or amenorrhea
Norethindrone (Aygestin)	5 mg per day orally for 2 weeks; then increase by 2.5 mg per day every 2 weeks up to 15 mg per day	Same as with other oral progestins
Leuprolide (Lupron)	3.75 mg IM every month for 6 months	Decrease in bone density, estrogen deficiency
Goserelin (Zoladex)	3.6 mg SC (in upper abdominal wall) every 28 days	Estrogen deficiency
Nafarelin (Synarel)	400 mg per day: 1 spray in 1 nostril in a.m.; 1 spray in other nostril in p.m.; start treatment on day 2 to 4 of menstrual cycle	Estrogen deficiency, bone density changes, nasal irritation

C. **GnRH agonists.** These agents (eg, leuprolide [Lupron], goserelin [Zoladex]) inhibit the secretion of gonadotropin. GnRH agonists are contraindicated in pregnancy and have hypoestrogenic side effects. They produce a mild degree of bone loss. Because of concerns about osteopenia, "add-back" therapy with low-dose estrogen has been recommended. The dosage of leuprolide is a single monthly 3.75-mg depot injection given intramuscularly. Goserelin, in a dosage of 3.6 mg, is administered subcutaneously every 28 days. A nasal spray (nafarelin [Synarel]) may be used twice daily. The response rate is similar to that with danazol; about 90 percent of patients experience pain relief.

D. **Surgical treatment**
   1. Surgical treatment is the preferred approach to infertile patients with advanced endometriosis. Laparoscopic ablation of endometriosis lesions may result in a 13 percent increase in the probability of pregnancy.
   2. Definitive surgery, which includes hysterectomy and oophorectomy, is reserved for women with intractable pain who no longer desire pregnancy.

References: See page 311.

Primary Amenorrhea

Amenorrhea (absence of menses) results from dysfunction of the hypothalamus, pituitary, ovaries, uterus, or vagina. It is often classified as either primary (absence of menarche by age 16) or secondary (absence of menses for more than three cycle intervals or six months in women who were previously menstruating).

I. Etiology

A. Primary amenorrhea is usually the result of a genetic or anatomic abnormality. Common etiologies of primary amenorrhea:
   1. Chromosomal abnormalities causing gonadal dysgenesis: 45 percent
   2. Physiologic delay of puberty: 20 percent
   3. Müllerian agenesis: 15 percent
   4. Transverse vaginal septum or imperforate hymen: 5 percent
   5. Absent production of gonadotropin-releasing hormone (GnRH) by the hypothalamus: 5 percent
   6. Anorexia nervosa: 2 percent
   7. Hypopituitarism: 2 percent

Causes of Primary and Secondary Amenorrhea

Abnormality	Causes
Pregnancy	
Anatomic abnormalities	
Congenital abnormality in Mullerian development	Isolated defect Testicular feminization syndrome 5-Alpha-reductase deficiency Vanishing testes syndrome Defect in testis determining factor
Congenital defect of urogenital sinus development	Agenesis of lower vagina Imperforate hymen
Acquired ablation or scarring of the endometrium	Asherman's syndrome Tuberculosis
Disorders of hypothalamic-pituitary ovarian axis Hypothalamic dysfunction Pituitary dysfunction Ovarian dysfunction	

Causes of Amenorrhea due to Abnormalities in the Hypothalamic-Pituitary-Ovarian Axis

Abnormality	Causes
Hypothalamic dysfunction	Functional hypothalamic amenorrhea Weight loss, eating disorders Exercise Stress Severe or prolonged illness Congenital gonadotropin-releasing hormone deficiency Inflammatory or infiltrative diseases Brain tumors - eg, craniopharyngioma Pituitary stalk dissection or compression Cranial irradiation Brain injury - trauma, hemorrhage, hydrocephalus Other syndromes - Prader-Willi, Laurence-Moon-Biedl
Pituitary dysfunction	Hyperprolactinemia Other pituitary tumors- acromegaly, corticotroph adenomas (Cushing's disease) Other tumors - meningioma, germinoma, glioma Empty sella syndrome Pituitary infarct or apoplexy
Ovarian dysfunction	Ovarian failure (menopause) Spontaneous Premature (before age 40 years) Surgical
Other	Hyperthyroidism Hypothyroidism Diabetes mellitus Exogenous androgen use

II. Diagnostic evaluation of primary amenorrhea

A. Step I: Evaluate clinical history:

1. Signs of puberty may include a growth spurt, absence of axillary and pubic hair, or apocrine sweat glands, or absence of breast development. Lack of pubertal development suggests ovarian or pituitary failure or a chromosomal abnormality.
2. Family history of delayed or absent puberty suggests a familial disorder.
3. Short stature may indicate Turner syndrome or hypothalamic-pituitary disease.
4. Poor health may be a manifestation of hypothalamic-pituitary disease. Symptoms of other hypothalamic-pituitary disease include headaches, visual field defects, fatigue, or polyuria and polydipsia.
5. Virilization suggests polycystic ovary syndrome, an androgen-secreting ovarian or adrenal tumor, or the presence of Y chromosome material.
6. Recent stress, change in weight, diet, or exercise habits; or illness may suggest hypothalamic amenorrhea.
7. Heroin and methadone can alter hypothalamic gonadotropin secretion.
8. Galactorrhea is suggestive of excess prolactin. Some drugs cause amenorrhea by increasing serum prolactin concentrations, including metoclopramide and antipsychotic drugs.

B. Step II: Physical examination

1. An evaluation of pubertal development should include current height, weight, and arm span (normal arm span for adults is within 5 cm of height) and an evaluation of the growth chart.
2. Breast development should be assessed by Tanner staging.
3. The genital examination should evaluate clitoral size, pubertal hair development, intactness of the hymen, depth of the vagina, and presence of a cervix, uterus, and ovaries. If the vagina can not be penetrated with a finger, rectal examination may allow evaluation of the internal organs. Pelvic ultrasound is also useful to determine the presence or absence of müllerian structures.
4. The skin should be examined for hirsutism, acne, striae, increased pigmentation, and vitiligo.
5. Classic physical features of Turner syndrome include low hair line, web neck, shield chest, and widely spaced nipples.

C. Step III: Basic laboratory testing

1. **If a normal vagina or uterus are not obviously present** on physical examination, pelvic ultrasonography should be performed to confirm the presence or absence of ovaries, uterus, and cervix. Ultrasonography can be useful to exclude vaginal or cervical outlet obstruction in patients with cyclic pain.
   a. **Uterus absent**
      (1) If the uterus is absent, evaluation should include a karyotype and serum testosterone. These tests should distinguish abnormal müllerian development (46, XX karyotype with normal female serum testosterone concentrations) from androgen insensitivity syndrome (46, XY karyotype and normal male serum testosterone concentrations).
      (2) Patients with 5-alpha reductase deficiency also have a 46, XY karyotype and normal male serum testosterone concentrations but, in contrast to the androgen insensitivity syndrome which is associated with a female phenotype, these patients undergo striking virilization at the time of puberty (secondary sexual hair, muscle mass, and deepening of the voice).
2. **Uterus present**. For patients with a normal vagina and uterus and no evidence of an imperforate hymen, vaginal septum, or congenital absence of the vagina. Measurement of serum beta human chorionic gonadotropin to exclude pregnancy and of serum FSH, prolactin, and TSH.
   a. A high serum FSH concentration is indicative of primary ovarian failure. A karyotype is then required and may demonstrate complete or partial deletion of the X chromosome (Turner syndrome) or the presence of Y chromatin. The presence of a Y chromosome is associated with a higher risk of gonadal tumors and makes gonadectomy mandatory.
   b. A low or normal serum FSH concentration suggests functional hypothalamic amenorrhea, congenital GnRH deficiency, or other disorders of the hypothalamic-pituitary axis. Cranial MR imaging is indicated in most cases of hypogonadotropic hypogonadism to evaluate hypothalamic or pituitary disease. Cranial MRI is recommended for all women with primary hypogonadotropic hypogonadism, visual field defects, or headaches.
   c. Serum prolactin and thyrotropin (TSH) should be measured, especially if galactorrhea is present.
   d. If there are signs or symptoms of hirsutism, serum testosterone and dehydroepiandrosterone sulfate (DHEA-S) should be measured to assess for an androgen-secreting tumor.
   e. If hypertension is present, blood tests should be drawn for evaluate for CYP17 deficiency. The characteristic findings are elevations in serum progesterone (>3 ng/mL) and deoxycorticosterone and low values for serum 17-alpha-hydroxyprogesterone (<0.2 ng/mL).

III. Treatment

A. Treatment of primary amenorrhea is directed at correcting the underlying pathology; helping the woman to achieve fertility, if desired; and prevention of complications of the disease.

B. Congenital anatomic lesions or Y chromosome material usually requires surgery. Surgical correction of a vaginal outlet obstruction is necessary before menarche, or as soon as the diagnosis is made after menarche. Creation of a neovagina for patients with müllerian failure is usually delayed until the women is emotionally mature. If Y chromosome material is found, gonadectomy should be performed to prevent gonadal neoplasia. However, gonadectomy should be delayed until after puberty in patients with androgen insensitivity syndrome. These patients have a normal pubertal growth spurt and feminize at the time of expected puberty.

C. Ovarian failure requires counseling about the benefits and risks of hormone replacement therapy.

D. Polycystic ovary syndrome is managed with measures to reduce hirsutism, resume menses, and fertility and prevent of endometrial hyperplasia, obesity, and metabolic defects.

E. Functional hypothalamic amenorrhea can usually be reversed by weight gain, reduction in the intensity of exercise, or resolution of illness or emotional stress. For women who want to continue to exercise, estrogen-progestin replacement therapy should be given to those not seeking fertility to prevent osteoporosis. Women who want to become pregnant can be treated with gonadotropins or pulsatile GnRH.

F. Hypothalamic or pituitary dysfunction that is not reversible (eg, congenital GnRH deficiency) is treated with either exogenous gonadotropins or pulsatile GnRH if the woman wants to become pregnant.

References: See page 311.

Secondary Amenorrhea

Amenorrhea (absence of menses) can be a transient, intermittent, or permanent condition resulting from dysfunction of the hypothalamus, pituitary, ovaries, uterus, or vagina. Amenorrhea is classified as either primary (absence of menarche by age 16 years) or secondary (absence of menses for more than three cycles or six months in women who previously had menses). Pregnancy is the most common cause of secondary amenorrhea.

I. Diagnosis of secondary amenorhea

A. Step 1: Rule out pregnancy. A pregnancy test is the first step in evaluating secondary amenorrhea. Measurement of serum beta subunit of hCG is the most sensitive test.

B. Step 2: Assess the history

1. Recent stress; change in weight, diet or exercise habits; or illnesses that might result in hypothalamic amenorrhea should be sought.
2. Drugs associated with amenorrhea, systemic illnesses that can cause hypothalamic amenorrhea, recent initiation or

discontinuation of an oral contraceptive, androgenic drugs (danazol) or high-dose progestin, and antipsychotic drugs should be evaluated.

3. Headaches, visual field defects, fatigue, or polyuria and polydipsia may suggest hypothalamic-pituitary disease.
4. Symptoms of estrogen deficiency include hot flashes, vaginal dryness, poor sleep, or decreased libido.
5. Galactorrhea is suggestive of hyperprolactinemia. Hirsutism, acne, and a history of irregular menses are suggestive of hyperandrogenism.
6. A history of obstetrical catastrophe, severe bleeding, dilatation and curettage, or endometritis or other infection that might have caused scarring of the endometrial lining suggests Asherman's syndrome.

Causes of Primary and Secondary Amenorrhea

Abnormality	Causes
Pregnancy	
Anatomic abnormalities	
Congenital abnormality in Mullerian development	Isolated defect Testicular feminization syndrome 5-Alpha-reductase deficiency Vanishing testes syndrome Defect in testis determining factor
Congenital defect of urogenital sinus development	Agenesis of lower vagina Imperforate hymen
Acquired ablation or scarring of the endometrium	Asherman's syndrome Tuberculosis
Disorders of hypothalamic-pituitary ovarian axis Hypothalamic dysfunction Pituitary dysfunction Ovarian dysfunction	

Causes of Amenorrhea due to Abnormalities in the Hypothalamic-Pituitary-Ovarian Axis

Abnormality	Causes
Hypothalamic dysfunction	Functional hypothalamic amenorrhea Weight loss, eating disorders Exercise Stress Severe or prolonged illness Congenital gonadotropin-releasing hormone deficiency Inflammatory or infiltrative diseases Brain tumors - eg, craniopharyngioma Pituitary stalk dissection or compression Cranial irradiation Brain injury - trauma, hemorrhage, hydrocephalus Other syndromes - Prader-Willi, Laurence-Moon-Biedl
Pituitary dysfunction	Hyperprolactinemia Other pituitary tumors- acromegaly, corticotroph adenomas (Cushing's disease) Other tumors - meningioma, germinoma, glioma Empty sella syndrome Pituitary infarct or apoplexy
Ovarian dysfunction	Ovarian failure (menopause) Spontaneous Premature (before age 40 years) Surgical
Other	Hyperthyroidism Hypothyroidism Diabetes mellitus Exogenous androgen use

Drugs Associated with Amenorrhea

Drugs that Increase Prolactin	Antipsychotics Tricyclic antidepressants Calcium channel blockers
Drugs with Estrogenic Activity	Digoxin, marijuana, oral contraceptives
Drugs with Ovarian Toxicity	Chemotherapeutic agents

C. **Step 3: Physical examination.** Measurements of height and weight, signs of other illnesses, and evidence of cachexia should be assessed. The skin, breasts, and genital tissues should be evaluated for estrogen deficiency. The breasts should be palpated, including an attempt to express galactorrhea. The skin should be examined for hirsutism, acne, striae, acanthosis nigricans, vitiligo, thickness or thinness, and easy bruisability.

D. **Step 4: Basic laboratory testing**. In addition to measurement of serum hCG to rule out pregnancy, minimal laboratory testing should include measurements of serum prolactin, thyrotropin, and FSH to rule out hyperprolactinemia, thyroid disease, and ovarian failure (high serum FSH). If there is hirsutism, acne or irregular menses, serum

dehydroepiandrosterone sulfate (DHEA-S) and testosterone should be measured.

E. Step 5: Follow-up laboratory evaluation

1. **High serum prolactin concentration**. Prolactin secretion can be transiently increased by stress or eating. Therefore, serum prolactin should be measured at least twice before cranial imaging is obtained, particularly in those women with small elevations (<50 ng/mL). These women should be screened for thyroid disease with a TSH and free T4 because hypothyroidism can cause hyperprolactinemia.
2. Women with verified high serum prolactin values should have a cranial MRI unless a very clear explanation is found for the elevation (eg, antipsychotics). Imaging should rule out a hypothalamic or pituitary tumor.
3. **High serum FSH concentration.** A high serum FSH concentration indicates the presence of ovarian failure. This test should be repeated monthly on three occasions to confirm. A karyotype should be considered in most women with secondary amenorrhea age 30 years or younger.
4. **High serum androgen concentrations**. A high serum androgen value may suggest the diagnosis of polycystic ovary syndrome or may suggest an androgen-secreting tumor of the ovary or adrenal gland. Further testing for a tumor might include a 24-hour urine collection for cortisol and 17-ketosteroids, determination of serum 17-hydroxyprogesterone after intravenous injection of corticotropin (ACTH), and a dexamethasone suppression test. Elevation of 17-ketosteroids, DHEA-S, or 17-hydroxyprogesterone is more consistent with an adrenal, rather than ovarian, source of excess androgen.
5. **Normal or low serum gonadotropin concentrations and all other tests normal**
   - **a.** This result is one of the most common outcomes of laboratory testing in women with amenorrhea. Women with hypothalamic amenorrhea (caused by marked exercise or weight loss to more than 10 percent below the expected weight) have normal to low serum FSH values. Cranial MRI is indicated in all women without an a clear explanation for hypogonadotropic hypogonadism and in most women who have visual field defects or headaches. No further testing is required if the onset of amenorrhea is recent or is easily explained (eg, weight loss, excessive exercise) and there are no symptoms suggestive of other disease.
   - **b.** High serum transferrin saturation may indicate hemochromatosis, high serum angiotensin-converting enzyme values suggest sarcoidosis, and high fasting blood glucose or hemoglobin A1c values indicate diabetes mellitus.
6. **Normal serum prolactin and FSH concentrations with history of uterine instrumentation preceding amenorrhea**
   - **a.** Evaluation for Asherman's syndrome should be completed. A progestin challenge should be performed (medroxyprogesterone acetate 10 mg for 10 days). If withdrawal bleeding occurs, an outflow tract disorder has been ruled out. If bleeding does not occur, estrogen and progestin should be administered.
   - **b.** Oral conjugated estrogens (0.625 to 2.5 mg daily for 35 days) with medroxyprogesterone added (10 mg daily for days 26 to 35); failure to bleed upon cessation of this therapy strongly suggests endometrial scarring. In this situation, a hysterosalpingogram or hysteroscopy can confirm the diagnosis of Asherman syndrome.

II. Treatment

- **A. Athletic women** should be counseled on the need for increased caloric intake or reduced exercise. Resumption of menses usually occurs.
- **B. Nonathletic women who are underweight** should receive nutritional counseling and treatment of eating disorders.
- **C. Hyperprolactinemia** is treated with a dopamine agonist. Cabergoline (Dostinex) or bromocriptine (Parlodel) are used for most adenomas. Ovulation, regular menstrual cycles, and pregnancy may usually result.
- **D. Ovarian failure** should be treated with hormone replacement therapy.
- **E. Hyperandrogenism** is treated with measures to reduce hirsutism, resume menses, and fertility and preventing endometrial hyperplasia, obesity, and metabolic defects.
- **F. Asherman's syndrome** is treated with hysteroscopic lysis of adhesions followed by long-term estrogen administration to stimulate regrowth of endometrial tissue.

References: See page 311.

Menopause

Menopause is diagnosed by the presence of amenorrhea for six to twelve months, together with the occurrence of symptoms such as hot flashes. If the diagnosis is uncertain, a high serum concentration of follicle-stimulating hormone (FSH) can confirm the diagnosis.

I. Perimenopausal transition

- **A.** Perimenopause is defined as the two to eight years preceding menopause and the one year after the last menstrual period. It is characterized by a normal ovulatory cycle interspersed with anovulatory cycles. Menses become irregular, and heavy breakthrough bleeding can occur. Some women complain of hot flashes and vaginal dryness.
- **B.** Chronic anovulation and progesterone deficiency in this transition period may lead to long periods of unopposed estrogen exposure and endometrial hyperplasia. Oligomenorrhea (irregular cycles) for six or more months or an episode of heavy dysfunctional bleeding is an indication for endometrial surveillance. Endometrial biopsy is the standard to rule out endometrial hyperplasia, but screening with vaginal

ultrasonography is acceptable. Biopsy can be deferred if endometrial thickness is 4 mm or less.

C. Irregular bleeding and menopausal symptoms during this perimenopausal transition may be treated by estrogen-progestin replacement therapy. However, some women still require contraception. In this case, menopausal symptoms may be effectively treated with a low-dose oral contraceptive if the woman does not smoke and has no other contraindications to oral contraceptive therapy.

D. The oral contraceptive can be continued until the onset of menopause, determined by a high serum FSH concentration after six days off the pill. Estrogen replacement therapy can be started at this point.

E. In women with no symptoms of estrogen deficiency but with dysfunctional uterine bleeding who smoke or have other reasons to avoid an oral contraceptive, monthly withdrawal bleeding can be induced with medroxyprogesterone acetate (5 to 10 mg daily for 10 to 14 days per month).

II. Menopause occurs at a mean age of 51 years in normal women. Menopause occurring after age 55 is defined as late menopause. The age of menopause is reduced by about two years in women who smoke.

III. Short-term effects of estrogen deficiency

A. Hot flashes. The most common symptom of menopause is the hot flash, which occurs in 75 percent of women. Flashes are self-limited, with 50 to 75 percent of women having cessation of hot flashes within five years.

B. Hot flashes typically begin as the sudden sensation of heat centered on the face and upper chest, which rapidly becomes generalized. The sensation of heat lasts from two to four minutes, is often associated with profuse perspiration and occasionally palpitations, and is often followed by chills and shivering. Hot flashes usually occur several times per day.

C. Treatment of menopausal symptoms with estrogen

1. Estrogen therapy remains the gold standard for relief of menopausal symptoms, and is a reasonable option for most postmenopausal women, with the exception of those with a history of breast cancer, CHD, a previous venous thromboembolic event or stroke, or those at high risk for these complications. Estrogen therapy should be used for shortest duration possible (eg, 6 months to 5 years).

2. Dose. A low-dose estrogen is recommended when possible (eg, 0.3 mg conjugated estrogens or 0.5 mg estradiol).

3. Adding a progestin. Endometrial hyperplasia and cancer can occur with unopposed estrogen therapy; therefore, a progestin should be added in women who have not had a hysterectomy. Medroxyprogesterone (Provera), 1.5 mg, is usually given every day of the month. Prempro 0.3/1.5 (0.3 mg of conjugated estrogens and 1.5 mg of medroxyprogesterone) or Prempro 0.45/1.5 (0.45 mg of conjugated estrogens and 1.5 mg of medroxyprogesterone), taken daily.

4. Low-dose oral contraceptives. A low-estrogen oral contraceptive (20 µg of ethinyl estradiol) remains an appropriate treatment for perimenopausal women who seek relief of menopausal symptoms. Most of these women are between the ages of 40 and 50 years and are still candidates for oral contraception. For them, an oral contraceptive pill containing 20 µg of ethinyl estradiol provides symptomatic relief while providing better bleeding control than conventional estrogen-progestin therapy because the oral contraceptive contains higher doses of both estrogen and progestin.

5. Treatment of vasomotor instability in women not taking estrogen: Venlafaxine (Effexor), at doses of 75 mg daily, reduces hot flashes by 61 percent. Mouth dryness, anorexia, nausea, and constipation are common.

D. Urogenital changes. Menopause has been associated with decreased sexual function and an increased incidence of urinary incontinence and urinary tract infection.

1. Sexual function

a. Estrogen deficiency leads to a decrease in blood flow to the vagina and vulva, causing decreased vaginal lubrication and sexual function.

b. Dyspareunia in postmenopausal women should be treated with estrogen. Systemic estrogen therapy is usually adequate in women who desire estrogen therapy for reasons in addition to genitourinary symptoms. Vaginal estrogens are a good choice for women who want to minimize systemic effects.

2. Urinary incontinence

a. Low estrogen production after the menopause results in atrophy of the urethral epithelium and irritation; these changes predispose to stress and urge urinary incontinence.

b. Estrogen therapy should be attempted in women with stress or urge urinary incontinence. Urinary incontinence may be treated with systemic or vaginal estrogen.

3. Urinary tract infection. Recurrent urinary tract infections are a problem for many postmenopausal women.

4. Treatment of urogenital atrophy in women not taking systemic estrogen

a. Moisturizers and lubricants. Regular use of a vaginal moisturizing agent (Replens) and lubricants during intercourse are helpful. Water soluble lubricants such as Astroglide are more effective than lubricants that become more viscous after application such as K-Y jelly. A more effective treatment is vaginal estrogen therapy.

b. Low-dose vaginal estrogen

(1) Vaginal ring estradiol (Estring), a silastic ring impregnated with estradiol, is the preferred means of delivering estrogen to the vagina. The silastic ring delivers 6 to 9 µg of estradiol to the vagina daily for a period of three months. The rings are changed once every three months by the patient. Concomitant progestin therapy is not necessary.

(2) Conjugated estrogens (Premarin), 0.5 gm of cream, or one-eighth of an applicatorful daily into the vagina for three weeks, followed by twice weekly

thereafter. Concomitant progestin therapy is not necessary.

(3) **Estrace cream (estradiol)** can also by given by vaginal applicator at a dose of one-eighth of an applicator or 0.5 g (which contains 50 µg of estradiol) daily into the vagina for three weeks, followed by twice weekly thereafter. Concomitant progestin therapy is not necessary.

(4) **Estradiol (Vagifem).** A tablet containing 25 micrograms of estradiol is available and is inserted into the vagina twice per week. Concomitant progestin therapy is not necessary.

IV. Prevention and treatment of osteoporosis

A. Screening for osteoporosis. Measurement of BMD is recommended for all women 65 years and older regardless of risk factors. BMD should also be measured in all women under the age of 65 years who have one or more risk factors for osteoporosis (in addition to menopause).

B. Bisphosphonates

1. **Alendronate (Fosamax)** has effects comparable to those of estrogen for both the treatment of osteoporosis (10 mg/day or 70 mg once a week) and for its prevention (5 mg/day). Alendronate (in a dose of 5 mg/day or 35 mg/week) can also prevent osteoporosis in postmenopausal women.
2. **Risedronate (Actonel)**, a bisphosphonate, has been approved for prevention and treatment of osteoporosis at doses of 5 mg/day or 35 mg once per week. Its efficacy and side effect profile are similar to those of alendronate.

C. Raloxifene (Evista) is a selective estrogen receptor modulator. It is available for prevention and treatment of osteoporosis. At a dose of 60 mg/day, bone density increases by 2.4 percent in the lumbar spine and hip over a two year period. This effect is slightly less than with bisphosphonates.

D. Calcium. Maintaining a positive calcium balance in postmenopausal women requires a daily intake of 1500 mg of elemental calcium; to meet this most women require a supplement of 1000 mg daily.

E. Vitamin D. All postmenopausal women should take a multivitamin containing at least 400 IU vitamin D daily.

F. Exercise for at least 20 minutes daily reduces the rate of bone loss. Weight bearing exercises are preferable.

References: See page 311.

Premenstrual Syndrome and Premenstrual Dysphoric Disorder

Premenstrual syndrome (PMS) is characterized by physical and behavioral symptoms that occur repetitively in the second half of the menstrual cycle and interfere with some aspects of the woman's life. Premenstrual dysphoric disorder (PMDD) is the most severe form of PMS, with the prominence anger, irritability, and internal tension. PMS affects up to 75 percent of women with regular menstrual cycles, while PMDD affects only 3 to 8 percent of women.

I. Symptoms

A. The most common physical manifestation of PMS is abdominal bloating, which occurs in 90 percent of women with this disorder; breast tenderness and headaches are also common, occurring in more than 50 percent of cases.

B. The most common behavioral symptom of PMS is an extreme sense of fatigue which is seen in more than 90 percent. Other frequent behavioral complaints include irritability, tension, depressed mood, labile mood (80 percent), increased appetite (70 percent), and forgetfulness and difficulty concentrating (50 percent).

Symptom Clusters Commonly Noted in Patients with PMS

Affective Symptoms	**Cognitive or performance**
Depression or sadness	Mood instability or mood swings
Irritability	Difficulty in concentrating
Tension	Decreased efficiency
Anxiety	Confusion
Tearfulness or crying easily	Forgetfulness
Restlessness or jitteriness	Accident-prone
Anger	Social avoidance
Loneliness	Temper outbursts
Appetite change	Energetic
Food cravings	**Fluid retention**
Changes in sexual interest	Breast tenderness or swelling
Pain	Weight gain
Headache or migraine	Abdominal bloating or swelling
Back pain	Swelling of extremities
Breast pain	**General somatic**
Abdominal cramps	Fatigue or tiredness
General or muscular pain	Dizziness or vertigo
	Nausea
	Insomnia

C. Other common findings include acne, oversensitivity to environmental stimuli, anger, easy crying, and gastrointestinal upset. Hot flashes, heart palpitations, and dizziness occur in 15 to 20 percent of patients. Symptoms should occur in the luteal phase only.

UCSD Criteria for Premenstrual Syndrome

At least one of the following affective and somatic symptoms during the five days before menses in each of the three previous cycles:
Affective symptoms: depression, angry outbursts, irritability, anxiety, confusion, social withdrawal
Somatic symptoms: breast tenderness, abdominal bloating, headache, swelling of extremities Symptoms relieved from days 4 through 13 of the menstrual cycle

DSM-IV Criteria for Premenstrual Dysphoric Disorder

- Five or more symptoms
- At least one of the following four symptoms:
  - Markedly depressed mood, feelings of hopelessness, or self-deprecating thoughts
  - Marked anxiety, tension, feeling of being "keyed up" or "on edge"
  - Marked affective lability
  - Persistent and marked anger or irritability or increase in interpersonal conflicts
- Additional symptoms that may be used to fulfill the criteria:
  - Decreased interest in usual activities
  - Subjective sense of difficulty in concentrating
  - Lethargy, easy fatigability, or marked lack of energy
  - Marked change in appetite, overeating, or specific food cravings
  - Hypersomnia or insomnia
  - Subjective sense of being overwhelmed or out of control
- Other physical symptoms such as breast tenderness or swelling, headaches, joint or muscle pain, a sensation of bloating, or weight gain
- Symptoms occurring during last week of luteal phase
- Symptoms are absent postmenstrually
- Disturbances that interfere with work or school or with usual social activities and relationships
- Disturbances that are not an exacerbation of symptoms of another disorder

Differential Diagnosis of Premenstrual Syndrome

Affective disorder (eg, depression, anxiety, dysthymia, panic)	Endometriosis
Anemia	Hypothyroidism
Anorexia or bulimia	Oral contraceptive pill use
Chronic medical conditions (eg, diabetes mellitus)	Perimenopause
Dysmenorrhea	Personality disorder
	Substance abuse disorders

D. Differential diagnosis

1. PMDD should be differentiated from premenstrual exacerbation of an underlying major psychiatric disorder, as well as medical conditions such as hyper- or hypothyroidism.
2. About 13 percent of women with PMS are found to have a psychiatric disorder alone with no evidence of PMS, while 38 percent had premenstrual exacerbation of underlying depressive and anxiety disorders.
3. 39 percent of women with PMDD meet criteria for mood or anxiety disorders.
4. The assessment of patients with possible PMS or PMDD should begin with the history, physical examination, chemistry profile, complete blood count, and serum TSH. The history should focus in particular on the regularity of menstrual cycles. Appropriate gynecologic endocrine evaluation should be performed if the cycles are irregular (lengths less than 25 or greater than 36 days).
5. The patient should be asked to record symptoms prospectively for two months. If the patient fails to demonstrate a symptom free interval in the follicular phase, she should be evaluated for a mood or anxiety disorder.

II. Nonpharmacologic therapy

A. Relaxation therapy and cognitive behavioral therapy have shown some benefit. Behavioral measures include keeping a symptom diary, getting adequate rest and exercise, and making dietary changes.

B. Sleep disturbances, ranging from insomnia to excessive sleep, are common. A structured sleep schedule with consistent sleep and wake times is recommended. Sodium restriction may minimize bloating, fluid retention, and breast swelling and tenderness. Caffeine restriction and aerobic exercise often reduce symptoms.

III. Dietary Supplementation

A. Vitamin E supplementation is a treatment for mastalgia. The administration of 400 IU per day of vitamin E during the luteal phase improves affective and somatic symptoms.

B. Calcium carbonate in a dosage of 1200 mg per day for three menstrual cycles results in symptom improvement in 48 percent of women with PMS.

IV. Pharmacologic Therapy

A. Fluoxetine (Sarafem) and sertraline (Zoloft) have been approved for the treatment of PMDD. SSRIs are recommended as initial drug therapy in women with PMS and PMDD. Common side effects of SSRIs include insomnia, drowsiness, fatigue, nausea, nervousness, headache, mild tremor, and sexual dysfunction.

B. Fluoxetine (Sarafem) 20 mg or sertraline (Zoloft) 50 mg, taken in the morning, is best tolerated and sufficient to improve symptoms. Fluoxetine or sertraline can be given during the 14 days before the menstrual period.

C. Benefit has also been demonstrated for citalopram (Celexa) during the 14 days before the menstrual period.

D. Diuretics. Spironolactone (Aldactone) is the only diuretic that has been shown to effectively relieve breast tenderness and fluid retention. Spironolactone is administered only during the luteal phase.

E. Prostaglandin Inhibitors. Nonsteroidal anti-inflammatory drugs (NSAIDs) are traditional therapy for primary dysmenorrhea and menorrhagia. These agents include mefenamic acid (Ponstel) and naproxen sodium (Anaprox, Aleve).

Prescription Medications Commonly Used in the Treatment of Premenstrual Syndrome (PMS)			
Drug class and representative agents	**Dosage**	**Recommendations**	**Side effects**
SSRIs			
Fluoxetine (Sarafem)	10 to 20 mg per day	First-choice agents for the treatment of PMDD. Effective in alleviating behavioral and physical symptoms of PMS and PMDD Administer during luteal phase (14 days before menses).	Insomnia, drowsiness, fatigue, nausea, nervousness, headache, mild tremor, sexual dysfunction
Sertraline (Zoloft)	50 to 150 mg per day		
Paroxetine (Paxil)	10 to 30 mg per day		
Fluvoxamine (Luvox)	25 to 50 mg per day		
Citalopram (Celexa)	20 to 40 mg per day		
Diuretics			
Spironolactone (Aldactone)	25 to 100 mg per day luteal phase	Effective in alleviating breast tenderness and bloating.	Antiestrogenic effects, hyperkalemia
NSAIDs			
Naproxen sodium (Anaprox)	275 to 550 mg twice daily	Effective in alleviating various physical symptoms of PMS. Any NSAID should be effective.	Nausea, gastric ulceration, renal dysfunction. Use with caution in women with preexisting gastrointestinal or renal disease.
Mefenamic acid (Ponstel)	250 mg tid with meals		
Androgens			
Danazol (Danocrine)	100 to 400 mg twice daily	Somewhat effective in alleviating mastalgia when taken during luteal phase.	Weight gain, decreased breast size, deepening of voice. Monitor lipid profile and liver function.
GnRH agonists			
Leuprolide (Lupron)	3.75 mg IM every month or 11.25 mg IM every three months	Somewhat effective in alleviating physical and behavioral symptoms of PMS Side effect profile and cost limit use.	Hot flashes, cardiovascular effects, and osteoporosis
Goserelin (Zoladex)	3.6 mg SC every month or 10.8 mg SC every three months		
Nafarelin (Synarel)	200 to 400 mcg intranasally twice daily		

Abnormal Vaginal Bleeding

Menorrhagia (excessive bleeding) is most commonly caused by anovulatory menstrual cycles. Occasionally it is caused by thyroid dysfunction, infections or cancer.

I. Pathophysiology of normal menstruation

A. In response to gonadotropin-releasing hormone from the hypothalamus, the pituitary gland synthesizes follicle-stimulating hormone (FSH) and luteinizing hormone (LH), which induce the ovaries to produce estrogen and progesterone.

B. During the follicular phase, estrogen stimulation causes an increase in endometrial thickness. After ovulation, progesterone causes endometrial maturation. Menstruation is caused by estrogen and progesterone withdrawal.

C. Abnormal bleeding is defined as bleeding that occurs at intervals of less than 21 days, more than 36 days, lasting longer than 7 days, or blood loss greater than 80 mL.

II. Clinical evaluation of abnormal vaginal bleeding

A. A menstrual and reproductive history should include last menstrual period, regularity, duration, frequency; the number of pads used per day, and intermenstrual bleeding.

B. Stress, exercise, weight changes and systemic diseases, particularly thyroid, renal or hepatic diseases or coagulopathies, should be sought. The method of birth control should be determined.

C. Pregnancy complications, such as spontaneous abortion, ectopic pregnancy, placenta previa and abruptio placentae, can

cause heavy bleeding. Pregnancy should always be considered as a possible cause of abnormal vaginal bleeding.

III. Puberty and adolescence--menarche to age 16

A. Irregularity is normal during the first few months of menstruation; however, soaking more than 25 pads or 30 tampons during a menstrual period is abnormal.

B. Absence of premenstrual symptoms (breast tenderness, bloating, cramping) is associated with anovulatory cycles.

C. Fever, particularly in association with pelvic or abdominal pain may, indicate pelvic inflammatory disease. A history of easy bruising suggests a coagulation defect. Headaches and visual changes suggest a pituitary tumor.

D. Physical findings

1. Pallor not associated with tachycardia or signs of hypovolemia suggests chronic excessive blood loss secondary to anovulatory bleeding, adenomyosis, uterine myomas, or blood dyscrasia.

2. Fever, leukocytosis, and pelvic tenderness suggests PID.

3. Signs of impending shock indicate that the blood loss is related to pregnancy (including ectopic), trauma, sepsis, or neoplasia.

4. Pelvic masses may represent pregnancy, uterine or ovarian neoplasia, or a pelvic abscess or hematoma.

5. Fine, thinning hair, and hypoactive reflexes suggest hypothyroidism.

6. Ecchymoses or multiple bruises may indicate trauma, coagulation defects, medication use, or dietary extremes.

E. Laboratory tests

1. CBC and platelet count and a urine or serum pregnancy test should be obtained.

2. Screening for sexually transmitted diseases, thyroid function, and coagulation disorders (partial thromboplastin time, INR, bleeding time) should be completed.

3. Endometrial sampling is rarely necessary for those under age 20.

F. Treatment of infrequent bleeding

1. Therapy should be directed at the underlying cause when possible. If the CBC and other initial laboratory tests are normal and the history and physical examination are normal, reassurance is usually all that is necessary.

2. Ferrous gluconate, 325 mg bid-tid, should be prescribed.

G. Treatment of frequent or heavy bleeding

1. Treatment with nonsteroidal anti-inflammatory drugs (NSAIDs) improves platelet aggregation and increases uterine vasoconstriction. NSAIDs are the first choice in the treatment of menorrhagia because they are well tolerated and do not have the hormonal effects of oral contraceptives.

a. Mefenamic acid (Ponstel) 500 mg tid during the menstrual period.

b. Naproxen (Anaprox, Naprosyn) 500 mg loading dose, then 250 mg tid during the menstrual period.

c. Ibuprofen (Motrin, Nuprin) 400 mg tid during the menstrual period.

d. Gastrointestinal distress is common. NSAIDs are contraindicated in renal failure and peptic ulcer disease.

2. Iron should also be added as ferrous gluconate 325 mg tid.

H. Patients with hypovolemia or a hemoglobin level below 7 g/dL should be hospitalized for hormonal therapy and iron replacement.

1. Hormonal therapy consists of estrogen (Premarin) 25 mg IV q6h until bleeding stops. Thereafter, oral contraceptive pills should be administered q6h x 7 days, then taper slowly to one pill qd.

2. If bleeding continues, IV vasopressin (DDAVP) should be administered. Hysteroscopy may be necessary, and dilation and curettage is a last resort. Transfusion may be indicated in severe hemorrhage.

3. Iron should also be added as ferrous gluconate 325 mg tid.

IV. Primary childbearing years – ages 16 to early 40s

A. Contraceptive complications and pregnancy are the most common causes of abnormal bleeding in this age group. Anovulation accounts for 20% of cases.

B. Adenomyosis, endometriosis, and fibroids increase in frequency as a woman ages, as do endometrial hyperplasia and endometrial polyps. Pelvic inflammatory disease and endocrine dysfunction may also occur.

C. Laboratory tests

1. CBC and platelet count, Pap smear, and pregnancy test.

2. Screening for sexually transmitted diseases, thyroid-stimulating hormone, and coagulation disorders (partial thromboplastin time, INR, bleeding time).

3. If a non-pregnant woman has a pelvic mass, ultrasonography or hysterosonography (with uterine saline infusion) is required.

D. Endometrial sampling

1. Long-term unopposed estrogen stimulation in anovulatory patients can result in endometrial hyperplasia, which can progress to adenocarcinoma; therefore, in perimenopausal patients who have been anovulatory for an extended interval, the endometrium should be biopsied.

2. Biopsy is also recommended before initiation of hormonal therapy for women over age 30 and for those over age 20 who have had prolonged bleeding.

3. Hysteroscopy and endometrial biopsy with a Pipelle aspirator should be done on the first day of menstruation (to avoid an unexpected pregnancy) or anytime if bleeding is continuous.

E. Treatment

1. Medical protocols for anovulatory bleeding (dysfunctional uterine bleeding) are similar to those described above for adolescents.

2. Hormonal therapy

a. In women who do not desire immediate fertility, hormonal therapy may be used to treat menorrhagia.

b. A 21-day package of oral contraceptives is used. The patient should take one pill three times a day for 7 days. During the 7 days of therapy, bleeding should subside, and, following treatment, heavy flow will occur. After 7 days off the hormones, another 21-day package is

initiated, taking one pill each day for 21 days, then no pills for 7 days.

c. Alternatively, medroxyprogesterone (Provera), 10-20 mg per day for days 16 through 25 of each month, will result in a reduction of menstrual blood loss. Pregnancy will not be prevented.

d. Patients with severe bleeding may have hypotension and tachycardia. These patients require hospitalization, and estrogen (Premarin) should be administered IV as 25 mg q4-6h until bleeding slows (up to a maximum of four doses). Oral contraceptives should be initiated concurrently as described above.

3. Iron should also be added as ferrous gluconate 325 mg tid.

4. Surgical treatment can be considered if childbearing is completed and medical management fails to provide relief.

V. Premenopausal, perimenopausal, and postmenopausal years--age 40 and over

A. Anovulatory bleeding accounts for about 90% of abnormal vaginal bleeding in this age group. However, bleeding should be considered to be from cancer until proven otherwise.

B. History, physical examination and laboratory testing are indicated as described above. Menopausal symptoms, personal or family history of malignancy and use of estrogen should be sought. A pelvic mass requires an evaluation with ultrasonography.

C. Endometrial carcinoma

1. In a perimenopausal or postmenopausal woman, amenorrhea preceding abnormal bleeding suggests endometrial cancer. Endometrial evaluation is necessary before treatment of abnormal vaginal bleeding.

2. Before endometrial sampling, determination of endometrial thickness by transvaginal ultrasonography is useful because biopsy is often not required when the endometrium is less than 5 mm thick.

D. Treatment

1. Cystic hyperplasia or endometrial hyperplasia without cytologic atypia is treated with depo-medroxyprogesterone, 200 mg IM, then 100 to 200 mg IM every 3 to 4 weeks for 6 to 12 months. Endometrial hyperplasia requires repeat endometrial biopsy every 3 to 6 months.

2. Atypical hyperplasia requires fractional dilation and curettage, followed by progestin therapy or hysterectomy.

3. If the patient's endometrium is normal (or atrophic) and contraception is a concern, a low-dose oral contraceptive may be used. If contraception is not needed, estrogen and progesterone therapy should be prescribed.

4. Surgical management

a. Vaginal or abdominal hysterectomy is the most absolute curative treatment.

b. Dilatation and curettage can be used as a temporizing measure to stop bleeding.

c. Endometrial ablation and resection by laser, electrodiathermy "rollerball," or excisional resection are alternatives to hysterectomy.

References: See page 311.

Endometrial Hyperplasia

Endometrial hyperplasia is defined as proliferation of endometrial glands, resulting in a greater gland-to-stroma ratio than normal endometrium. The disorder is characterized by variation in the size and shape of the proliferating glands and the potential for cytological atypia, which may progress to endometrial cancer. Endometrial hyperplasia usually results from chronic estrogen stimulation unopposed by progesterone.

I. Pathophysiology

A. Simple hyperplasia without atypia is least likely to progress to endometrial carcinoma, whereas complex hyperplasia with atypia is most likely to progress to carcinoma. The presence of nuclear atypia is the most worrisome finding. Progression to endometrial carcinoma was more than tenfold higher in women with atypical hyperplasia (simple or complex) than in women with no atypia (23 and 1.6 percent, respectively). Approximately 25 percent of women with atypical hyperplasia have coexistent endometrial cancer.

B. Risk factors for endometrial hyperplasia are the same as those for endometrial cancer. The risk for both disorders is increased tenfold in women who use unopposed estrogen-replacement therapy.

Risk factors for Endometrial Cancer

Risk factor	Relative risk (RR)
Increasing age	NA
Unopposed estrogen therapy	2-10
Late menopause (after age 55)	2
Nulliparity	2
Polycystic ovary syndrome (chronic anovulation)	3
Obesity	2-4
Diabetes	3
Hereditary nonpolyposis colorectal cancer	22-50 percent lifetime risk
Tamoxifen	2/1000
Early menarche	NA
Estrogen secreting tumor	NA
Family history of endometrial, ovarian, breast, or colon cancer	NA

C. Etiology. Exposure of the endometrium to continuous estrogen unopposed by progesterone can lead to endometrial hyperplasia.

1. **Endogenous estrogen.** One source of endogenous unopposed estrogen is chronic anovulation is associated with polycystic ovary syndrome (PCOS) and the perimenopausal period. Secretion of excessive estradiol from an ovarian tumor (eg, granulosa cell tumor) may also result in endometrial hyperplasia.
2. **Exogenous estrogen.** Continuous exposure to unopposed estrogen results in endometrial hyperplasia.

II. Clinical manifestations. Endometrial hyperplasia should be suspected in women with heavy, prolonged, frequent, or irregular uterine bleeding. Abnormal uterine bleeding in perimenopausal or menopausal women is the most common clinical symptom of endometrial neoplasia, although such bleeding is usually (80 percent) due to a benign condition.

III. Screening

A. Diagnostic evaluation. Tissue is required for diagnosis of endometrial hyperplasia. Ultrasonography may be useful for selecting patients who should be biopsied.

B. Endometrial biopsy

1. An endometrial biopsy should be performed in all women with abnormal uterine bleeding in whom endometrial hyperplasia or carcinoma is a possibility. There is an excellent correlation between Novak or Pipelle biopsy instruments and curettage.
2. In addition, atypical glandular cells on a Papanicolaou (Pap) smear should be investigated with an endometrial biopsy to determine whether endometrial hyperplasia or carcinoma is the cause.
3. Endometrial biopsy is also recommended for women with any endometrial cells on a Papanicolaou (Pap) smear.
4. Additional endometrial assessment should be performed if abnormal uterine bleeding persists after a benign endometrial biopsy. Transvaginal sonography with or without hysteroscopy and directed biopsy should be considered to rule out an occult malignancy.

C. Hysteroscopy and curettage. If endometrial hyperplasia with atypia is diagnosed by blind biopsy, further evaluation is needed to exclude a coexistent endometrial adenocarcinoma, which is present in 25 percent. Hysteroscopy with curettage is recommended.

D. Transvaginal ultrasonography of women not on estrogen replacement therapy

1. Transvaginal ultrasonography (TVUS) has been used to select postmenopausal women with abnormal uterine bleeding not on estrogen-replacement therapy (ERT) who are at highest risk of having endometrial hyperplasia/cancer.
2. Endometrial biopsy is required for histological diagnosis if the stripe is ≥4 mm and in women with persistent bleeding. Persistent bleeding is worrisome even when the endometrial thickness is <4 mm, particularly if there are other risk factors for endometrial cancer.

E. Transvaginal ultrasonography in women on ERT. TVUS is not a useful screening tool for excluding endometrial hyperplasia/cancer in women on estrogen-replacement therapy that is given with cyclic progesterone.

Women Who Should Undergo Evaluation for Endometrial Hyperplasia or Endometrial Cancer

Over age 40 years with abnormal uterine bleeding
Under age 40 years with abnormal uterine bleeding and risk factors (eg, chronic anovulation, obesity, tamoxifen)
Failure to respond to medical treatment of abnormal uterine bleeding
Postmenopausal women with uterus in situ receiving unopposed estrogen replacement therapy
Presence of atypical glandular cells on Papanicolaou smear
Presence of endometrial cells on Papanicolaou smear in a woman >40 year of age
Women with hereditary nonpolyposis colorectal cancer

IV. Treatment

A. Premenopausal women

1. **No atypia.** Endometrial hyperplasia without atypia is treated with medroxyprogesterone acetate (MPA) 10 mg daily for 12 to 14 days each month for three to six months.
2. **With atypia.** Endometrial hyperplasia with atypia on endometrial biopsy is further evaluated by hysteroscopy with dilatation and curettage. If the diagnosis remains unchanged (eg, no coexistent adenocarcinoma), treatment with continuous oral megestrol 40 mg two to four times per day is initiated. Hysterectomy is an alternative for women who are not planning future pregnancy.

Options for Progestin Treatment for Prevention of Endometrial Hyperplasia

Oral contraceptive pills
Levonorgestrel-releasing intrauterine device
Depot medroxyprogesterone acetate (150 mg IM) every three months
Intermittent progestin therapy taken daily for 12-14 days per month:
- medroxyprogesterone acetate (5-10 mg)
- norethindrone acetate (5-15 mg)
- micronized progesterone in a vaginal cream (100-200 mg)

Continuous combined estrogen replacement therapy

Progestin Treatment of Endometrial Hyperplasia Without Atypia

Medroxyprogesterone acetate (MPA) 10 mg daily for 12-14 days each month for 3-6 months Micronized progesterone 100-200 mg daily in a vaginal cream for 12-14 days each month for 3-6 months Insertion of a levonorgestrel containing intrauterine device

B. Postmenopausal women

1. No atypia

a. Endometrial hyperplasia without atypia is evaluated initially by hysteroscopy and dilatation and curettage. If the diagnosis remains unchanged and an ovarian estrogen source is excluded, then treatment with continuous medroxyprogesterone acetate (MPA, Provera) 10 mg daily for three months can be initiated. A follow-up endometrial biopsy should be performed immediately after cessation of drug therapy.

2. With atypia. Endometrial hyperplasia with atypia is a premalignant condition, preferably treated with hysterectomy. Alternatively, continuous oral megestrol at doses of 40 mg two to four times per day can be administered after coexistent endometrial cancer is excluded. An endometrial biopsy should be performed after three months of therapy.

References: See page 311.

Breast Cancer Screening and Diagnosis

Breast cancer is the second most commonly diagnosed cancer among women, after skin cancer. Approximately 182,800 new cases of invasive breast cancer are diagnosed in the United States per year. The incidence of breast cancer increases with age. White women are more likely to develop breast cancer than black women. The incidence of breast cancer in white women is about 113 cases per 100,000 women and in black women, 100 cases per 100,000.

I. Risk factors

Risk Factors for Breast Cancer	
Age greater than 50 years Prior history of breast cancer Family history Early menarche, before age 12 Late menopause, after age 50 Nulliparity	Age greater than 30 at first birth Obesity High socioeconomic status Atypical hyperplasia on biopsy Ionizing radiation exposure

A. Family history is highly significant in a first-degree relative (ie, mother, sister, daughter), especially if the cancer has been diagnosed premenopausally. Women who have premenopausal first-degree relatives with breast cancer have a three- to fourfold increased risk of breast cancer. Having several second-degree relatives with breast cancer may further increase the risk of breast cancer. Most women with breast cancer have no identifiable risk factors.

B. Approximately 8 percent of all cases of breast cancer are hereditary. About one-half of these cases are attributed to mutations in the BRCA1 and BRCA2 genes. Hereditary breast cancer commonly occurs in premenopausal women. Screening tests are available that detect BRCA mutations.

II. Diagnosis and evaluation

A. Clinical evaluation of a breast mass should assess duration of the lesion, associated pain, relationship to the menstrual cycle or exogenous hormone use, and change in size since discovery. The presence of nipple discharge and its character (bloody or tea-colored, unilateral or bilateral, spontaneous or expressed) should be assessed.

B. Menstrual history. The date of last menstrual period, age of menarche, age of menopause or surgical removal of the ovaries, previous pregnancies should be determined.

C. History of previous breast biopsies, cyst aspiration, dates and results of previous mammograms should be determined.

D. Family history should document breast cancer in relatives and the age at which family members were diagnosed.

III. Physical examination

A. The breasts should be inspected for asymmetry, deformity, skin retraction, erythema, peau d'orange (breast edema), and nipple retraction, discoloration, or inversion.

B. Palpation

1. The breasts should be palpated while the patient is sitting and then supine with the ipsilateral arm extended. The entire breast should be palpated systematically. The mass should be evaluated for size, shape, texture, tenderness, fixation to skin or chest wall.

2. A mass that is suspicious for breast cancer is usually solitary, discrete and hard. In some instances, it is fixed to the skin or the muscle. A suspicious mass is usually unilateral and nontender. Sometimes, an area of thickening may represent cancer. Breast cancer is rarely bilateral. The nipples should be expressed for discharge.

3. The axillae should be palpated for adenopathy, with an assessment of size of the lymph nodes, number, and fixation.

IV. Mammography. Screening mammograms are recommended every year for asymptomatic women 40 years and older. Unfortunately, only 60 percent of cancers are diagnosed at a local stage.

Screening for Breast Cancer in Women	
Age	**American Cancer Society guidelines**
20 to 39 years	Clinical breast examination every three years Monthly self-examination of breasts
Age 40 years and older	Annual mammogram Annual clinical breast examination

	Monthly self-examination of breasts

V. Methods of breast biopsy

A. Palpable masses. Fine-needle aspiration biopsy (FNAB) has a sensitivity ranging from 90-98%. Nondiagnostic aspirates require surgical biopsy.

1. The skin is prepped with alcohol and the lesion is immobilized with the nonoperating hand. A 10 mL syringe, with a 14 gauge needle, is introduced in to the central portion of the mass at a 90° angle. When the needle enters the mass, suction is applied by retracting the plunger, and the needle is advanced. The needle is directed into different areas of the mass while maintaining suction on the syringe.
2. Suction is slowly released before the needle is withdrawn from the mass. The contents of the needle are placed onto glass slides for pathologic examination.
3. Excisional biopsy is done when needle biopsies are negative but the mass is clinically suspected of malignancy.

B. Stereotactic core needle biopsy. Using a computer-driven stereotactic unit, the lesion is localized in three dimensions, and an automated biopsy needle obtains samples. The sensitivity and specificity of this technique are 95-100% and 94-98%, respectively.

C. Nonpalpable lesions

1. **Needle localized biopsy**
   - **a.** Under mammographic guidance, a needle and hookwire are placed into the breast parenchyma adjacent to the lesion. The patient is taken to the operating room along with mammograms for an excisional breast biopsy.
   - **b.** The skin and underlying tissues are infiltrated with 1% lidocaine with epinephrine. For lesions located within 5 cm of the nipple, a periareolar incision may be used or use a curved incision located over the mass and parallel to the areola. Incise the skin and subcutaneous fat, then palpate the lesion and excise the mass.
   - **c.** After removal of the specimen, a specimen x-ray is performed to confirm that the lesion has been removed. The specimen can then be sent fresh for pathologic analysis.
   - **d.** Close the subcutaneous tissues with a 4-0 chromic catgut suture, and close the skin with 4-0 subcuticular suture.

D. Ultrasonography. Screening is useful to differentiate between solid and cystic breast masses when a palpable mass is not well seen on a mammogram. Ultrasonography is especially helpful in young women with dense breast tissue when a palpable mass is not visualized on a mammogram. Ultrasonography is not used for routine screening because microcalcifications are not visualized and the yield of carcinomas is negligible.

References: See page 311.

Evaluation of Breast Lumps

Breast lumps should be evaluated because of the threat of breast cancer, especially in women over age 40. Breast cancer is found in 11 percent of women complaining of a lump. The vast majority of breast lumps and breast complaints are caused by benign breast disease. Breast cancer accounts for 10 percent of breast complaints; the most common conditions are cysts and fibroadenomas.

I. Diagnostic evaluation of breast lumps

A. History

1. The precise location of the lump.
2. How it was first noted (by breast self-examination, or during a screening clinical breast examination or mammogram).
3. How long the patient has noted its presence.
4. Whether there is any accompanying nipple discharge.
5. Whether the lump waxes and wanes in size at particular times in the menstrual cycle. Benign cysts may be more prominent premenstrually and regress in size during the follicular phase.

B. A past history of breast cancer or breast biopsy and a history of risk factors for breast cancer (eg, age, family history of breast cancer, age of menarche, age at first pregnancy, age of menopause, alcohol use, and hormonal replacement therapy).

Risk Factors for Developing Breast Cancer			
Risk factors	**Low risk**	**High risk**	**Relative risk**
Deleterious BRCA1/BRCA2 genes	Negative	Positive	3-7
Mother or sister with breast cancer	No	Yes	2.6
Age	30 to 34	70 to 74	18.0
Age at menarche	>14	<12	1.5
Age at first birth	<20	>30	1.9-3.5
Age at menopause	<45	>55	2.0
Use of contraceptive pills	Never	Past/current	1.2
Hormone replacement therapy	Never	use Current	1.4
Alcohol	None		1.4
Breast density on mammography (%)	0	2 to 5 drinks/day	1.8-6
Bone density	Lowest quartile	≥75	2.7-3.5
History of a benign breast biopsy	No	Highest quartile	1.7
History of atypical hyperplasia on biopsy	No	Yes	3.7
		Yes	

C. Breast tissue in normal women is often lumpy. Characteristics of cancerous lesions include:

1. Single lesion.
2. Hard.
3. Immovable.
4. Irregular borders.

D. Symptoms and physical findings to note when evaluating a breast lump:

1. Smooth, well-demarcated lumps are usually benign.
2. Although usually painless, breast cancer can be accompanied by pain in thirteen percent.
3. Nipple discharge is uncommon in cancer and, if present, is unilateral. Fourteen percent of unilateral nipple discharges are caused by breast cancer.
4. Careful examination of the axillae and supraclavicular area for nodal involvement is necessary.

E. Mammography

1. Diagnostic mammography is recommended as part of the evaluation of any woman age 35 or older who has a breast mass. The sensitivity and specificity of diagnostic mammography in women with a nonpalpable abnormality are 82.3 and 91.2 percent, respectively.
2. Mammography usually cannot determine whether a lump is benign. Mammography misses 10 to 20 percent of clinically palpable breast cancers. Diagnostic mammography usually is not ordered routinely in women under age 35. The breast tissue in younger women is often too dense to evaluate the lump.

F. Ultrasonography

1. Ultrasonography can determine whether a breast mass is a simple or complex cyst or a solid tumor. It is most useful in the following circumstances:
a. In women under age 35.
b. When a mass detected on screening mammography cannot be felt.
c. When the mass is too small or deep for aspiration.
2. The risk of cancer is low if the lesion is a simple cyst on ultrasound. For women with palpable masses, ultrasonography in conjunction with mammography is recommended in women over age 35 and ultrasound alone in women under age 35.

G. Fine-needle aspiration biopsy

1. Fine-needle aspiration biopsy (FNAB) can be useful in determining if a palpable lump is a simple cyst. To aspirate a palpable, suspected cyst, the mass is stabilized between the fingers and a 22- to 24-gauge needle is inserted with the other hand. Local anesthesia may be used but is not always required.
2. FNAB is especially valuable in evaluating cystic breast lesions and can be therapeutic if all of the fluid is removed. There are three possible scenarios with FNAB:
a. Fluid that is obtained and is not bloody should not be sent for analysis. The mass should disappear and the patient can be checked in four to six weeks to ensure that the cyst has not reappeared; a recurrence suggests the need for surgical referral.
b. Bloody fluid should be sent for pathological analysis; cancer is found in 7 percent of such cases.
3. When no fluid is obtained and the mass turns out to be solid, cells can be obtained for cytologic analysis with FNAB.

H. Triple diagnosis

1. Triple diagnosis refers to the concurrent use of physical examination, mammography, and FNAB for diagnosing palpable breast lumps. Very few breast cancers are missed using triple diagnosis. Only 0.7 percent of women had breast cancer when all three tests suggested benign lesions, while 99.4 percent of women in whom all three tests were positive have breast cancer.
2. The following scenarios occur with the triple diagnosis approach:
a. Women in whom all three tests suggest benign disease are followed with physical examination every three to six months for one year to make sure the mass is stable or regresses.
b. Women in whom all three tests suggest malignancy are referred for definitive therapy.

c. Women with any one of the tests suggesting malignancy should undergo excisional biopsy.

I. Women younger than age 35

1. Diagnostic mammography is usually not helpful in women under age 35 because the breast tissue is too dense. In a young woman with no physical findings indicating malignancy, the patient should return 3 to 10 days after the next menstruation begins to determine if the lump regresses.
2. FNAB can be performed if the lump remains easily palpable and feels cystic (round, smooth, and not hard). If fluid is obtained and is not bloody, the patient can be reassured and followed in four to six weeks to check for recurrence; a recurrence suggests the need for surgical referral. Bloody fluid should be sent for cytology.
3. If the lump does not feel cystic, the patient may be referred for ultrasound. If ultrasound shows a solid mass, the patient should undergo either FNAB, core-needle biopsy, or excisional biopsy. If a solid lump is small (<1 cm in size) and is not clinically suspicious (eg, is soft, not fixed, not new, and not changing), the lump is likely to be a fibroadenoma and the patient can be followed with physical examination every three to six months.

J. Women age 35 and older

1. Mammography is recommended as part of the evaluation of any woman age 35 or older who has a breast mass. Mammography misses 10 to 20 percent of clinically palpable breast cancers.
2. Solid masses with malignant or suspicious cytology should receive definitive therapy or biopsy. Masses that are not suspicious need careful follow-up. Breast lumps found to be benign on both FNAB and mammography have about 1 percent risk of being cancer.
3. Women who have had a non-palpable breast lump identified on screening mammography should have it evaluated. Women with mammogram readings highly suggestive of malignancy or with suspicious abnormalities need a core-needle or excisional biopsy.

Benign Breast Disease

Benign breast disease includes breast pain, breast lumps, or nipple discharge. The most common cause of breast nodularity and tenderness is fibrocystic change, which occurs in 60 percent of premenopausal women.

I. Benign breast lesions, which are discovered by breast palpation or mammography, have been subdivided into those that are associated with an increased risk of breast cancer and those that are not.

A. No increased risk of breast cancer

1. **Fibrocystic changes** consist of an increased number of cysts or fibrous tissue in an otherwise normal breast. Fibrocystic changes do not constitute a disease state.
2. **Fibrocystic disease** is diagnosed when fibrocystic changes occur in conjunction with pain, nipple discharge, or a degree of lumpiness sufficient to cause suspicion of cancer.
3. **Duct ectasia** is characterized by distention of subareolar ducts.
4. **Solitary papillomas** consist of papillary cells that grow from the wall of a cyst into its lumen.
5. **Simple fibroadenomas** are benign solid tumors, usually presenting as a well-defined, mobile mass.

B. Increased risk of breast cancer

1. **Ductal hyperplasia** without atypia is the most common lesion associated with increased risk of breast cancer.
2. **Sclerosing adenosis** consists of lobular tissue that has undergone hyperplastic change.
3. **Diffuse papillomatosis** refers to the formation of multiple papillomas.
4. **Complex fibroadenomas** are tumors that contain cysts greater than 3 mm in diameter, sclerosing adenosis, epithelial calcification, or papillary apocrine changes.
5. **Atypical hyperplasia** is associated with a four to sixfold increased risk of breast cancer.
6. **Radial scars** are benign breast lesions of uncertain pathogenesis that are occasionally detected by mammography. Thus, histologic confirmation is required to exclude spiculated carcinoma.

II. Symptoms and signs of benign breast disease

A. Women with fibrocystic changes can have breast tenderness during the luteal phase of the menstrual cycle. Fibrocystic disease is characterized by more severe or prolonged pain.

B. Women in their 30s sometimes present with multiple breast nodules 2 to 10 mm in size as a result of proliferation of glandular cells.

C. Women in their 30s and 40s present with solitary or multiple cysts. Acute enlargement of cysts may cause severe, localized pain of sudden onset. Nipple discharge is common, varying from pale green to brown.

III. Differential diagnosis

A. Breast pain

1. Women with mastitis usually complain of the sudden onset of pain,fever, erythema, tenderness, and induration.
2. Large pendulous breasts may cause pain due to stretching of Cooper's ligaments.
3. Hidradenitis suppurativa can present as breast nodules and pain.
4. Chest wall pain induced by trauma or trauma-induced fat necrosis, intercostal neuralgia, costochondritis, underlying pleuritic lesions, or arthritis of the thoracic spine can mimic benign breast disease.

B. Nipple discharge is uncommon in cancer and, if present, is unilateral. Approximately 3 percent of cases of unilateral nipple discharge are due to breast cancer; a mass is usually also present.

1. Nonspontaneous, nonbloody, or bilateral nipple discharge is unlikely to be due to cancer.
   a. Purulent discharge is often caused by mastitis or a breast abscess.
   b. Milky discharge commonly occurs after childbearing and can last several years; it also may be associated with oral contraceptives or tricyclic antidepressants. Serum prolactin should be measured if the discharge is sustained, particularly if it is associated with menstrual abnormalities.
   c. A green, yellow, white, grey, or brown discharge can be caused by duct ectasia.
2. Evaluation of nipple discharge for suspected cancer may include cytology and galactography. Occult blood can be detected with a guaiac test.

IV. Clinical evaluation

A. History

1. The relationship of symptoms to the menstrual cycles, the timing of onset of breast lumps and their subsequent course, the color and location of nipple discharge, and hormone use should be assessed.
2. Risk factors for breast cancer should be determined, including menarche before age 12 years, first live birth at age ≥30 years, and menopause at age ≥55 years; the number of previous breast biopsies, the presence of atypical ductal hyperplasia on biopsy, obesity, nulliparity, increased age, the amount of alcohol consumed, and the number and ages of first-degree family members with breast cancer with two such relatives with breast cancer at any early age should be determined.

B. Physical examination. The examination is performed when the breasts are least stimulated, seven to nine days after the onset of menses. The four breast quadrants, subareolar areas, and the axillae should be systematically examined with the woman both lying and sitting with her hands on her hips.

1. **The specific goals of the examination are to:**
   a. Delineate and document breast masses
   b. Elicit discharge from a nipple
   c. Identify localized areas of tenderness
   d. Detect enlarged axillary or supraclavicular lymph nodes
   e. Detect skin changes, noting the symmetry and contour of the breasts, position of the nipples, scars, dimpling, edema or erythema, ulceration or crusting of the nipple
2. "**Classic" characteristics of breast cancers:**
   a. Single lesion
   b. Hard
   c. Immovable
   d. Irregular border
   e. Size ≥2 cm

C. Mammography

1. Although 90 percent or more of palpable breast masses in women in their 20s to early 50s are benign, excluding breast cancer is a crucial step in the evaluation. Mammography is recommended for any woman age 35 years or older who has a breast mass.
2. Mammography usually is not ordered routinely in women under age 35 years. The breast tissue in younger women is often too dense to evaluate the lump. Ultrasonography is useful in these women to evaluate lumps and to assess for cysts.
3. Round dense lesions on mammography often represent cystic fluid. Solid and cystic lesions can often be distinguished by ultrasonography and mammography, and needle aspiration under ultrasound guidance further documents the cystic nature of the lesion.

D. Breast pain. Women who present with breast pain as their only symptom often undergo mammography. Only 0.4 percent of women with breast pain have breast cancer. The vast majority of women have normal findings (87 percent); benign abnormalities are noted in 9 percent.

E. Ductal lavage. The cytologic detection of cellular atypia can identify women with a higher risk of developing breast cancer.

V. Treatment

A. Fibrocystic disease. The major aim of therapy in fibrocystic disease is to relieve breast pain or discomfort. Symptomatic relief also may be achieved with a soft brassiere with good support, acetaminophen or a nonsteroidal anti-inflammatory drug, or both.

1. Breast pain or discomfort may be relieved with a thiazide diuretic.
2. **Avoidance of caffeine** may provide some patients with relief of pain.
3. **Vitamin E,** 400 IU twice daily reduces breast pain.
4. **Evening primrose oil** in doses of 1500-3000 mg daily, relieves breast pain in 30 to 80 percent.
5. **Danazol** in doses of 100 to 200 mg daily reduces breast pain. Common side effects include weight gain, acne, hirsutism, bloating, and amenorrhea.
6. **Tamoxifen** reduces breast pain in about 70 percent of women. It is safe and well-tolerated as 10 mg twice daily, or bromocriptine 1.25 to 5 mg daily can be tried.
7. **Oral contraceptives.** The frequency of fibrocystic changes decreases with prolonged oral contraceptive therapy. Oral contraceptives containing 19-norprogestins, such as norlutate, have androgenic properties that are beneficial.

References: See page 311.

Sexual Assault

Sexual assault is defined as any sexual act performed by one person on another without the person's consent. Sexual assault includes genital, anal, or oral penetration by a part of the accused's body or by an object. It may result from force, the threat of force, or the victim's inability to give consent. The annual incidence of sexual assault is 200 per 100,000 persons.

I. Psychological effects

A. A woman who is sexually assaulted loses control over her life during the period of the assault. Her integrity and her life are threatened. She may experience intense anxiety, anger, or fear. After the assault, a "rape-trauma" syndrome often occurs. The immediate response may last for hours or days and is characterized by generalized pain, headache, chronic pelvic pain, eating and sleep disturbances, vaginal symptoms, depression, anxiety, and mood swings.

B. The delayed phase is characterized by flashbacks, nightmares, and phobias.

II. Medical evaluation

A. Informed consent must be obtained before the examination. Acute injuries should be stabilized. About 1% of injuries require hospitalization and major operative repair, and 0.1% of injuries are fatal.

B. A history and physical examination should be performed. A chaperon should be present during the history and physical examination to reassure the victim and provide support. The patient should be asked to state in her own words what happened, identify her attacker if possible, and provide details of the act(s) performed if possible.

Clinical Care of the Sexual Assault Victim

Medical

Obtain informed consent from the patient
Obtain a gynecologic history
Assess and treat physical injuries
Obtain appropriate cultures and treat any existing infections
Provide prophylactic antibiotic therapy and offer immunizations
Provide therapy to prevent unwanted conception
Offer baseline serologic tests for hepatitis B virus, human immunodeficiency virus (HIV), and syphilis
Provide counseling
Arrange for follow-up medical care and counseling

Legal

Provide accurate recording of events
Document injuries
Collect samples (pubic hair, fingernail scrapings, vaginal secretions, saliva, blood-stained clothing)
Report to authorities as required
Assure chain of evidence

C. Previous obstetric and gynecologic conditions should be sought, particularly infections, pregnancy, use of contraception, and date of the last menstrual period. Preexisting pregnancy, risk for pregnancy, and the possibility of preexisting infections should be assessed.

D. Physical examination of the entire body and photographs or drawings of the injured areas should be completed. Bruises, abrasions, and lacerations should be sought. Superficial or extensive lacerations of the hymen and vagina, injury to the urethra, and occasionally rupture of the vaginal vault into the abdominal cavity may be noted. Bite marks are common.

1. **Pelvic examination** should assess the status of the reproductive organs, collect samples from the cervix and vagina, and test for Neisseria gonorrhoeae and Chlamydia trachomatis.
2. **A Wood light** should be used to find semen on the patient's body: dried semen will fluoresce. Sperm and other Y-chromosome-bearing cells may be identified from materials collected from victims.

E. A serum sample should be obtained for baseline serology for syphilis, herpes simplex virus, hepatitis B virus, and HIV.

F. Trichomonas is the most frequently acquired STD. The risk of acquiring human immunodeficiency virus (HIV) <1% during a single act of heterosexual intercourse, but the risk depends on the population involved and the sexual acts performed. The risk of acquiring gonorrhea is 6-12%, and the risk of acquiring syphilis is 3%.

G. Hepatitis B virus is 20 times more infectious than HIV during sexual intercourse. Hepatitis B immune globulin (0.06 mL of hepatitis B immune globulin per kilogram) should be administered intramuscularly as soon as possible within 14 days of exposure. It is followed by the standard three-dose immunization series with hepatitis B vaccine (0, 1, and 6 months), beginning at the time of hepatitis B immune globulin administration.

H. Emergency contraception. If the patient is found to be at risk for pregnancy as a result of the assault, emergency contraception should be offered. The risk of pregnancy after sexual assault is 2-4% in victims not already using contraception. One dose of combination oral contraceptive tablets is given at the time the victim is seen and an additional dose is given in 12 hours. Emergency contraception can be effective up to 120 hours after unprotected coitus. Metoclopramide (Reglan), 20 mg with each dose of hormone, is prescribed for nausea. A pregnancy test should be performed at the 2-week return visit if conception is suspected.

Emergency Contraception

1. Consider pretreatment one hour before each oral contraceptive pill dose, using one of the following orally administered antiemetic agents:
   Prochlorperazine (Compazine), 5 to 10 mg
   Promethazine (Phenergan), 12.5 to 25 mg
   Trimethobenzamide (Tigan), 250 mg
2. Administer the first dose of oral contraceptive pill within 72 hours of intercourse, and administer the second dose 12 hours after the first dose. Brand name options for emergency contraception include the following:
   Preven Kit--two pills per dose (0.5 mg of levonorgestrel and 100 µg of ethinyl estradiol per dose)
   Ovral--two pills per dose (0.5 mg of levonorgestrel and 100 µg of ethinyl estradiol per dose)
   Plan B--one pill per dose (0.75 mg of levonorgestrel per dose)
   Nordette--four pills per dose (0.6 mg of levonorgestrel and 120 µg of ethinyl estradiol per dose)
   Triphasil--four pills per dose (0.5 mg of levonorgestrel and 120 µg of ethinyl estradiol per dose)

Screening and Treatment of Sexually Transmissible Infections Following Sexual Assault

Initial Examination

Infection
- Testing for and gonorrhea and chlamydia from specimens from any sites of penetration or attempted penetration
- Wet mount and culture or a vaginal swab specimen for Trichomonas
- Serum sample for syphilis, herpes simplex virus, hepatitis B virus, and HIV

Pregnancy Prevention
Prophylaxis
- Hepatitis B virus vaccination and hepatitis B immune globulin.
- Empiric recommended antimicrobial therapy for chlamydial, gonococcal, and trichomonal infections and for bacterial vaginosis:
  Ceftriaxone, 125 mg intramuscularly in a single dose, plus
  Metronidazole, 2 g orally in a single dose, plus
  Doxycycline 100 mg orally two times a day for 7 days
  Azithromycin (Zithromax) is used if the patient is unlikely to comply with the 7 day course of doxycycline; single dose of four 250 mg caps.
  If the patient is penicillin-allergic, ciprofloxacin 500 mg PO or ofloxacin 400 mg PO is substituted for ceftriaxone. If the patient is pregnant, erythromycin 500 mg PO qid for 7 days is substituted for doxycycline.
  HIV prophylaxis consists of zidovudine (AZT) 200 mg PO tid, plus lamivudine (3TC) 150 mg PO bid for 4 weeks.

Follow-Up Examination (2 weeks)

- Cultures for N gonorrhoeae and C trachomatis (not needed if prophylactic treatment has been provided)
- Wet mount and culture for T vaginalis
- Collection of serum sample for subsequent serologic analysis if test results are positive

Follow-Up Examination (12 weeks)

Serologic tests for infectious agents:
T pallidum
HIV (repeat test at 6 months)
Hepatitis B virus (not needed if hepatitis B virus vaccine was given)

III. Emotional care
- **A.** The physician should discuss the injuries and the probability of infection or pregnancy with the victim, and she should be allowed to express her anxieties.
- **B.** Anxiolytic medication may be useful; lorazepam (Ativan) 1-5 mg PO tid prn anxiety.
- **C.** The patient should be referred to personnel trained to handle rape-trauma victims within 1 week.

IV. Follow-up care
- **A.** The patient is seen for medical follow-up in 2 weeks for documentation of healing of injuries.
- **B.** Repeat testing includes syphilis, hepatitis B, and gonorrhea and chlamydia cultures. HIV serology should be repeated in 3 months and 6 months.
- **C.** A pregnancy test should be performed if conception is suspected.

References: See page 311.

Osteoporosis

Over 1.3 million osteoporotic fractures occur each year in the United States. The risk of all fractures increases with age; among persons who survive until age 90, 33 percent of women will have a hip fracture. The lifetime risk of hip fracture for white women at age 50 is 16 percent. Osteoporosis is characterized by low bone mass, microarchitectural disruption, and increased skeletal fragility.

Risk Factors for Osteoporotic Fractures

Personal history of fracture as an adult	White race
History of fracture in a first-degree relative	Advanced age
Current cigarette smoking	Lifelong low calcium intake
Low body weight (less than 58 kg [127 lb])	Alcoholism
Female sex	Inadequate physical activity
Estrogen deficiency (menopause before age 45 years or bilateral ovariectomy, prolonged premenopausal amenorrhea [greater than one year])	Recurrent falls Dementia Impaired eyesight despite adequate correction Poor health/frailty

I. Screening for osteoporosis and osteopenia

A. Normal bone density is defined as a bone mineral density (BMD) value within one standard deviation of the mean value in young adults of the same sex and race.

B. Osteopenia is defined as a BMD between 1 and 2.5 standard deviations below the mean.

C. Osteoporosis is defined as a value more than 2.5 standard deviations below the mean; this level is the fracture threshold. These values are referred to as T-scores (number of standard deviations above or below the mean value).

D. Dual x-ray absorptiometry. In dual x-ray absorptiometry (DXA), two photons are emitted from an x-ray tube. DXA is the most commonly used method for measuring bone density because it gives very precise measurements with minimal radiation. DXA measurements of the spine and hip are recommended.

E. Biochemical markers of bone turnover. **Urinary deoxypyridinoline (DPD) and urinary alpha-1 to alpha-2 N-telopeptide of collagen (NTX)** are the most specific and clinically useful markers of bone resorption. Biochemical markers are not useful for the screening or diagnosis of osteoporosis because the values in normal and osteoporosis overlap substantially.

II. Recommendations for screening for osteoporosis of the National Osteoporosis Foundation

A. All women should be counseled about the risk factors for osteoporosis, especially smoking cessation and limiting alcohol. All women should be encouraged to participate in regular weight-bearing and exercise.

B. Measurement of BMD is recommended for all women 65 years and older regardless of risk factors. BMD should also be measured in all women under the age of 65 years who have one or more risk factors for osteoporosis (in addition to menopause). The hip is the recommended site of measurement.

C. All adults should be advised to consume at least 1,200 mg of calcium per day and 400 to 800 IU of vitamin D per day. A daily multivitamin (which provides 400 IU) is recommended. In patients with documented vitamin D deficiency, osteoporosis, or previous fracture, two multivitamins may be reasonable, particularly if dietary intake is inadequate and access to sunlight is poor.

D. Treatment is recommended for women without risk factors who have a BMD that is 2 SD below the mean for young women, and in women with risk factors who have a BMD that is 1.5 SD below the mean.

III. Nonpharmacologic therapy of osteoporosis in women

A. Diet. An optimal diet for treatment (or prevention) of osteoporosis includes an adequate intake of calories (to avoid malnutrition), calcium, and vitamin D.

B. Calcium. Postmenopausal women should be advised to take 1000 to 1500 mg/day of elemental calcium, in divided doses, with meals.

C. Vitamin D total of 800 IU daily should be taken.

D. Exercise. Women should exercise for at least 30 minutes three times per week. Any weight-bearing exercise regimen, including walking, is acceptable.

E. Cessation of smoking is recommended for all women because smoking cigarettes accelerates bone loss.

IV. Drug therapy of osteoporosis in women

A. Selected postmenopausal women with osteoporosis or at high risk for the disease should be considered for drug therapy. Particular attention should be paid to treating women with a recent fragility fracture, including hip fracture, because they are at high risk for a second fracture.

B. Candidates for drug therapy are women who already have postmenopausal osteoporosis (less than -2.5) and women with osteopenia (T score -1 to -2.5) soon after menopause.

C. Bisphosphonates

1. Alendronate (Fosamax) (10 mg/day or 70 mg once weekly) or **risedronate (Actonel)** (5 mg/day or 35 mg once weekly) are good choices for the treatment of osteoporosis. Bisphosphonate therapy increases bone mass and reduces the incidence of vertebral and nonvertebral fractures.

2. Alendronate (5 mg/day or 35 mg once weekly) and risedronate (5 mg/day of 35 mg once weekly) have been approved for prevention of osteoporosis.

3. Alendronate or risedronate should be taken with a full glass of water 30 minutes before the first meal or beverage of the day. Patients should not lie down for at least 30 minutes after taking the dose to avoid the unusual complication of pill-induced esophagitis.

4. Alendronate is well tolerated and effective for at least seven years.

5. The bisphosphonates (alendronate or risedronate) and raloxifene are first-line treatments for *prevention* of osteoporosis. The bisphosphonates are first-line therapy for *treatment* of osteoporosis. Bisphosphonates are preferred for prevention and treatment of osteoporosis because they increase bone mineral density more than raloxifene.

D. Selective estrogen receptor modulators

1. Raloxifene (Evista) (5 mg daily or a once-a-week preparation) is a selective estrogen receptor modulator (SERM) for prevention and treatment of osteoporosis. It increases bone mineral density and reduces serum total and low-density-lipoprotein (LDL) cholesterol. It also appears to reduce the incidence of vertebral fractures and is one of the first-line drugs for prevention of osteoporosis.

2. Raloxifene is somewhat less effective than the bisphosphonates for the prevention and treatment of osteoporosis. Venous thromboembolism is a risk.

Treatment Guidelines for Osteoporosis
Calcium supplements with or without vitamin D supplements or calcium-rich diet Weight-bearing exercise Avoidance of alcohol tobacco products Alendronate (Fosamax) Risedronate (Actonel) Raloxifene (Evista)

Agents for Treating Osteoporosis

Medication	Dosage	Route
Calcium	1,000 to 1,500 mg per day	Oral
Vitamin D	400 IU per day (800 IU per day in winter in northern latitudes)	Oral
Alendronate (Fosamax)	**Prevention:** 5 mg per day or 35 mg once-a-week **Treatment:** 10 mg per day or 70 mg once-a-week	Oral
Risedronate (Actonel)	5 mg daily or 35 mg once weekly	Oral
Raloxifene (Evista)	60 mg per day	Oral
Conjugated estrogens	0.3 mg per day	Oral

E. Monitoring the response to therapy

1. Bone mineral density and a marker of bone turnover should be measured at baseline, followed by a repeat measurement of the marker in three months.
2. If the marker falls appropriately, the drug is having the desired effect, and therapy should be continued for two years, at which time bone mineral density can be measured again. The anticipated three-month decline in markers is 50 percent with alendronate.

F. Estrogen/progestin therapy

1. Estrogen-progestin therapy is no longer a first-line approach for the treatment of osteoporosis in postmenopausal women because of increases in the risk of breast cancer, stroke, venous thromboembolism, and coronary disease.
2. Indications for estrogen-progestin in postmenopausal women include persistent menopausal symptoms and patients with an indication for antiresorptive therapy who cannot tolerate the other drugs.

References: See page 311.

Urinary Incontinence

Women between the ages of 20 to 80 year have an overall prevalence for urinary incontinence of 53.2 percent.

I. Types of Urinary Incontinence

A. Stress Incontinence

1. Stress incontinence is the involuntary loss of urine produced by coughing, laughing or exercising. The underlying abnormality is typically urethral hypermobility caused by a failure of the anatomic supports of the bladder neck. Loss of bladder neck support is often attributed to injury occurring during vaginal delivery.
2. The lack of normal intrinsic pressure within the urethra--known as intrinsic urethral sphincter deficiency--is another factor leading to stress incontinence. Advanced age, inadequate estrogen levels, previous vaginal surgery and certain neurologic lesions are associated with poor urethral sphincter function.

B. Overactive Bladder. Involuntary loss of urine preceded by a strong urge to void, whether or not the bladder is full, is a symptom of the condition commonly referred to as "urge incontinence." Other commonly used terms such as detrusor instability and detrusor hyperreflexia refer to involuntary detrusor contractions observed during urodynamic studies.

II. History and Physical Examination

A. A preliminary diagnosis of urinary incontinence can be made on the basis of a history, physical examination and a few simple office and laboratory tests.

B. The medical history should assess diabetes, stroke, lumbar disc disease, chronic lung disease, fecal impaction and cognitive impairment. The obstetric and gynecologic history should include gravity; parity; the number of vaginal, instrument-assisted and cesarean deliveries; the time interval between deliveries; previous hysterectomy and/or vaginal or bladder surgery; pelvic radiotherapy; trauma; and estrogen status.

Key Questions in Evaluating Patients for Urinary Incontinence

Do you leak urine when you cough, laugh, lift something or sneeze? How often?
Do you ever leak urine when you have a strong urge on the way to the bathroom? How often?
How frequently do you empty your bladder during the day?
How many times do you get up to urinate after going to sleep? Is it the urge to urinate that wakes you?
Do you ever leak urine during sex?
Do you wear pads that protect you from leaking urine? How often do you have to change them?
Do you ever find urine on your pads or clothes and were unaware of when the leakage occurred?
Does it hurt when you urinate?
Do you ever feel that you are unable to completely empty your bladder?

Drugs That Can Influence Bladder Function

Drug	Side effect
Antidepressants, antipsychotics, sedatives/hypnotics	Sedation, retention (overflow)
Diuretics	Frequency, urgency (OAB)
Caffeine	Frequency, urgency (OAB)
Anticholinergics	Retention (overflow)
Alcohol	Sedation, frequency (OAB)
Narcotics	Retention, constipation, sedation (OAB and overflow)
Alpha-adrenergic blockers	Decreased urethral tone (stress incontinence)
Alpha-adrenergic agonists	Increased urethral tone, retention (overflow)
Beta-adrenergic agonists	Inhibited detrusor function, retention (overflow)

C. Because fecal impaction has been linked to urinary incontinence, a history that includes frequency of bowel movements, length of time to evacuate and whether the patient must splint her vagina or perineum during defecation should be obtained. Patients should be questioned about fecal incontinence.

D. A complete list of all prescription and nonprescription drugs should be obtained. When appropriate, discontinuation of these medications associated with incontinence or substitution of appropriate alternative medications will often cure or significantly improve urinary incontinence.

E. Physical Examination

1. Immediately before the physical examination, the patient should void as normally and completely as possible. The voided volume should be recorded. A post-void residual volume can then be determined within 10 minutes by catheterization or ultrasound examination. Post-void residual volumes more than 100 mL are considered abnormal.

2. A clean urine sample can be sent for culture and urinalysis.

3. Determining post-void residual volume and urinalysis allows screening for overflow incontinence, chronic urinary tract infections, hematuria, diabetes, kidney disease and metabolic abnormalities.

4. The abdominal examination should rule out diastasis recti, masses, ascites and organomegaly. Pulmonary and cardiovascular assessment may be indicated to assess control of cough or the need for medications such as diuretics.

5. The lumbosacral nerve roots should be assessed by checking deep tendon reflexes, lower extremity strength, sharp/dull sensation and the bulbocavernosus and clitoral sacral reflexes.

6. The pelvic examination should include an evaluation for inflammation, infection and atrophy. Signs of inadequate estrogen levels are thinning and paleness of the vaginal epithelium, loss of rugae, disappearance of the labia minora and presence of a urethral caruncle.

7. A urethral diverticula is usually identified as a distal bulge under the urethra. Gentle massage of the area will frequently produce a purulent discharge from the urethral meatus.

8. Testing for stress incontinence is performed by asking the patient to cough vigorously while the examiner watches for leakage of urine.

9. While performing the bimanual examination, levator ani muscle function can be evaluated by asking the patient to tighten her “vaginal muscles” and hold the contraction as long as possible. It is normal for a woman to be able to hold such a contraction for five to 10 seconds. The bimanual examination should also include a rectal examination to assess anal sphincter tone, fecal impaction, occult blood, or rectal lesions.

III. Treatment of urinary incontinence

A. Rehabilitation of the pelvic floor muscles is the common goal of treatments through the use of pelvic muscle exercises (Kegel's exercises), weighted vaginal cones and pelvic floor electrical stimulation.

B. A set of specially designed vaginal weights can be used as mechanical biofeedback to augment pelvic muscle exercises. The weights are held inside the vagina by contracting the pelvic muscles for 15 minutes at a time.

C. Pelvic floor electrical stimulation with a vaginal or anal probe produces a contraction of the levator ani muscle. Cure or improvement in 48 percent of treated patients, compared with 13 percent of control subjects.

D. Occlusive devices, such as pessaries, can mimic the effects of a retropubic urethropexy. A properly fitted pessary prevents urine loss during vigorous coughing in the standing position with a full bladder.

E. Medications such as estrogens and alpha-adrenergic drugs may also be effective in treating women with stress incontinence. Stress incontinence may be treated with localized estrogen replacement therapy (ERT). Localized ERT can be given in the form of estrogen cream or an estradiol-impregnated vaginal ring (Estring).

Medications Used to Treat Urinary Incontinence

Drug	Dosage
Stress Incontinence	
Pseudoephedrine (Sudafed)	15 to 30 mg, three times daily
Vaginal estrogen ring (Estring)	Insert into vagina every three months.
Vaginal estrogen cream	0.5 g, apply in vagina every night
Overactive bladder	
Oxybutynin transdermal (Oxytrol)	39 cm^2 patch 2 times/week
Oxybutynin ER (Ditropan XL)	5 to 15 mg, every morning
Tolterodine LA (Detrol LA)	2-4 mg qd
Generic oxybutynin	2.5 to 10 mg, two to four times daily
Tolterodine (Detrol)	1 to 2 mg, two times daily
Imipramine (Tofranil)	10 to 75 mg, every night
Dicyclomine (Bentyl)	10 to 20 mg, four times daily
Hyoscyamine (Cystospaz)	0.375 mg, two times daily

F. Alpha-adrenergic drugs such as pseudoephedrine improve stress incontinence by increase resting urethral tone. These drugs cause subjective improvement in 20 to 60 percent of patients.

G. Surgery to correct genuine stress incontinence is a viable option for most patients. Retropubic urethropexies (ie, Burch laparoscopic and Marshall-Marchetti-Krantz [MMK] procedures) and suburethral slings have long-term success rates consistently reported in the 80 to 96 percent range.

H. Another minimally invasive procedure for the treatment of stress incontinence caused by intrinsic sphincter deficiency is periurethral injection.

I. Overactive bladder

1. Behavioral therapy, in the form of bladder retraining and biofeedback, seeks to reestablish cortical control of the bladder by having the patient ignore urgency and void only in response to cortical signals during waking hours.
2. Pharmacologic agents may be given empirically to women with symptoms of overactive bladder. Tolterodine (Detrol) and extended-release oxybutynin chloride (Ditropan XL) have largely replaced generic oxybutynin as a first-line treatment option for overactive bladder because of favorable side effect profiles. Oxybutynin transdermal may cause less dry mouth than the oral formulation.
3. ERT is also an effective treatment for women with overactive bladder. Even in patients taking systemic estrogen, localized ERT (ie, estradiol-impregnated vaginal ring) may increase inadequate estrogen levels and decrease the symptoms associated with overactive bladder.
4. Pelvic floor electrical stimulation is also effective in treating women with overactive bladder. Pelvic floor electrical stimulation results in a 50 percent cure rate of detrusor instability.
5. Neuromodulation of the sacral nerve roots through electrodes implanted in the sacral foramina is a promising new surgical treatment that has been found to be effective in the treatment of urge incontinence.
6. The FDA has recently approved extracorporeal magnetic innervation, a noninvasive procedure for the treatment of incontinence caused by pelvic floor weakness. Extracorporeal magnetic innervation may have a place in the treatment of women with both stress and urge incontinence.

References: See page 311.

Urinary Tract Infection

Urinary tract infections (UTIs) are a leading cause of morbidity in persons of all ages. Sexually active young women, elderly persons and those undergoing genitourinary instrumentation or catheterization are at risk.

I. Acute uncomplicated cystitis in young women

A. Sexually active young women are most at risk for UTIs.

B. Approximately 90 percent of uncomplicated cystitis episodes are caused by Escherichia coli, 10 to 20 percent are caused by coagulase-negative Staphylococcus saprophyticus and 5

percent or less are caused by other Enterobacteriaceae organisms or enterococci. Up to one-third of uropathogens are resistant to ampicillin and, but the majority are susceptible to trimethoprim-sulfamethoxazole (85 to 95 percent) and fluoroquinolones (95 percent).

C. Patients should be evaluated for pyuria by urinalysis (wet mount examination of spun urine) or a dipstick test for leukocyte esterase.

Urinary Tract Infections in Adults

Category	Diagnostic criteria	First-line therapy	Comments
Acute uncomplicated cystitis	Urinalysis for pyuria and hematuria (culture not required)	TMP-SMX DS (Bactrim, Septra) Trimethoprim (Proloprim) Ciprofloxacin (Cipro) Ofloxacin (Floxin)	Three-day course is best Quinolones may be used in areas of TMP-SMX resistance or in patients who cannot tolerate TMP-SMX
Recurrent cystitis in young women	Symptoms and a urine culture with a bacterial count of more than 100 CFU per mL of urine	If the patient has more than three cystitis episodes per year, treat prophylactically with postcoital, patient- directed or continuous daily therapy	Repeat therapy for seven to 10 days based on culture results and then use prophylactic therapy
Acute cystitis in young men	Urine culture with a bacterial count of 1,000 to 10,000 CFU per mL of urine	Same as for acute uncomplicated cystitis	Treat for seven to 10 days
Acute uncomplicated pyelonephritis	Urine culture with a bacterial count of 100,000 CFU per mL of urine	If gram-negative organism, oral fluoroquinolone If gram-positive organism, amoxicillin If parenteral administration is required, ceftriaxone (Rocephin) or a fluoroquinolone If Enterococcus species, add oral or IV amoxicillin	Switch from IV to oral administration when the patient is able to take medication by mouth; complete a 14-day course
Complicated urinary tract infection	Urine culture with a bacterial count of more than 10,000 CFU per mL of urine	If gram-negative organism, oral fluoroquinolone If Enterococcus species, ampicillin or amoxicillin with or without gentamicin (Garamycin)	Treat for 10 to 14 days
Catheter-associated urinary tract infection	Symptoms and a urine culture with a bacterial count of more than 100 CFU per mL of urine	If gram-negative organism, a fluoroquinolone If gram-positive organism, ampicillin or amoxicillin plus gentamicin	Remove catheter if possible, and treat for seven to 10 days For patients with long-term catheters and symptoms, treat for five to seven days

Antibiotic Therapy for Urinary Tract Infections

Diagnostic group	Duration of therapy	Empiric options
Acute uncomplicated urinary tract infections in women	Three days	Trimethoprim-sulfamethoxazole (Bactrim DS), one double-strength tablet PO twice daily Trimethoprim (Proloprim), 100 mg PO twice daily Norfloxacin (Noroxin), 400 mg twice daily Ciprofloxacin (Cipro), 250 mg twice daily Lomefloxacin (Maxaquin), 400 mg per day Ofloxacin (Floxin), 200 mg twice daily Enoxacin (Penetrex), 200 mg twice daily Sparfloxacin (Zagam), 400 mg as initial dose, then 200 mg per day Levofloxacin (Levaquin), 250 mg per day Nitrofurantoin (Macrodantin), 100 mg four times daily Cefpodoxime (Vantin), 100 mg twice daily Cefixime (Suprax), 400 mg per day Amoxicillin-clavulanate(Augmentin), 500 mg twice daily
Acute uncomplicated pyelonephritis	14 days	Trimethoprim-sulfamethoxazole DS, one double-strength tablet PO twice daily Ciprofloxacin (Cipro), 500 mg twice daily Levofloxacin (Maxaquin), 250 mg per day Enoxacin (Penetrex), 400 mg twice daily Sparfloxacin (Zagam) 400 mg initial dose, then 200 mg per day 104.50 Ofloxacin (Floxin), 400 mg twice daily Cefpodoxime (Vantin), 200 mg twice daily Cefixime (Suprax), 400 mg per day

Diagnostic group	Duration of therapy	Empiric options
	Up to 3 days	Trimethoprim-sulfamethoxazole (Bactrim) 160/800 IV twice daily Ceftriaxone (Rocephin), 1 g IV per day Ciprofloxacin (Cipro), 400 mg twice daily Ofloxacin (Floxin), 400 mg twice daily Levofloxacin (Penetrex), 250 mg per day Aztreonam (Azactam), 1 g three times daily Gentamicin (Garamycin), 3 mg per kg per day in 3 divided doses every 8 hours
Complicated urinary tract infections	14 days	Fluoroquinolones PO
	Up to 3 days	Ampicillin, 1 g IV every six hours, and gentamicin, 3 mg per kg per day
Urinary tract infections in young men	Seven days	Trimethoprim-sulfamethoxazole, one double-strength tablet PO twice daily Fluoroquinolones

D. Treatment of acute uncomplicated cystitis in young women

1. Three-day regimens appear to offer the optimal combination of convenience, low cost and an efficacy comparable to that of seven-day or longer regimens.
2. Trimethoprim-sulfamethoxazole is the most cost-effective treatment. Three-day regimens of ciprofloxacin (Cipro), 250 mg twice daily, and ofloxacin (Floxin), 200 mg twice daily, produce better cure rates with less toxicity.
3. Quinolones that are useful in treating complicated and uncomplicated cystitis include ciprofloxacin, norfloxacin, ofloxacin, enoxacin (Penetrex), lomefloxacin (Maxaquin), sparfloxacin (Zagam) and levofloxacin (Levaquin).
4. Trimethoprim-sulfamethoxazole remains the antibiotic of choice in the treatment of uncomplicated UTIs in young women. Fluoroquinolones are recommended for patients who cannot tolerate sulfonamides or trimethoprim or who have a high frequency of antibiotic resistance. Three days is the optimal duration of treatment for uncomplicated cystitis. A seven-day course should be considered in pregnant women, diabetic women and women who have had symptoms for more than one week.

II. Recurrent cystitis in young women

A. Up to 20 percent of young women with acute cystitis develop recurrent UTIs. The causative organism should be identified by urine culture.

B. Women who have more than three UTI recurrences within one year can be managed using one of three preventive strategies.

1. Acute self-treatment with a three-day course of standard therapy.
2. Postcoital prophylaxis with one-half of a trimethoprim-sulfamethoxazole double-strength tablet (40/200 mg).
3. Continuous daily prophylaxis for six months with trimethoprim-sulfamethoxazole, one-half tablet per day (40/200 mg); nitrofurantoin, 50 to 100 mg per day; norfloxacin (Noroxin), 200 mg per day; cephalexin (Keflex), 250 mg per day; or trimethoprim (Proloprim), 100 mg per day.

III. Complicated UTI

A. A complicated UTI is one that occurs because of enlargement of the prostate gland, blockages, or the presence of resistant bacteria.

B. Accurate urine culture and susceptibility are necessary. Treatment consists of an oral fluoroquinolone. In patients who require hospitalization, parenteral administration of ceftazidime (Fortaz) or cefoperazone (Cefobid), cefepime (Maxipime), aztreonam (Azactam), imipenem-cilastatin (Primaxin) or the combination of an antipseudomonal penicillin (ticarcillin [Ticar], mezlocillin [Mezlin], piperacillin [Pipracil]) with an aminoglycoside.

C. Enterococci are frequently encountered uropathogens in complicated UTIs. In areas in which vancomycin-resistant Enterococcus faecium is prevalent, quinupristin-dalfopristin (Synercid) may be useful.

D. Patients with complicated UTIs require at least a 10- to 14-day course of therapy. Follow-up urine cultures should be performed within 10 to 14 days after treatment.

IV. Uncomplicated pyelonephritis

A. Women with acute uncomplicated pyelonephritis may present with a mild cystitis-like illness and flank pain; fever, chills, nausea, vomiting, leukocytosis and abdominal pain; or a serious gram-negative bacteremia. Uncomplicated pyelonephritis is usually caused by E. coli.

B. The diagnosis should be confirmed by urinalysis and by urine culture. Urine cultures demonstrate more than 100,000 CFU per mL of urine in 80 percent of women with pyelonephritis. Blood cultures are positive in up to 20 percent of women who have this infection.

C. Empiric therapy using an oral fluoroquinolone is recommended in women with mild to moderate symptoms. Patients who are too ill to take oral antibiotics should initially be treated with a parenterally third-generation cephalosporin, aztreonam, a broad-spectrum penicillin, a quinolone or an aminoglycoside.

D. The total duration of therapy is usually 14 days. Patients with persistent symptoms after three days of antimicrobial therapy should be evaluated by renal ultrasonography for evidence of urinary obstruction or abscess.

References: See page 311.

Pubic Infections

I. Molluscum contagiosum

A. This disease is produced by a virus of the pox virus family and is spread by sexual or close personal contact. Lesions are usually asymptomatic and multiple, with a central umbilication. Lesions can be spread by autoinoculation and last from 6 months to many years.

B. Diagnosis. The characteristic appearance is adequate for diagnosis, but biopsy may be used to confirm the diagnosis.

C. Treatment. Lesions are removed by sharp dermal curette, liquid nitrogen cryosurgery, or electrodesiccation.

II. Pediculosis pubis (crabs)

A. Phthirus pubis is a blood sucking louse that is unable to survive more than 24 hours off the body. It is often transmitted sexually and is principally found on the pubic hairs. Diagnosis is confirmed by locating nits or adult lice on the hair shafts.

B. Treatment

1. Permethrin cream (Elimite), 5% is the most effective treatment; it is applied for 10 minutes and washed off.

2. Kwell shampoo, lathered for at least 4 minutes, can also be used, but it is contraindicated in pregnancy or lactation.

3. All contaminated clothing and linen should be laundered.

III. Pubic scabies

A. This highly contagious infestation is caused by the Sarcoptes scabiei (0.2-0.4 mm in length). The infestation is transmitted by intimate contact or by contact with infested clothing. The female mite burrows into the skin, and after 1 month, severe pruritus develops. A multiform eruption may develop, characterized by papules, vesicles, pustules, urticarial wheals, and secondary infections on the hands, wrists, elbows, belt line, buttocks, genitalia, and outer feet.

B. Diagnosis is confirmed by visualization of burrows and observation of parasites, eggs, larvae, or red fecal compactions under microscopy.

C. Treatment. Permethrin 5% cream (Elimite) is massaged in from the neck down and remove by washing after 8 hours.

References: See page 311.

Sexually Transmissible Infections

Approximately 12 million patients are diagnosed with a sexually transmissible infection (STI) annually in the United States. Sequella of STIs include infertility, chronic pelvic pain, ectopic pregnancy, and other adverse pregnancy outcomes.

Diagnosis and Treatment of Bacterial Sexually Transmissible Infections

Organism	Diagnostic Methods	Recommended Treatment	Alternative
Chlamydia trachomatis	Direct fluorescent antibody, enzyme immunoassay, DNA probe, cell culture, DNA amplification	Doxycycline 100 mg PO 2 times a day for 7 days or Azithromycin (Zithromax) 1 g PO	Ofloxacin (Floxin) 300 mg PO 2 times a day for 7 days
Neisseria gonorrhoeae	Culture DNA probe	Ceftriaxone (Rocephin) 125 mg IM or Cefixime 400 mg PO or Ciprofloxacin (Cipro) 500 mg PO or Ofloxacin (Floxin) 400 mg PO plus Doxycycline 100 mg 2 times a day for 7 days or azithromycin 1 g PO	Levofloxacin (Levaquin) 250 mg PO once Spectinomycin 2 g IM once
Treponema pallidum	Clinical appearance Dark-field microscopy Nontreponemal test: rapid plasma reagin, VDRL Treponemal test: MHA-TP, FTA-ABS	Primary and secondary syphilis and early latent syphilis (<1 year duration): benzathine penicillin G 2.4 million units IM in a single dose.	Penicillin allergy in patients with primary, secondary, or early latent syphilis (<1 year of duration): doxycycline 100 mg PO 2 times a day for 2 weeks.

Diagnosis and Treatment of Viral Sexually Transmissible Infections		
Organism	**Diagnostic Methods**	**Recommended Treatment Regimens**
Herpes simplex virus	Clinical appearance Cell culture confirmation	First episode: Acyclovir (Zovirax) 400 mg PO 5 times a day for 7-10 days, or famciclovir (Famvir) 250 mg PO 3 times a day for 7-10 days, or valacyclovir (Valtrex) 1 g PO 2 times a day for 7-10 days. Recurrent episodes: acyclovir 400 mg PO 3 times a day for 5 days, or 800 mg PO 2 times a day for 5 days or famciclovir 125 mg PO 2 times a day for 5 days, or valacyclovir 500 mg PO 2 times a day for 5 days Daily suppressive therapy: acyclovir 400 mg PO 2 times a day, or famciclovir 250 mg PO 2 times a day, or valacyclovir 250 mg PO 2 times a day, 500 mg PO 1 time a day, or 1000 mg PO 1 time a day
Human papilloma virus	Clinical appearance of condyloma papules Cytology	External warts: Patient may apply podofilox 0.5% solution or gel 2 times a day for 3 days, followed by 4 days of no therapy, for a total of up to 4 cycles, or imiquimod 5% cream at bedtime 3 times a week for up to 16 weeks. Cryotherapy with liquid nitrogen or cryoprobe, repeat every 1-2 weeks; or podophyllin, repeat weekly; or TCA 80-90%, repeat weekly; or surgical removal. Vaginal warts: cryotherapy with liquid nitrogen, or TCA 80-90%, or podophyllin 10-25%
Human immunodeficiency virus	Enzyme immunoassay Western blot (for confirmation) Polymerase chain reaction	Antiretroviral agents

Treatment of Pelvic Inflammatory Disease		
Regimen	**Inpatient**	**Outpatient**
A	Cefotetan (Cefotan) 2 g IV q12h; or cefoxitin (Mefoxin) 2 g IV q6h plus doxycycline 100 mg IV or PO q12h.	Ofloxacin (Floxin) 400 mg PO bid for 14 days plus metronidazole 500 mg PO bid for 14 days.
B	Clindamycin 900 mg IV q8h plus gentamicin loading dose IV or IM (2 mg/kg of body weight), followed by a maintenance dose (1.5 mg/kg) q8h.	Ceftriaxone (Rocephin) 250 mg IM once; or cefoxitin 2 g IM plus probenecid 1 g PO; or other parenteral third-generation cephalosporin (eg, ceftizoxime, cefotaxime) plus doxycycline 100 mg PO bid for 14 days.

I. Chlamydia Trachomatis

A. Chlamydia trachomatis is the most prevalent STI in the United States. Chlamydial infections are most common in women age 15-19 years.

B. Routine screening of asymptomatic, sexually active adolescent females undergoing pelvic examination is recommended. Annual screening should be done for women age 20-24 years who are either inconsistent users of barrier contraceptives or who acquired a new sex partner or had more than one sexual partner in the past 3 months.

II. Gonorrhea. Gonorrhea has an incidence of 800,000 cases annually. Routine screening for gonorrhea is recommended among women at high risk of infection, including prostitutes, women with a history of repeated episodes of gonorrhea, women under age 25 years with two or more sex partners in the past year, and women with mucopurulent cervicitis.

III. Syphilis

A. Syphilis has an incidence of 100,000 cases annually. The rates are highest in the South, among African Americans, and among those in the 20- to 24-year-old age group.

B. Prostitutes, persons with other STIs, and sexual contacts of persons with active syphilis should be screened.

IV. Herpes simplex virus and human papillomavirus

A. An estimated 200,000-500,000 new cases of herpes simplex occur annually in the United States. New infections are most common in adolescents and young adults.

B. Human papillomavirus affects about 30% of young, sexually active individuals.

References: See page 311.

Pelvic Inflammatory Disease

Pelvic inflammatory disease (PID) is an acute infection of the upper genital tract in women, involving any or all of the uterus, oviducts, and ovaries. PID is a community-acquired infection initiated by a sexually transmitted agent. Pelvic inflammatory disease accounts for approximately 2.5 million outpatient visits and 200,000 hospitalizations annually.

I. Clinical evaluation

A. Lower abdominal pain is the cardinal presenting symptom in women with PID, although the character of the pain may be quite subtle. The onset of pain during or shortly after menses is particularly suggestive. The abdominal pain is usually bilateral and rarely of more than two weeks' duration.

B. Abnormal uterine bleeding occurs in one-third or more of patients with PID. New vaginal discharge, urethritis, proctitis, fever, and chills can be associated signs.

C. Risk factors for PID:

1. Age less than 35 years
2. Nonbarrier contraception
3. New, multiple, or symptomatic sexual partners
4. Previous episode of PID
5. Oral contraception
6. African-American ethnicity

II. Physical examination

A. Only one-half of patients with PID have fever. Abdominal examination reveals diffuse tenderness greatest in the lower quadrants, which may or may not be symmetrical. Rebound tenderness and decreased bowel sounds are common. Tenderness in the right upper quadrant does not exclude PID, because approximately 10 percent of these patients have perihepatitis (Fitz-Hugh Curtis syndrome).

B. Purulent endocervical discharge and/or acute cervical motion and adnexal tenderness by bimanual examination is strongly suggestive of PID. Rectovaginal examination should reveal the uterine adnexal tenderness.

III. Diagnosis

A. Diagnostic criteria and guidelines. The index of suspicion for the clinical diagnosis of PID should be high, especially in adolescent women.

B. The CDC has recommended minimum criteria required for empiric treatment of PID. These major determinants include lower abdominal tenderness, adnexal tenderness, and cervical motion tenderness. Minor determinants (ie, signs that may increase the suspicion of PID) include:

1. Fever (oral temperature >101°F; >38.3°C)
2. Vaginal discharge
3. Documented STD
4. Erythrocyte sedimentation rate (ESR)
5. C-reactive protein
6. Systemic signs
7. Dyspareunia

C. Empiric treatment for pelvic inflammatory disease is recommended when:

1. The examination suggests PID
2. Demographics (risk factors) are consistent with PID
3. Pregnancy test is negative

Laboratory Evaluation for Pelvic Inflammatory Disease

- Pregnancy test
- Microscopic exam of vaginal discharge in saline
- Complete blood counts
- Tests for chlamydia and gonococcus
- Urinalysis
- Fecal occult blood test
- C-reactive protein(optional)

IV. Diagnostic testing

A. Laboratory testing for patients suspected of having PID always begins with a pregnancy test to rule out ectopic pregnancy and complications of an intrauterine pregnancy. A urinalysis and a stool for occult blood should be obtained because abnormalities in either reduce the probability of PID. Blood counts have limited value. Fewer than one-half of PID patients exhibit leukocytosis.

B. Gram stain and microscopic examination of vaginal discharge may provide useful information. If a cervical Gram stain is positive for Gram-negative intracellular diplococci, the probability of PID greatly increases; if negative, it is of little use.

C. Increased white blood cells (WBC) in vaginal fluid may be the most sensitive single laboratory test for PID (78 percent for >3 WBC per high power field. However, the specificity is only 39 percent.

D. Recommended laboratory tests:

1. Pregnancy test
2. Microscopic exam of vaginal discharge in saline
3. Complete blood counts
4. Tests for chlamydia and gonococcus
5. Urinalysis
6. Fecal occult blood test
7. C-reactive protein(optional)

E. Ultrasound imaging is reserved for acutely ill patients with PID in whom a pelvic abscess is a consideration.

V. Recommendations

A. Health care providers should maintain a low threshold for the diagnosis of PID, and sexually active young women with lower abdominal, adnexal, and cervical motion tenderness should receive empiric treatment. The specificity of these clinical criteria can be enhanced by the presence of fever, abnormal cervical/vaginal discharge, elevated ESR and/or serum C-reactive protein, and the demonstration of cervical gonorrhea or chlamydia infection.

B. If clinical findings (epidemiologic, symptomatic, and physical examination) suggest PID empiric treatment should be initiated.

Differential Diagnosis of Pelvic Inflammatory Disease

Appendicitis	Irritable bowel syndrome
Ectopic pregnancy	Somatization
Hemorrhagic ovarian cyst	Gastroenteritis
Ovarian torsion	Cholecystitis
Endometriosis	Nephrolithiasis
Urinary tract Infection	

VI. Treatment of pelvic inflammatory disease

A. The two most important initiators of PID, Neisseria gonorrhoeae and Chlamydia trachomatis, must be treated, but coverage should also be provided for groups A and B

streptococci, Gram negative enteric bacilli (Escherichia coli, Klebsiella spp., and Proteus spp.), and anaerobes.

B. Outpatient therapy

1. For outpatient therapy, the CDC recommends either oral ofloxacin (Floxin, 400 mg twice daily) or levofloxacin (Levaquin, 500 mg once daily) with or without metronidazole (Flagyl, 500 mg twice daily) for 14 days. An alternative is an initial single dose of ceftriaxone (Rocephin, 250 mg IM), cefoxitin (Mefoxin, 2 g IM plus probenecid 1 g orally), or another parenteral third-generation cephalosporin, followed by doxycycline (100 mg orally twice daily) with or without metronidazole for 14 days. Quinolones are not recommended to treat gonorrhea acquired in California or Hawaii. If the patient may have acquired the disease in Asia, Hawaii, or California, cefixime or ceftriaxone should be used.
2. Another alternative is azithromycin (Zithromax, 1 g PO for Chlamydia coverage) and amoxicillin-clavulanate (Amoxicillin, 875 mg PO) once by directly observed therapy, followed by amoxicillin-clavulanate (Amoxicillin, 875 mg PO BID) for 7 to 10 days.

C. Inpatient therapy

1. For inpatient treatment, the CDC suggests either of the following regimens:
   a. **Cefotetan (Cefotan)**, 2 g IV Q12h, or cefoxitin (Mefoxin, 2 g IV Q6h) plus doxycycline (100 mg IV or PO Q12h)
   b. **Clindamycin (Cleocin)**, 900 mg IV Q8h, plus gentamicin (1-1.5 mg/kg IV q8h)
2. **Alternative regimens:**
   a. **Ofloxacin (Floxin)**, 400 mg IV Q12h or levofloxacin (Levaquin, 500 mg IV QD) with or without metronidazole (Flagyl, 500 mg IV Q8h). Quinolones are not recommended to treat gonorrhea acquired in California or Hawaii. If the patient may have acquired the disease in Asia, Hawaii, or California, cefixime or ceftriaxone should be used.
   b. **Ampicillin-sulbactam (Unasyn)**, 3 g IV Q6h plus doxycycline (100 mg IV or PO Q12h)
3. Parenteral administration of antibiotics should be continued for 24 hours after clinical response, followed by doxycycline (100 mg PO BID) or clindamycin (Cleocin, 450 mg PO QID) for a total of 14 days.
4. **The following regimen may also be used: Levofloxacin (Levaquin)**, 500 mg IV Q24h, plus metronidazole (Flagyl, 500 mg IV Q8h). With this regimen, azithromycin (Zithromax, 1 g PO once) should be given as soon as the patient is tolerating oral intake. Parenteral therapy is continued until the pelvic tenderness on bimanual examination is mild or absent.

D. Annual screening is recommended for all sexually active women under age 25 and for women over 25 if they have new or multiple sexual partners. A retest for chlamydia should be completed in 3 to 4 months after chlamydia treatment because of high rates of reinfection.

E. Additional evaluation:

1. Serology for the human immunodeficiency virus (HIV)
2. Papanicolaou smear
3. Hepatitis B surface antigen determination and initiation of the vaccine series for patients who are antigen negative and unvaccinated
4. Hepatitis C virus serology
5. Serologic tests for syphilis

References: See page 311.

Vaginitis

Approximately 8-18% of women reported an episode of vaginal symptoms in the previous year. The etiology of vaginal complaints includes infection of the vagina, cervix, and upper genital tract, chemicals or irritants (eg, spermicides or douching), hormone deficiency, and rarely systemic diseases.

I. Clinical evaluation

A. Symptoms of vaginitis include vaginal discharge, pruritus, irritation, soreness, odor, dyspareunia and dysuria. Dyspareunia is a common feature of atrophic vaginitis. Abdominal pain is suggestive of pelvic inflammatory disease and suprapubic pain is suggestive of cystitis.

B. A new sexual partner increases the risk of acquiring sexually transmitted diseases, such as trichomonas, chlamydia, or Neisseria gonorrheae. Trichomoniasis often occurs during or immediately after the menstrual period; candida vulvovaginitis often occurs during the premenstrual period.

C. Antibiotics and high-estrogen oral contraceptive pills may predispose to candida vulvovaginitis; increased physiologic discharge can occur with oral contraceptives; pruritus unresponsive to antifungal agents suggests vulvar dermatitis.

II. Physical examination

A. The vulva usually appears normal in bacterial vaginosis. Erythema, edema, or fissure formation suggest candidiasis, trichomoniasis, or dermatitis. Trichomonas is associated with a purulent discharge; candidiasis is associated with a thick, adherent, “cottage cheese-like” discharge; and bacterial vaginosis is associated with a thin, homogeneous, “fishy smelling” discharge. The cervix in women with cervicitis is usually erythematous and friable, with a mucopurulent discharge. Abdominal or cervical motion tenderness is suggestive of PID.

III. Diagnostic studies

A. Vaginal pH. Measurement of vaginal pH should always be determined. The pH of the normal vaginal secretions is 4.0 to 4.5. A pH above 4.5 suggests bacterial vaginosis or trichomoniasis (pH 5 to 6), and helps to exclude candida vulvovaginitis (pH 4 to 4.5).

B. Saline microscopy should look for candidal buds or hyphae, motile trichomonads, epithelial cells studded with adherent

coccobacilli (clue cells), and polymorphonuclear cells (PMNs). The addition of 10% potassium hydroxide to the wet mount is helpful in diagnosing candida vaginitis. Culture for candida and trichomonas may be useful if microscopy is negative.

C. Cervical culture. A diagnosis of cervicitis, typically due to Neisseria gonorrhoeae or Chlamydia trachomatis, must always be considered in women with purulent vaginal discharge. The presence of high-risk behavior or any sexually transmitted disease requires screening for HIV, hepatitis B, and other STDs.

Clinical Manifestations of Vaginitis	
Candidal Vaginitis	Nonmalodorous, thick, white, "cottage cheese-like" discharge that adheres to vaginal walls Hyphal forms or budding yeast cells on wet-mount Pruritus Normal pH (<4.5)
Bacterial Vaginosis	Thin, dark or dull grey, homogeneous, malodorous discharge that adheres to the vaginal walls Elevated pH level (>4.5) Positive KOH (whiff test) Clue cells on wet-mount microscopic evaluation
Trichomonas Vaginalis	Copious, yellow-gray or green, homogeneous or frothy, malodorous discharge Elevated pH level (>4.5) Mobile, flagellated organisms and leukocytes on wet-mount microscopic evaluation Vulvovaginal irritation, dysuria
Atrophic Vaginitis	Vaginal dryness or burning

IV. Bacterial vaginosis

A. Incidence. Bacterial vaginosis is the most common cause of vaginitis in women of childbearing age, with prevalence of 5-60%.

B. Microbiology and risk factors. Bacterial vaginosis represents a change in vaginal flora characterized by a reduction of lactobacilli and an increase of Gardnerella vaginalis, Mobiluncus species, Mycoplasma hominis, anaerobic gram-negative rods, and Peptostreptococcus species. Risk factors for bacterial vaginosis include multiple or new sexual partners, early age of first coitus, douching, cigarette smoking, and use of an intrauterine contraceptive device.

C. Clinical features. Symptoms include a “fishy smelling” discharge that is more noticeable after unprotected intercourse. The discharge is off-white, thin, and homogeneous. Pruritus and inflammation are absent.

D. Complications

1. Pregnant women appear to be at higher risk of preterm delivery.
2. Bacterial vaginosis may cause plasma-cell endometritis, postpartum fever, post-hysterectomy vaginal-cuff cellulitis, and postabortal infection.
3. Bacterial vaginosis is a risk factor for HIV acquisition and transmission.

E. Diagnosis. Three of the four criteria listed below are necessary for diagnosis.

1. Homogeneous, grayish-white discharge
2. Vaginal pH greater than 4.5
3. Positive whiff-amine test, defined as the presence of a fishy odor when 10% KOH is added to vaginal discharge samples
4. Clue cells on saline wet mount (epithelial cells studded with coccobacilli)

F. Therapy. Treatment is indicated in women with symptomatic infection and those with asymptomatic infection prior to abortion or hysterectomy.

1. Metronidazole or clindamycin administered either orally or intravaginally will result in a high rate of clinical cure (70-80% at 4 weeks of follow-up). Oral medication is more convenient, but associated with a higher rate of systemic side effects than vaginal administration.
2. The oral regimen is 500 mg twice daily for 7 days. Topical vaginal therapy with 0.75% metronidazole gel (MetroGel, 5 g once daily for 5 days) is as effective as oral metronidazole.
3. Single-dose therapy with 2 g of metronidazole achieves a similar immediate rate of clinical response and is considered an alternative, slightly less effective regimen.
4. Side effects of metronidazole include a metallic taste, nausea, a disulfiram-like effect with alcohol, interaction with warfarin, and peripheral neuropathy.
5. Topical vaginal therapy with 2% clindamycin cream (5 g once daily for 7 days) appears to be less effective than the metronidazole regimens but is a reasonable choice. Pseudomembranous colitis has been reported with topical clindamycin. Clindamycin cream should not be used with condoms, which may be weakened.

G. Relapse

1. Approximately 30% of patients have a recurrence within three months. Recurrence usually reflects a failure to eradicate the offending organisms. Management of symptomatic relapse includes prolonged therapy for 10 to 14 days.
2. Most women with a history of recurrent infection benefit from suppressive therapy with metronidazole gel 0.75% for 10 days, followed by twice-weekly applications for three to six months.

V. Candida vulvovaginitis

A. Incidence. Candida vulvovaginitis accounts for one-third of vaginitis. Up to 75% of women report having had at least one episode of candidiasis. The condition is rare before menarche. It is less common in postmenopausal women, unless they are taking estrogen replacement therapy.

B. Microbiology and risk factors. Candida albicans is responsible for 80-92% of vulvovaginal candidiasis. Sporadic attacks

of vulvovaginal candidiasis usually occur without an identifiable precipitating factor.

1. **Antibiotics.** A minority of women are prone to vulvovaginal candidiasis while taking antibiotics.
2. **Intrauterine devices** have been associated with vulvovaginal candidiasis.
3. **Pregnancy.** Symptomatic infection is more common in pregnancy.

C. **Clinical features.** Vulvar pruritus is the dominant feature. Women may also complain of dysuria (external rather than urethral), soreness, irritation, and dyspareunia. There is often little or no discharge; that which is present is typically white and clumpy. Physical examination often reveals erythema of the vulva and vaginal mucosa. The discharge is thick, adherent, and "cottage cheese-like."

D. **Diagnosis**

1. The vaginal pH is typically 4 to 4.5, which distinguishes candidiasis from Trichomonas or bacterial vaginosis. The diagnosis is confirmed by finding the organism on a wet mount; adding 10% potassium hydroxide facilitates recognition of budding yeast and hyphae. Microscopy is negative in 50% of patients with vulvovaginal candidiasis.
2. Empiric therapy is often considered in women with typical clinical features, a normal vaginal pH, and no other pathogens visible on microscopy. Culture should be performed in patients with persistent or recurrent symptoms.

E. **Therapy**

1. Women with mild infection usually respond to treatment within a couple of days. More severe infections require a longer course of therapy and may take up to 14 days to fully resolve.
2. **Uncomplicated infection.** Both oral and topical antimycotic drugs achieve comparable clinical cure rates that are in excess of 80%.
3. Oral azole agents are more convenient. Side effects of single-dose fluconazole (150 mg) tend to be mild and infrequent, including gastrointestinal intolerance, headache, and rash.

Treatment regimens for yeast vaginitis*

1-day regimens
Clotrimazole vaginal tablets (Mycelex G), 500 mg hs**
Fluconazole tablets (Diflucan), 150 mg PO
Itraconazole capsules (Sporanox), 200 mg PO bid
Tioconazole 6.5% vaginal ointment (Vagistat-1), 4.6 g hs** [5 g]

3-day regimens
Butoconazole nitrate 2% vaginal cream (Femstat 3), 5 g hs [28 g]
Clotrimazole vaginal inserts (Gyne-Lotrimin 3), 200 mg hs**
Miconazole vaginal suppositories (Monistat 3), 200 mg hs**
Terconazole 0.8% vaginal cream (Terazol 3), 5 g hs
Terconazole vaginal suppositories (Terazol 3), 80 mg hs
Itraconazole capsules (Sporanox), 200 mg PO qd (4)

5-day regimen
Ketoconazole tablets (Nizoral), 400 mg PO bid (4)

7-day regimens
Clotrimazole 1% cream (Gyne-Lotrimin, Mycelex-7, Sweet'n Fresh Clotrimazole-7), 5 g hs**
Clotrimazole vaginal tablets (Gyne-Lotrimin, Mycelex-7, Sweet'n Fresh Clotrimazole-7), 100 mg hs**
Miconazole 2% vaginal cream (Femizol-M, Monistat 7), 5 g hs**
Miconazole vaginal suppositories (Monistat 7), 100 mg hs**
Terconazole 0.4% vaginal cream (Terazol 7), 5 g hs

14-day regimens
Nystatin vaginal tablets (Mycostatin), 100,000 U hs
Boric acid No. 0 gelatin vaginal suppositories, 600 mg bid (2)

*Suppositories can be used if inflammation is predominantly vaginal; creams if vulvar; a combination if both. Cream-suppository combination packs available: clotrimazole (Gyne-Lotrimin, Mycelex); miconazole (Monistat, M-Zole). If diagnosis is in doubt, consider oral therapy to avoid amelioration of symptoms with use of creams. Use 1-day or 3-day regimen if compliance is an issue. Miconazole nitrate may be used during pregnancy.

**Nonprescription formulation. If nonprescription therapies fail, use terconazole 0.4% cream or 80-mg suppositories at bedtime for 7 days.

4. **Complicated infections.** Factors that predispose to complicated infection include uncontrolled diabetes, immunosuppression, and a history of recurrent vulvovaginal candidiasis. Women with severe inflammation or complicated infection require seven to 14 days of topical therapy or two doses of oral therapy 72 hours apart.

Management options for complicated or recurrent yeast vaginitis

Extend any 7-day regimen to 10 to 14 days
Eliminate use of nylon or tight-fitting clothing
Consider discontinuing oral contraceptives
Consider eating 8 oz yogurt (with Lactobacillus acidophilus culture) per day
Improve glycemic control in diabetic patients
For long-term suppression of recurrent vaginitis, use ketoconazole, 100 mg (½ of 200-mg tablet) qd for 6 months

5. **Partner treatment** is not necessary since this is not a primary route of transmission.
6. **Pregnancy.** Topical azoles applied for seven days are recommended for treatment during pregnancy.

F. **Women with recurrent infections should receive longer initial therapy** (10 to 14 days of a topical agent or fluconazole 150 mg orally with a repeat dose three days later). Antifungal maintenance suppressive therapy that should be taken for six months after an initial induction regimen include ketoconazole (100 mg per day), itraconazole (100 mg per day or 400 mg

once monthly), fluconazole (100 to 150 mg once per week), and clotrimazole (500 mg vaginal suppository once per week). Alternatively, fluconazole 200 mg orally may be given every three days until the patient is asymptomatic, with redosing weekly, tapered to every two weeks, and then every three to four weeks. Redosing once per month just before menses may be effective because this is when most patients flare. Patients receiving long-term ketoconazole should be monitored for hepatotoxicity.

VI. Trichomoniasis

A. Trichomoniasis, the third most common cause of vaginitis, is caused by the flagellated protozoan, Trichomonas vaginalis. The disorder is virtually always sexually transmitted.

B. Clinical features. Trichomoniasis in women ranges from an asymptomatic state to a severe, acute, inflammatory disease. Signs and symptoms include a purulent, malodorous, thin discharge (70%) with associated burning, pruritus, dysuria, and dyspareunia. Physical examination reveals erythema of the vulva and vaginal mucosa; the classic green-yellow frothy discharge is observed in 10-30%. Punctate hemorrhages may be visible on the vagina and cervix in 2%.

C. Complications. Infection is associated with premature rupture of the membranes and prematurity; however, treatment of asymptomatic infection has not been shown to reduce these complications. Trichomoniasis is a risk factor for development of post-hysterectomy cellulitis. The infection facilitates transmission of the human immunodeficiency virus.

D. Diagnosis

1. The presence of motile trichomonads on wet mount is diagnostic of infection, but this occurs in only 50-70% of cases. Other findings include an elevated vaginal pH (>4.5) and an increase in polymorphonuclear leukocytes on saline microscopy.

2. Culture on Diamond's medium has a 95% high sensitivity and should be considered in patients with elevated vaginal pH, increased numbers of polymorphonuclear leukocytes, and an absence of motile trichomonads and clue cells; rapid diagnostic kits using DNA probes and monoclonal antibodies have a sensitivity of 90%.

3. Trichomonads are often seen on conventional Papanicolaou smears, but false positive results are not uncommon (30%). Thus, asymptomatic women with Trichomonas identified on conventional Pap smear should not be treated until the diagnosis is confirmed by wet mount. Treatment of asymptomatic women with trichomonads noted on liquid-based cervical cytology is recommended.

E. Therapy is indicated in all nonpregnant women diagnosed with Trichomonas vaginitis and their sexual partner(s). Intercourse should not resume until both partners have completed treatment.

1. Metronidazole is the treatment of choice. Oral is preferred to local vaginal therapy since systemic administration achieves therapeutic drug levels in the urethra and periurethral glands. Sexual partners should also be treated.

2. Similar cure rates are obtained with oral metronidazole in a dose of 500 mg twice a day for seven days (cure rate, 85-90%) and a single 2 g oral dose (82-88%). Patients should be advised not to take alcohol for the duration of 48 hours after treatment because of the disulfiram-like (Antabuse effect) reaction.

Treatment options for trichomoniasis
Initial measures Metronidazole (Flagyl, Protostat), 2 g PO in a single dose, or metronidazole, 500 mg PO bid X 7 days, or metronidazole, 375 mg PO bid X 7 days Treat male sexual partners
Measures for treatment failure Treatment sexual contacts Re-treat with metronidazole, 500 mg PO bid X 7 days If infection persists, confirm with culture and re-treat with metronidazole, 2-4 g PO qd X 3-10 days

3. Pregnancy. Metronidazole is the drug of choice in pregnancy. Metronidazole 500 mg twice daily for 5-7 days is preferred to the 2 g single-dose regimen, but both regimens are acceptable. Treatment of asymptomatic infections is not recommended during pregnancy because it does not prevent preterm delivery.

4. Refractory cases. If treatment failure occurs, retreatment with metronidazole (500 mg PO twice a day for seven days) is recommended. If treatment failure recurs again, the woman should be treated with a single oral 2 g dose of oral metronidazole daily for 3-5 days.

VII. Other causes of vaginitis and vaginal discharge

A. Atrophic vaginitis

1. Reduced endogenous estrogen causes thinning of the vaginal epithelium. Symptoms include vaginal soreness, postcoital burning, dyspareunia, and occasional spotting. The vaginal mucosa is thin with diffuse erythema, occasional petechiae or ecchymoses, and few or no vaginal folds. There may be a serosanguineous or watery discharge with a pH of 5.0-7.0.

2. Treatment consists of topical vaginal estrogen. **Vaginal ring estradiol (Estring)**, a silastic ring impregnated with estradiol, is the preferred means of delivering estrogen to the vagina. The silastic ring delivers 6 to 9 µg of estradiol to the vagina daily. The rings are changed once every three months. Concomitant progestin therapy is not necessary.

3. Conjugated estrogens (Premarin), 0.5 gm of cream, or one-eighth of an applicatorful daily into the vagina for three weeks, followed by twice weekly thereafter is also effective. Concomitant progestin therapy is not necessary.

4. Estrace cream (estradiol) can also by given by vaginal applicator at a dose of one-eighth of an applicator or 0.5 g (which contains 50 µg of estradiol) daily into the vagina for

three weeks, followed by twice weekly thereafter. Concomitant progestin therapy is not necessary.

5. **Oral estrogen (Premarin)** 0.3 mg qd should also provide relief.

B. Desquamative inflammatory vaginitis

1. Chronic purulent vaginitis usually occurs perimenopausally, with diffuse exudative vaginitis, massive vaginal-cell exfoliation, purulent vaginal discharge, and occasional vaginal and cervical spotted rash. Laboratory findings included an elevated pH, increased numbers of parabasal cells, the absence of gram-positive bacilli and their replacement by gram-positive cocci on Gram staining. Clindamycin 2% cream is usually effective.

C. Noninfectious vaginitis and vulvitis

1. Noninfectious causes of vaginitis include irritants (eg, minipads, spermicides, povidone-iodine, topical antimycotic drugs, soaps and perfumes) and contact dermatitis (eg, latex condoms and antimycotic creams).
2. Typical symptoms, including pruritus, irritation, burning, soreness, and variable discharge, are most commonly confused with acute candida vaginitis. The diagnosis should be suspected in symptomatic women who do not have an otherwise apparent infectious cause.
3. Management of noninfectious vaginitis includes identifying and eliminating the offending agent. Sodium bicarbonate sitz baths and topical vegetable oils may provide some local relief. Topical corticosteroids are not recommended.

References: See page 311.

Gynecologic Oncology

Cervical Cancer

Invasive cervical carcinoma is the third most common cancer in the United States. The International Federation of Gynecology and Obstetrics (FIGO) recently revised its staging criteria. Survival rates for women with cervical cancer improve when radiotherapy is combined with cisplatin-based chemotherapy.

I. Clinical evaluation

A. Human papillomavirus is the most important factor contributing to the development of cervical intraepithelial neoplasia and cervical cancer. Other epidemiologic risk factors associated with cervical intraepithelial neoplasia and cervical cancer include history of sexual intercourse at an early age, multiple sexual partners, sexually transmitted diseases (including chlamydia), and smoking. Additional risk factors include a male partner or partners who have had multiple sexual partners; previous history of squamous dysplasias of the cervix, vagina, or vulva; and immunosuppression.

B. The signs and symptoms of early cervical carcinoma include watery vaginal discharge, intermittent spotting, and postcoital bleeding. Diagnosis often can be made with cytologic screening, colposcopically directed biopsy, or biopsy of a gross or palpable lesion. In cases of suspected microinvasion and early-stage cervical carcinoma, cone biopsy of the cervix is indicated to evaluate the possibility of invasion or to define the depth and extent of microinvasion. Cold knife cone biopsy provides the most accurate evaluation of the margins.

C. Histology. The two major histologic types of invasive cervical carcinomas are squamous cell carcinomas and adenocarcinomas. Squamous cell carcinomas comprise 80% of cases, and adenocarcinoma or adenosquamous carcinoma comprise approximately 15%.

II. Staging of cervical cancer

A. Histologic confirmation of invasive cervical cancer should be followed by a careful staging evaluation.

B. Physical examination. The cervix and entire vagina should be carefully inspected and palpated to identify overt tumors or subepithelial vaginal extension. Rectovaginal examination permits the best clinical assessment of tumor size and parametrial involvement. Palpation of the right upper quadrant and inguinal and supraclavicular lymph nodes is important to screen for metastatic disease.

C. Laboratory studies. Laboratory studies should include a complete blood count and renal and liver function tests.

Pretreatment Assessment of Women with Histologic Diagnosis of Cervical Cancer

History
Physical examination
Complete blood count, blood urea nitrogen, creatinine, hepatic function
Chest radiography
Intravenous pyelography or computed tomography of abdomen with intravenous contrast
Consider the following: barium enema, cystoscopy, rectosigmoidoscopy

Staging of Carcinoma of the Cervix Uteri: FIGO Nomenclature

Stage 0 Carcinoma in situ, cervical intraepithelial neoplasia Grade III

Stage I The carcinoma is strictly confined to the cervix (extension to the corpus would be disregarded).

- **Ia** Invasive carcinoma that can be diagnosed only by microscopy. All macroscopically visible lesions-even with superficial invasion-are allotted to Stage Ib carcinomas. Invasion is limited to a measured stromal invasion with a maximal depth of 5.0 mm and a horizontal extension of not more than 7.0 mm. Depth of invasion should not be more than 5.0 mm taken from the base of the epithelium of the original tissue-superficial or glandular. The involvement of vascular spaces-venous or lymphatic-should not change the stage allotment.
  - **Ia1** Measured stromal invasion of not more than 3.0 mm in depth and extension of not more than 7.0 mm
  - **Ia2** Measured stromal invasion of more than 3.0 mm and not more than 5.0 mm with an extension of not more than 7.0 mm
- **Ib** Clinically visible lesions limited to the cervix uteri or preclinical cancers greater than Stage Ia
  - **Ib1** Clinically visible lesions not more than 4.0 cm
  - **Ib2** Clinically visible lesions more than 4.0 cm

Stage II Cervical carcinoma invades beyond the uterus, but not to the pelvic wall or to the lower third of the vagina

- **IIa** No obvious parametrial involvement
- **IIb** Obvious parametrial involvement

Stage III The carcinoma has extended to the pelvic wall. On rectal examination, there is no cancer-free space between the tumor and the pelvic wall. The tumor involves the lower third of the vagina. All cases with hydronephrosis or nonfunctioning kidney are included, unless they are known to be due to other causes.

- **IIIa** Tumor involves lower third of the vagina, with no extension to the pelvic wall
- **IIIb** Extension to the pelvic wall or hydronephrosis or nonfunctioning kidney

Stage IV The carcinoma has extended beyond the true pelvis, or has involved (biopsy proved) the mucosa of the bladder or rectum. Bullous edema, as such, does not permit a case to be allotted to Stage IV.

- **IVa** Spread of the growth to adjacent organs (bladder or rectum or both)
- **IVb** Spread to distant organs

Guidelines for Clinical Staging of Invasive Cervical Carcinoma
Examinations should include inspection, palpation, colposcopy, endocervical curettage, hysteroscopy, cystoscopy, proctoscopy, intravenous pyelography, and X-ray examination of lungs and skeleton.
Conization of the cervix is considered a clinical examination.
Suspected bladder or rectal involvement should be confirmed histologically.
If there is a question about the most appropriate stage, the earlier stage should be assigned.

III. FIGO staging systems

A. The International Federation of Gynecologists and Obstetricians (FIGO) staging system is based upon clinical evaluation. This examination should be performed under anesthesia whenever necessary.

B. Based upon FIGO guidelines, the following examinations are appropriate to establish the stage of disease: palpation and inspection of the primary tumor, palpation of groin and supraclavicular lymph nodes, colposcopy, endocervical curettage, conization, hysteroscopy, cystoscopy, proctoscopy, intravenous pyelogram (IVP), and radiographic examination of the lungs and skeleton.

C. Chest X-rays are indicated in all patients with cervical cancer, and imaging of the urinary tract (IVP, magnetic resonance or computed tomography urogram) should be carried out in all patients with more than microscopic cervical cancer. Suspected rectal or bladder involvement requires confirmation by biopsy.

IV. Optional evaluation procedures. Although they are not used to assign disease stage in the FIGO classification, optional staging examinations, including computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET), lymphangiography, ultrasonography, or laparoscopy, may be of value for planning treatment, particularly the extent of the radiation therapy (RT) field or scope of surgery.

A. MRI is the preferred modality to provide information about tumor size, degree of stromal penetration, nodal metastasis, and local tissue extension. Positive findings should be histologically confirmed by fine needle aspiration under CT guidance.

V. Surgical evaluation. Although cervical cancer is staged clinically, the results of surgical staging can be used for treatment planning. The staging procedure can be performed through a laparotomy (transperitoneal or extraperitoneal) or laparoscopically. Surgical staging allows for a complete pelvic and paraaortic lymphadenectomy. Nodal tissue obtained at the time of surgery can detect microscopic disease. Staging offers an opportunity to resect bulky metastatic lymph nodes and allows for individualization of the radiation field. In premenopausal women, oophoropexy can be done at the same time to protect the ovaries from radiation damage.

VI. Treatment of microinvasive cervical cancer. According to the FIGO criteria, patients with stage Ia 1 carcinoma could be treated with simple hysterectomy without nodal dissection or conization in selected cases. Those patients with invasion greater than 3 mm and no greater than 5 mm (stage Ia2) should undergo radical hysterectomy and pelvic lymphadenectomy. Although lymphatic-vascular invasion should not alter the FIGO stage, it is an important factor in treatment decisions. The risk of recurrence with lymphatic-vascular involvement is 3.1% if the extent of invasion is 3 mm or less and 15.7% if it is greater than 3 mm and no greater than 5 mm. Therefore, the presence of lymphatic-vascular invasion would suggest the need for more radical treatment.

VII. Treatment of early-stage (Ib-IIa) carcinoma

A. Both treatment strategies for stage Ib and early-stage IIa invasive carcinoma include 1) a primary surgical approach with radical hysterectomy and pelvic lymphadenectomy or 2) primary radiation therapy with external beam radiation and either high-dose-rate or low-dose-rate brachytherapy. The 5-year survival rate is 87-92% using either approach.

B. Radical surgery leaves the vagina in more functional condition, while radiation therapy results in a reduction in length, caliber, and lubrication of the vagina. In premenopausal women, ovarian function can be preserved with surgery. The surgical approach also provides the opportunity for pelvic and abdominal exploration and provides better clinical and pathologic information with which to individualize treatment.

VIII. Adjuvant therapy following primary surgery in early-stage carcinoma

A. Patients with histologically documented extracervical disease (pelvic nodal involvement, positive margins, or parametrial extension) are treated with concurrent pelvic radiation therapy and cisplatin-based chemotherapy. The use of combined adjuvant chemotherapy and radiation therapy in these high-risk patients following primary surgery significantly improves relapse-free survival and overall survival rates when compared with radiation therapy alone.

B. Following radical hysterectomy, a subset of node-negative patients who have a constellation of primary risk factors (large tumors, depth of stromal infiltration, and lymphovascular space involvement) may be defined as having intermediate risk for relapse. For these patients, adjuvant pelvic radiation therapy provides clear therapeutic benefit, with significantly improved relapse-free survival rates when compared with those who had no further therapy.

IX. Treatment of late-stage carcinoma (IIb or later). Cisplatin is usually administered weekly as a single agent because of its ease of delivery and favorable toxicity profile. Women with locally advanced cervical cancer in North America should receive cisplatin-based chemotherapy concurrent with radiation therapy.

X. Long term monitoring. Approximately 35% of patients will have persistent or recurrent disease. A common approach includes examinations and Pap tests every 3-4 months for the first 3 years, decreasing to twice yearly in the fourth and fifth years, with and chest X-rays annually for up to 5 years.

References: See page 311.

Endometrial Cancer

Uterine cancer is the most common malignant neoplasm of the female genital tract and the fourth most common cancer in women. About 6,000 women in the United States die of this disease each year. It is more frequent in affluent and white, especially obese, postmenopausal women of low parity. Hypertension and diabetes mellitus are also predisposing factors.

I. Risk factors

A. Any characteristic that increases exposure to unopposed estrogen increases the risk for endometrial cancer. Conversely, decreasing exposure to estrogen limits the risk. Unopposed estrogen therapy, obesity, anovulatory cycles and estrogen-secreting neoplasms all increase the amount of unopposed estrogen and thereby increase the risk for endometrial cancer. Smoking seems to decrease estrogen exposure, thereby decreasing the cancer risk, and oral contraceptive use increases progestin levels, thus providing protection.

B. Hormone replacement therapy. Unopposed estrogen treatment of menopause is associated with an eightfold increased incidence of endometrial cancer. The addition of progestin decreases this risk dramatically.

Risk Factors for Endometrial Cancer

Unopposed estrogen exposure
Median age at diagnosis: 59 years
Menstrual cycle irregularities, specifically menorrhagia and menometrorrhagia
Postmenopausal bleeding
Chronic anovulation
Nulliparity
Early menarche (before 12 years of age)
Late menopause (after 52 years of age)
Infertility
Tamoxifen (Nolvadex) use
Granulosa and thecal cell tumors
Ovarian dysfunction
Obesity
Diabetes mellitus
Arterial hypertension with or without atherosclerotic heart disease
History of breast or colon cancer

II. Clinical evaluation

A. Ninety percent of patients with endometrial cancer have abnormal vaginal bleeding, usually presenting as menometrorrhagia in a perimenopausal woman or menstrual-like bleeding in a woman past menopause. Perimenopausal women relate a history of intermenstrual bleeding, excessive bleeding lasting longer than seven days or an interval of less than 21 days between menses. Heavy, prolonged bleeding in patients known to be at risk for anovulatory cycles should prompt histologic evaluation of the endometrium. The size, contour, mobility and position of the uterus should be noted.

B. Patients who report abnormal vaginal bleeding and have risk factors for endometrial cancer should have histologic evaluation of the endometrium. Premenopausal patients with amenorrhea for more than six to 12 months should be offered endometrial sampling, especially if they have risk factors associated with excessive estrogen exposure. Postmenopausal women with vaginal bleeding who either are not on hormonal replacement therapy or have been on therapy longer than six months should be evaluated by endometrial sampling.

C. Endometrial sampling

1. In-office sampling of the endometrial lining may be accomplished with a Novak or Kevorkian curet, the Pipelle endometrial-suction curet, or the Vabra aspirator. Before having an in-office biopsy, the patient should take a preoperative dose of a nonsteroidal anti-inflammatory drug (NSAID). With the patient in the lithotomy position, a speculum is inserted in the vaginal canal. The cervix should be cleansed with a small amount of an antiseptic solution. After 1 mL of a local anesthetic is infused into the anterior lip of the cervix, a tenaculum is placed. The paracervical block is then performed using 1 or 2 percent lidocaine (Xylocaine) without epinephrine.

2. The cannula is then placed in the uterus and placement is confirmed with the help of the centimeter markings along the cannula. The inner sleeve is then pulled back while the cannula is held within the cavity. This generates a vacuum in the cannula that can be used to collect endometrial tissue for diagnosis. Moving the cannula in and out of the cavity no more than 2 to 3 cm with each stroke while turning the cannula clockwise or counterclockwise is helpful in obtaining specimens from the entire cavity.

III. Treatment of endometrial cancer

A. The treatment of endometrial cancer is usually surgical, such as total abdominal hysterectomy, bilateral salpingo-oophorectomy and evaluation for metastatic disease, which may include pelvic or para-aortic lymphadenectomy, peritoneal cytologic examination and peritoneal biopsies. The extent of the surgical procedure is based on the stage of disease, which can be determined only at the time of the operation.

Staging for Carcinoma of the Corpus Uteri

Stage*	Description
IA (G1, G2, G3)	Tumor limited to endometrium
IB (G1, G2, G3)	Invasion of less than one half of the myometrium
IC (G1, G2, G3)	Invasion of more than one half of the myometrium
IIA (G1, G2, G3)	Endocervical gland involvement
IIB (G1, G2, G3)	Cervical stromal involvement
IIIA (G1, G2, G3)	Invasion of serosa and/or adnexa and/or positive peritoneal cytologic results
IIIB (G1, G2, G3)	Metastases to vagina
IIIC (G1, G2, G3)	Metastases to pelvic and/or para-aortic lymph nodes
IVA (G1, G2, G3)	Invasion of bladder and/or bowel mucosa
IVB	Distant metastases including intra-abdominal and/or inguinal lymph nodes

*--Carcinoma of the corpus is graded (G) according to the degree of histologic differentiation: G1 = 5 percent or less of a solid growth pattern; G2 = 6 to 50 percent of a solid growth pattern; G3 = more than 50 percent of a solid growth pattern.

B. For most patients whose cancers have progressed beyond stage IB grade 2, postoperative radiation therapy is recommended. Because tumor response to cytotoxic chemotherapy has been poor, chemotherapy is used only for palliation.

C. Endometrial hyperplasia with atypia should be treated with hysterectomy except in extraordinary cases. Progestin treatment is a possibility in women younger than 40 years of age who refuse hysterectomy or who wish to retain their childbearing potential, but an endometrial biopsy should be performed every three months. Treatment of atypical hyperplasia and well-differentiated endometrial cancer with progestins in women younger than 40 years of age results in complete regression of disease in 94 percent and 75 percent, respectively.

D. Patients found to have hyperplasia without atypia should be treated with progestins and have an endometrial biopsy every three to six months.

IV. Serous and clear cell adenocarcinomas

A. These cancers are considered in a separate category from endometrioid adenocarcinomas. They have a worse prognosis overall. Patients with serious carcinomas have a poorer survival. The 3 year survival is 40% for stage I disease.

B. Serous and clear cell carcinomas are staged like ovarian cancer. A total abdominal hysterectomy and bilateral salpingo-oophorectomy, lymph node biopsy, and omental biopsy/omentectomy are completed. Washings from the pelvis, gutters and diaphragm are obtained, and the diaphragm is sampled and peritoneal biopsies completed.

References: See page 311.

Ovarian Cancer

Ovarian cancer is the second most common gynecologic malignancy, but the most common cause of death among women who develop gynecologic cancer, and it is the fifth most common cancer in females. The majority (90 percent) of primary ovarian tumors derive from epithelial cells, although they can also arise from germ cell tumors, sex cord-stromal tumors, and mixed cell type tumors.

I. Clinical manifestations

A. Most ovarian cancers are diagnosed between the ages of 40 and 65. Symptoms of early stage disease are often vague. Acute symptoms due to ovarian rupture or torsion are unusual. As a result, 75 to 85 percent of cases of ovarian cancer are advanced at the time of diagnosis. More advanced disease is typically associated with abdominal distention, nausea, anorexia, or early satiety due to the presence of ascites and omental or bowel metastases.

B. Most women have nonspecific symptoms, such as lower abdominal discomfort or pressure, gas, bloating, constipation, irregular menstrual cycles/abnormal vaginal bleeding, low-back pain, fatigue, nausea, indigestion, urinary frequency, or dyspareunia.

II. Physical examination

A. Palpation of an asymptomatic adnexal mass during a routine pelvic examination is the usual presentation for ovarian cancer. The presence of a solid, irregular, fixed pelvic mass on pelvic examination is highly suggestive of an ovarian malignancy. However, endometriomas and tubo-ovarian abscesses are benign tumors that may be fixed, while cystadenofibromas and tubo-ovarian abscesses are benign masses that feel irregular. The diagnosis of malignancy is almost certain if a fixed, irregular pelvic mass is associated with an upper abdominal mass or ascites.

Differential Diagnosis of Adnexal Masses in Women

Extraovarian mass Ectopic pregnancy Hydosalpinx or tuboovarian abscess Paraovarian cyst Peritoneal inclusion cyst	Pedunculated fibroid Diverticular abscess Appendiceal abscess
Ovarian mass Simple or hemorrhagic physiologic cysts (eg, follicular, corpus luteum) Endometrioma	Theca lutein cysts Benign or malignant neoplasms (eg, epithelial, germ cell, sex-cord) Metastatic carcinoma (eg, breast, colon, endometrium)

III. Diagnostic evaluation

A. The finding of a pelvic mass usually requires surgery for definitive histologic diagnosis. Tumor markers (eg, serum CA 125) and ultrasound examination can help distinguish between malignant and benign pelvic masses.

B. A complete pelvic examination and assessment of cervical cytology should be performed preoperatively. Routine hematologic and biochemical assessments should be obtained prior to surgery. Ultrasonography for diagnosis of ovarian malignancy has a sensitivity of 62 to 100 percent and a specificity of 77 to 95 percent.

C. It is reasonable to pursue a period of observation in a premenopausal woman with an adnexal mass if the mass is not clinically suspicious on ultrasonography. Adnexal masses that are mobile, purely cystic, unilateral, less than 8 to 10 cm in diameter, and have smooth internal and external contours by ultrasound are highly unlikely to be malignant and can be followed for two months; the majority of physiologic cysts will regress during this time.

D. Exploration is indicated if there is no resolution within two months. However, women who have solid, fixed, irregularly shaped, or large masses should undergo surgery. A mass that increases in size or does not regress must be presumed to be neoplastic and should be removed surgically.

E. The threshold for surgical intervention is lower in postmenopausal women; those with cysts greater than 3 cm should undergo exploratory surgery, laparotomy, or laparoscopy.

F. **Tumor markers. CA 125:** The preoperative evaluation of a woman with suspected ovarian cancer should include measurement of the CA 125 concentration. The serum CA 125 (normal <35 U/mL) is elevated (>65 U/mL) in 80 percent of women with epithelial ovarian cancer. It is also increased in patients with other malignancies, including endometrial cancer and certain pancreatic cancers; in endometriosis, uterine leiomyoma, and pelvic inflammatory disease; and in approximately 1 percent of healthy women.

IV. Staging

A. Surgery is necessary for diagnosis, accurate staging and optimal cytoreduction, and is crucial for the successful treatment of EOC. Ovarian malignancies are surgically staged according to the 2002 revised American Joint Committee on Cancer (AJCC) and International Federation of Gynecologic Oncologists (FIGO) joint staging system, as long as the patient is an appropriate surgical candidate.

Definitions of the Stages in Primary Carcinoma of the Ovary

Stage	Definition
I	Growth is limited to the ovaries
IA	Growth is limited to one ovary; no ascites present containing malignant cells; no tumor on the external surface; capsule is intact
IB	Growth is limited to both ovaries; no ascites present containing malignant cells; no tumor on the external surfaces; capsules are intact
IC	Tumor is classified as either stage IA or IB but with tumor on the surface of one or both ovaries; or with ruptured capsule(s); or with ascites containing malignant cells present or with positive peritoneal washings
II	Growth involves one or both ovaries with pelvic extension
IIA	Extension and/or metastases to the uterus and/or tubes
IIB	Extension to other pelvic tissues
IIC	Tumor is either stage IIA or IIB but with tumor on the surface of one or both ovaries; or with capsule(s) ruptured; or with ascites containing malignant cells present or with positive peritoneal washings

Stage	Definition
III	Tumor involves one or both ovaries with peritoneal implants outside the pelvis and/or positive retroperitoneal or inguinal nodes; superficial liver metastasis equals stage III; tumor is limited to the true pelvis but with histologically proven malignant extension to small bowel or omentum
IIIA	Tumor is grossly limited to the true pelvis with negative nodes but with histologically confirmed microscopic seeding of abdominal peritoneal surfaces
IIIB	Tumor involves one or both ovaries with histologically confirmed implants of abdominal peritoneal surfaces, none exceeding 2 cm in diameter; nodes are negative
IIIC	Abdominal implants greater than 2 cm in diameter and/or positive retroperitoneal or inguinal nodes
IV	Growth involves one or both ovaries with distant metastases; if pleural effusion is present, there must be positive cytology findings to assign a case to stage IV; parenchymal liver metastasis equals stage IV

B. Procedure

1. The staging procedure is usually approached through a laparotomy incision. Any free fluid in the cul-de-sac is submitted for cytologic evaluation. Washings of the peritoneal cavity are obtained by instilling and removing 50 to 100 mL of saline. The affected adnexa should be removed intact and a frozen section obtained to determine or confirm the diagnosis. Thorough surgical staging should be carried out in the absence of obvious stage IV disease. Preservation of the uterus and a normal appearing contralateral adnexa is an option in women desirous of maintaining future fertility.
2. All intraperitoneal surfaces should be carefully inspected and suspicious areas or adhesions should be biopsied. If there is no evidence of disease, multiple intraperitoneal biopsies should be performed, including from the cul-de-sac, both gutters, bladder peritoneum, and bowel mesentery.
3. The diaphragm is evaluated by either biopsy or cytologic smear. A complete omentectomy should be performed.
4. The retroperitoneal spaces are explored to dissect the pelvic and paraaortic lymph nodes. Any enlarged lymph nodes should be resected and submitted separately for histopathologic evaluation.
5. For patients with advanced disease, optimal cytoreduction (debulking) should be attempted at the time of initial surgery. The majority of women with EOC (except for those with stage I disease) will require surgery and chemotherapy.

V. Treatment of ovarian cancer

A. Cytoreductive surgery improves response to chemotherapy and survival of women with advanced ovarian cancer. Operative management is designed to remove as much tumor as possible. When a malignant tumor is present, a thorough abdominal exploration, total abdominal hysterectomy, bilateral salpingo-oophorectomy, lymphadenectomy, omentectomy, and removal of all gross cancer are standard therapy.

B. Adjuvant therapy

1. Patients with stage IA or IB disease (who have been completely surgically staged) and who have borderline, well- or moderately differentiated tumors do not benefit from additional chemotherapy because their prognosis is excellent with surgery alone.
2. Chemotherapy improves survival and is an effective means of palliation of ovarian cancer. In patients who are at increased risk of recurrence (stage I G3 and all IC-IV), chemotherapy is recommended. Sequential clinical trials of chemotherapy agents demonstrate that cisplatin (or carboplatin) given in combination with paclitaxel is the most active combination identified.

References: See page 311.

Breast Cancer

One of 8 women will develop breast cancer. The risk of breast cancer increases with age; approximately half of new cases occur in women aged 65 years or older. Two percent of 40- to 49-year-old women in the United States develop breast cancer during the fifth decade of their lives, and 0.3% die from breast cancer. Breast cancer is the most common malignancy in American women, and the second most lethal malignancy in women, following lung cancer.

I. Risk Factors

A. Major risk factors for breast cancer include: 1) early menarche, 2) nulliparity, 3) delayed childbirth, 4)increasing age, 5) race, and 6) family history.

Risk Factors for Breast Cancer
Major Risk Factors
Early menarche
Nulliparity
Delayed childbirth
Increasing age
Race
Family history

Risk Factors for Breast Cancer

Other Risk Factors

Late menopause
Obesity
Weight gain
Increased intra-abdominal fat (android body habitus)
Lack of regular exercise
Elevated serum estradiol
Elevated free testosterone levels
A previous premalignant breast biopsy
Radial scars in benign breast biopsies
A history of breast cancer
Exposure to ionizing radiation
Higher bone mineral density
Smoking
Alcohol consumption
Elevated insulin-like growth factor- I (IGF- I) levels
Increased mammographic density
Oral contraceptives

Familial Risk Factors for Breast Cancer

More than 50% of women in family have breast cancer
Breast cancer present in more than I generation
Multiple occurrences of breast cancer (>3) in close relatives
Onset at less than age 45 years
History of bilateral breast cancer
High rate of co-existing ovarian cancer
BRCA1 gene mutation

B. Nulliparity and increased age at first pregnancy are associated with an increased risk for breast cancer. Nulliparity alone accounts for 16% of new cases of breast cancer each year. The relative risk for breast cancer increases with advancing age.

C. Race is an independent risk factor. While white women are at an increased risk for breast cancer, African American women with breast cancer have higher fatality rates and a later stage at diagnosis.

D. A family history of breast cancer, especially in first-degree relatives, increases the risk.

E. A history of breast cancer increases a woman's risk for subsequent breast cancers. If the woman has no family history of breast cancer, then the initial occurrence was sporadic, and the incidence for developing a second breast cancer is 1% per year. If the initial occurrence was hereditary, the incidence for developing a second breast cancer is 3% per year. Approximately 10% of women with breast cancer will develop a second primary breast cancer.

F. Familial or Genetic Risk Factors. A mutation in a tumor-suppresser gene occurs in 1 of 400 women and is located on chromosome 17q. Carriers of a BRCA1 mutation have an 85% lifetime risk of developing breast cancer. In addition, the risk of colon and ovarian cancers is also increased (40% to 50%) in these groups. The 70% of breast cancer patients who do not have inherited mutations on BRCA1 have mutations on BRCA2. The cumulative lifetime risk of breast cancer in a woman with the BRCA2 mutation is 87%.

G. Conclusions. Seventy-five percent of women with newly diagnosed breast cancer demonstrate no specific, identifiable risk factor. Most premenopausal breast cancer cases are genetically determined. In contrast, many post-menopausal cases are environmentally related.

II. Screening Guidelines

A. Breast Self-Examination. All women older than age 20 years should perform regular monthly breast self-examinations. Menstruating women should examine their breasts in the first 7 to 10 days of the menstrual cycle.

Breast Screening Criteria

Age	Clinical Breast Examination	Mammography
30-39	Every 1-3 years	None
40-49	Annual	Optional 1-2 years
$\geq$ 50	Annual	Annual

Women aged 50 to 69 years should be offered mammography and receive a clinical breast examination every 1 to 2 years.

B. Clinical Breast Examination (CBE) is recommended every 1 to 3 years for women aged 30 to 39 years and annually for those aged 40 years and older.

C. Mammography alone is 75% sensitive, and, when combined with CBE, the screening sensitivity for detecting breast cancer increases to 88%. Screening guidelines from the US Preventive Services Task Force suggest mammography alone or with CBE every 1 to 2 years for women aged 50 to 69 years. Recent evidence suggests a benefit from annual mammography with or without CBE for women aged 40 to 49 years.

III. History and physical examination

A. In the woman with a suspicious breast mass, risk factors and a family history of breast cancers should be assessed. A personal history of radiation to the chest or breast, breast masses, biopsies, history of collagen vascular disease, and menstrual and gynecologic history are also important. Symptoms of nipple discharge, pain, skin changes, or rashes may occur.

B. On physical examination, the breast mass should be palpated for size, position, adherence of the tumor to the skin or chest wall, density, fluctuance, and tenderness. In addition, both breasts and axillae should be examined for other tumors and any lymph nodes. A search for supraclavicular lymph nodes should also be conducted.

C. Any evidence of skin changes, ulceration, peau d'orange (thickening of skin to resemble an orange skin), or lymphedema is suspicious for locally advanced cancer.

D. Immediate mammography should be obtained. A white blood count, hematocrit, and erythrocyte sedimentation rate may be needed if cancer is found.

IV. Diagnosis

A. The definitive diagnosis is made by pathological evaluation of tissue.

B. A combination of clinical breast examination, mammography, and fine-needle aspiration and biopsy may be sufficient to make a diagnosis. If all studies are "benign," there is a greater than 99% chance that a benign breast lesion is present.

C. Open biopsy in the operating room or wire-localization of a suspicious lesion noted on mammography may be necessary if fine-needle aspiration and biopsy is nondiagnostic. Biopsy by stereo-tactic technique in radiology also may be used to obtain tissue for diagnosis of the suspicious area.

V. Definition and classification of breast cancer for staging

A. The definition for staging and the classification of stages for breast cancer follow the system of the International Union Against Cancer. This system is based on the tumor, nodes, and metastases (TNM) nomenclature.

Definitions for Breast Cancer Staging	
Tumor	
TIS	Carcinoma in situ (intraductal carcinoma, Iobular)
T0	No evidence of primary tumor
T1	Tumor ≤2 cm in greatest dimension
T2	Tumor >2 cm but <5 cm in greatest dimension
T3	Tumor >5 cm in greatest dimension
T4	Tumor of any size with direct extension into chest wall or skin
Nodes	
N0	No regional lymph node metastases
N1	Metastases to movable ipsilateral axillary node(s)
N2	Metastases to ipsilateral axillary lymph node(s), fixed to one another or other structures
Metastases	
M0	No distant metastases
M I	Metastases to movable ipsilateral axillary node(s); metastases to ipsilateral axillary lymph node(s); fixed to one another or other structures; or metastases to ipsilateral internal mammary lymph node(s); distant metastases
Classification of Breast Cancer Staging	
Stage	Description*
0	TIS, N0, M0
I	TI, N0, M0
IIA	T0, NI, M0
IIB	T2, NI, M0, or T3, N0, M0
IIIA	T0, N2, M0, or TI, N2, M0, or T2, N2, M0, or T3, NI, or N2, M0
IIIB	T4, any N, M0 or any T, N3
IV	Any T, any N, MI
*Tumor/nodes/metastases	

B. The HER-2 gene (c-erbB-2, HER-2/neu) has been identified, and the HER-2 receptor is correlated with aggressive biological behavior of the cancer and a poor clinical outcome.

C. The staging of breast cancer dictates not only the prognosis but also directs treatment modality recommendations. The prognosis for women is based on their age, tumor type, initial tumor size, presence of nodes and staging, and hormone-receptor status. The overall 10-year survival rates for the more common breast cancer stages are greater than 90% for stage 0, greater than 75% for stage I, greater than 50% for stage IIA, and approximately 50% for stage IIB.

VI. Treatment of breast cancer

A. Treatment choices for ductal carcinoma in situ, a stage 0 cancer, include 1) mastectomy, 2) lumpectomy followed by radiation therapy, or 3) lumpectomy followed by radiation therapy and then tamoxifen if the tumor is estrogen-receptor test positive.

B. Surgical Treatment

1. Several long-term studies show that conservative therapy and radiation result in at least as good a prognosis as radical mastectomy. Skin-sparing mastectomy involves removing all the breast tissue, the nipple, and the areolar complex. The remainder of the surface skin tissue remains intact. Reconstruction is then completed with a natural-appearing breast. This procedure is considered

for those women with ductal carcinoma in situ or T1 or T2 invasive carcinomas. Because a mastectomy leaves 3.5% of the breast tissue behind, the recurrence rate for this procedure is comparable with a modified radical mastectomy.

2. Local excision of the tumor mass (lumpectomy) followed by lymph node staging and subsequent adjuvant hormone therapy, chemotherapy, or radiation therapy is an accepted treatment. Long-term studies have found that recurrence rates are similar when lumpectomy was compared with radiation therapy and mastectomy. One study showed no recurrence if 1-cm margins were obtained followed by the use of radiation therapy.

C. Radiation Therapy. External beam radiation therapy has proven effective in preventing recurrence of breast cancer and for palliation of pain. The risk of relapse after radiation therapy ranges from 4% to 10%. Lumpectomy can now be performed followed by implantation of high-dose brachytherapy catheters.

D. Anti-Hormonal Therapy. Hormonal therapy is indicated for those tumors that test positive for hormone receptors. Tamoxifen has both estrogenic and anti-estrogenic effects. In women who are older than 50 years with breast cancers that test positive for hormone receptors, tamoxifen use produces a 20% increase in 5-year survival rates. The response rate in advanced cases increases to 35%.

E. Chemotherapy

1. Chemotherapy is used in women at risk for metastatic disease. Cytotoxic agents used include methotrexate, fluorouracil, cyclophosphamide (Cytoxan, Neosar), doxorubicin, mitoxantrone (Novantrone), and paclitaxel (Taxol). In the management of stage 0 disease, chemotherapy is not used initially.
2. Stage I and stage II disease are treated with chemotherapy based on the relative risk of systemic recurrence. This risk is often based on the woman's age, axillary lymph node involvement, tumor size, hormone receptor status, histologic tumor grade, and cellular aggressiveness. Systemic chemotherapy is recommended for women with stage I disease who have node-negative cancers and a tumor size greater than 1 cm in diameter.
3. Women with stage IIA breast cancer are treated with adjuvant chemotherapy with or without tamoxifen. Some women with positive lymph nodes are placed on chemotherapy, including doxorubicin, fluorouracil, and methotrexate.
4. In women with stage III breast cancer, similar agents are selected. Doxorubicin is particularly useful in treating inflammatory breast cancer. In women with stage IIIB cancer, chemotherapy is usually administered before primary surgery or radiation therapy. High-dose chemotherapy plus stem-cell transplantation does not improve survival rates. In women with stage IV disease, chemotherapy is useful in treating metastatic breast cancer.

References: See page 311.

Obstetrics

Prenatal Care

I. Prenatal history and physical examination

A. Diagnosis of pregnancy

1. **Amenorrhea** is usually the first sign of conception. Other symptoms include breast fullness and tenderness, skin changes, nausea, vomiting, urinary frequency, and fatigue.
2. **Pregnancy tests.** Urine pregnancy tests may be positive within days of the first missed menstrual period. Serum beta human chorionic gonadotropin (HCG) is accurate up to a few days after implantation.
3. **Fetal heart tones** can be detected as early as 11-12 weeks from the last menstrual period (LMP) by Doppler. The normal fetal heart rate is 120-160 beats per minute.
4. **Fetal movements** ("quickening") are first felt by the patient at 17-19 weeks.
5. **Ultrasound** will visualize a gestational sac at 5-6 weeks and a fetal pole with movement and cardiac activity by 7-8 weeks. Ultrasound can estimate fetal age accurately if completed before 24 weeks.
6. **Estimated date of confinement.** The mean duration of pregnancy is 40 weeks from the LMP. Estimated date of confinement (EDC) can be calculated by Nägele's rule: Add 7 days to the first day of the LMP, then subtract 3 months.

B. Contraceptive history. Recent oral contraceptive usage often causes postpill amenorrhea, and may cause erroneous pregnancy dating.

C. Gynecologic and obstetric history

1. Gravidity is the total number of pregnancies. Parity is expressed as the number of term pregnancies, preterm pregnancies, abortions, and live births.
2. The character and length of previous labors, type of delivery, complications, infant status, and birth weight are recorded.
3. Assess prior cesarean sections and determine type of C-section (low transverse or classical), and determine reason it was performed.

D. Medical and surgical history and prior hospitalizations are documented.

E. Medications and allergies are recorded.

F. Family history of medical illnesses, hereditary illness, or multiple gestation is sought.

G. Social history. Cigarettes, alcohol, or illicit drug use.

H. Review of systems. Abdominal pain, constipation, headaches, vaginal bleeding, dysuria or urinary frequency, or hemorrhoids.

Basic Prenatal Medical History	
Endocrine disorder Thyroid Adrenal Diabetes	Autoimmune disorder Systemic lupus erythematosus Rheumatoid arthritis
Cardiovascular disease Hypertension Arrhythmia Congenital anomalies Rheumatic Fever Thromboembolic disease	History of blood transfusion Pulmonary disease Asthma Tuberculosis
Kidney disease Pyelonephritis Urinary tract infections Anomalies	Breast disorders Infectious diseases Herpes Gonorrhea Chlamydia Syphilis HIV
Neurologic or muscular disorders Seizure disorder Aneurysm Arteriovenous malformation	Gynecologic history Abnormal PAP smear Genital tract disease or procedures
Gastrointestinal disease Hepatitis Gall bladder disease Inflammatory bowel disease	Surgical procedures Allergies Medications Substance abuse Alcohol Cigarettes Illicit drugs

Current Pregnancy History	
Medications taken Alcohol use Cigarette use Illicit drug use Exposure to radiation	Vaginal bleeding Nausea, vomiting, weight loss Infections Exposure to toxic substances

Initial Prenatal Assessment of past Obstetrical History	
Date of delivery Gestational age at delivery Location of delivery Sex of child Birth weight Mode of delivery	Type of anesthesia Length of labor Outcome (miscarriage, stillbirth, ectopic, etc.) Details (eg, type of cesarean section scar, forceps, etc.) Complications (maternal, fetal child)

I. Physical examination

1. Weight, funduscopic examination, thyroid, breast, lungs, and heart are examined.
2. An extremity and neurologic exam are completed, and the presence of a cesarean section scar is sought.
3. **Pelvic examination**
   - **a.** Pap smear and culture for gonorrhea are completed routinely. Chlamydia culture is completed in high-risk patients.
   - **b. Estimation of gestational age by uterine size**
     - **(1)** The nongravid uterus is 3 x 4 x 7 cm. The uterus begins to change in size at 5-6 weeks.
     - **(2)** Gestational age is estimated by uterine size: 8 weeks = 2 x normal size; 10 weeks = 3 x normal; 12 weeks = 4 x normal.
     - **(3)** At 12 weeks the fundus becomes palpable at the symphysis pubis.
     - **(4)** At 16 weeks, the uterus is midway between the symphysis pubis and the umbilicus.
     - **(5)** At 20 weeks, the uterus is at the umbilicus. After 20 weeks, there is a correlation between the number of weeks of gestation and the number of centimeters from the pubic symphysis to the top of the fundus.
     - **(6)** Uterine size that exceeds the gestational dating by 3 or more weeks suggests multiple gestation, molar pregnancy, or (most commonly) an inaccurate date for LMP. Ultrasonography will confirm inaccurate dating or intrauterine growth failure.
   - **c.** Adnexa are palpated for masses.

II. Initial visit laboratory testing

A. Routine. A standard panel of laboratory tests should be obtained on every pregnant woman at the first prenatal visit. Chlamydia screening is recommended for all pregnant women.

Initial Prenatal Laboratory Examination	
Blood type and antibody screen Rhesus type Hematocrit or hemoglobin PAP smear Rubella status (immune or nonimmune) Syphilis screen	Urinary infection screen Hepatitis B surface antigen HIV counseling and testing Chlamydia

B. Human immunodeficiency virus
1. HIV testing is recommended for all pregnant women.
2. Retesting in the third trimester (around 36 weeks of gestation) is recommended for women at high risk for acquiring HIV infection.

C. At-risk women should receive additional tests:
1. Gonorrhea, tuberculosis and red cell indices to screen for thalassemia (eg, MCV <80), hemoglobin electrophoresis to detect hemoglobinopathies (eg, sickle cell, thalassemias)
2. Hexosaminidase A for Tay Sachs screening (serum test in nonpregnant and leukocyte assay in pregnant individuals), DNA analysis for Canavan's disease, cystic fibrosis carrier testing, serum phenylalanine level, toxoplasmosis screen, and Hepatitis C antibodies.
3. Testing for sexually transmitted diseases (eg, HIV, syphilis, hepatitis B surface antigen, chlamydia, gonorrhea) should be repeated in the third trimester in any woman at high risk for acquiring these infections; all women under age 25 years should be retested for Chlamydia trachomatis late in pregnancy.

D. CBC, AB blood typing and Rh factor, antibody screen, rubella, VDRL/RPR, hepatitis B surface Ag.

E. Pap smear, urine pregnancy test, urinalysis and urine culture. Cervical culture for gonorrhea and chlamydia.

F. Tuberculosis skin testing, HIV counseling/testing.

G. Hemoglobin electrophoresis is indicated in risks groups, such as sickle hemoglobin in African patients, B-thalassemia in Mediterranean patients, and alpha-thalassemia in Asian patients. Tay-Sachs carrier testing is indicated in Jewish patients.

III. Initial patient education

A. Frequency of prenatal visits, recommendations for nutrition, weight gain, exercise, rest, and sexual activity, routine pregnancy monitoring (eg, weight, urine dipstick, blood pressure, uterine growth, fetal activity and heart rate), listeria precautions, toxoplasmosis precautions (eg, hand washing, eating habits, cat care) should be discussed.

B. Abstinence from alcohol, cigarettes, illicit drugs should be assessed. Information on the safety of commonly used nonprescription drugs, signs and symptoms to be reported should be discussed, as appropriate for gestational age (eg, vaginal bleeding, ruptured membranes, contractions, decreased fetal activity).

C. Headache and backache. Acetaminophen (Tylenol) 325-650 mg every 3-4 hours is effective. Aspirin is contraindicated.

D. Nausea and vomiting. First-trimester morning sickness may be relieved by eating frequent, small meals, getting out of bed slowly after eating a few crackers, and by avoiding spicy or greasy foods. Promethazine (Phenergan) 12.5-50 mg PO q4-6h prn or diphenhydramine (Benadryl) 25-50 mg tid-qid is useful.

E. Constipation. A high-fiber diet with psyllium (Metamucil), increased fluid intake, and regular exercise should be advised. Docusate (Colace) 100 mg bid may provide relief.

IV. Nutrition, vitamins, and weight gain

A. All pregnant women should be encouraged to eat a well-balanced diet. Folic acid is recommended in the preconceptional and early prenatal period to prevent neural tube defects (NTDs). A standard prenatal multivitamin satisfies the requirements of most pregnant women.

B. Nutritional recommendations for pregnant women are based upon the prepregnancy body mass index (BMI). A weight gain of 12.5 to 18 kg (28 to 40 lb) for underweight women

(BMI<19.8), 7 to 11.5 kg (15 to 25 lb) for overweight women (BMI ≥26), and 11.5 to 16 kg (25 to 35 lb) for women of average weight (BMI 19.8 to 26.0) is recommended.

V. Clinical assessment at first trimester prenatal visits

A. Routine examination at each subsequent visit consists of measurement of blood pressure and weight, measurement of the uterine fundus to assess fetal growth, auscultation of fetal heart tones, and determination of fetal presentation and activity. The urine is typically screened for protein and glucose at each visit.

B. At 9 to 12 weeks the fetal heart usually can be heard by of gestation using a Doppler instrument. Transvaginal ultrasound can determine fetal viability as early as 5.5 to 6.5 weeks.

Frequency of Prenatal Care Visits in Low-Risk Pregnancies	
<28 weeks	Every month
28-36 weeks	Every 2 weeks
36-delivery	Every 1 week until delivery

VI. Clinical assessment at second trimester visits

A. Questions for each follow-up visit

1. **First detection of fetal movement (quickening)** should occur at around 17 weeks in a multigravida and at 19 weeks in a primigravida. **Fetal movement** should be documented at each visit after 17 weeks.
2. **Vaginal bleeding or symptoms of preterm labor** should be sought.

B. Fetal heart rate is documented at each visit.

VII. Second-trimester laboratory

A. Maternal serum testing at 15-16 weeks

1. **Triple screen (**α-fetoprotein, human chorionic gonadotropin [hCG], estriol**).** In women under age 35 years, screening for fetal Down syndrome is accomplished with a triple screen. Maternal serum alpha-fetoprotein is elevated in 20-25% of all cases of Down syndrome, and it is elevated in fetal neural tube deficits. Levels of hCG are higher in Down syndrome and levels of unconjugated estriol are lower in Down syndrome.
2. If levels are abnormal, an ultrasound examination is performed and genetic amniocentesis is offered. The triple screen identifies 60% of Down syndrome cases. Low levels of all three serum analytes identifies 60-75% of all cases of fetal trisomy 18.

B. At 15-18 weeks, genetic amniocentesis should be offered to patients ≥35 years old, and it should be offered if a birth defect has occurred in the mother, father, or in previous offspring.

C. Screening ultrasound. Ultrasound measurement of crown-rump length at 7 to 14 weeks is the most accurate technique for estimation of gestational age; it is accurate within three to five days.

D. At 24-28 weeks, a one-hour Glucola (blood glucose measurement 1 hour after 50-gm oral glucose) is obtained to screen for gestational diabetes. Those with a particular risk (eg, previous gestational diabetes or fetal macrosomia), require earlier testing. If the 1 hour test result is greater than 140 mg/dL, a 3-hour glucose tolerance test is necessary.

E. Second trimester education. Discomforts include backache, round ligament pain, constipation, and indigestion.

VIII. Clinical assessment at third trimester visits

A. Fetal movement is documented. Vaginal bleeding or symptoms of preterm labor should be sought. Preeclampsia symptoms (blurred vision, headache, rapid weight gain, edema) are sought.

B. Fetal heart rate is documented at each visit.

C. At 26-30 weeks, repeat hemoglobin and hematocrit are obtained to determine the need for iron supplementation.

D. At 28-30 weeks, an antibody screen is obtained in Rh-negative women, and D immune globulin (RhoGAM) is administered if negative.

E. At 36 weeks, repeat serologic testing for syphilis is recommended for high risk groups.

F. Sexually transmitted disease. Testing for sexually transmitted diseases (eg, HIV, syphilis, hepatitis B surface antigen, chlamydia, gonorrhea) should be repeated in the third trimester in any woman at high risk for acquiring these infections; all women under age 25 years should be retested for Chlamydia trachomatis late in pregnancy.

G. Screening for group B streptococcus colonization at 35-37 weeks. All pregnant women should be screened for group B beta-hemolytic streptococcus (GBS) colonization with swabs of both the lower vagina and rectum at 35 to 37 weeks of gestation. The only patients who are excluded from screening are those with GBS bacteriuria earlier in the current pregnancy or those who gave birth to a previous infant with invasive GBS disease. These latter patients are not included in the screening recommendation because they should receive intrapartum antibiotic prophylaxis regardless of the colonization status.

H. Influenza immunization is recommended for women in the second and third trimesters and for high-risk women prior to influenza season regardless of stage of pregnancy.

I. Third trimester education

1. **Signs of labor.** The patient should call physician when rupture of membranes or contractions have occurred every 5 minutes for one hour.
2. **Danger signs.** Preterm labor, rupture of membranes, bleeding, edema, signs of preeclampsia.
3. **Common discomforts.** Cramps, edema, frequent urination.

J. At 36 weeks, a cervical exam may be completed. Fetal position should be assessed by palpation (Leopold's Maneuvers).

References: See page 311.

Normal Labor

Labor consists of the process by which uterine contractions expel the fetus. A term pregnancy is 37 to 42 weeks from the last menstrual period (LMP).

I. Obstetrical History and Physical Examination

A. History of the present labor

1. **Contractions.** The frequency, duration, onset, and intensity of uterine contractions should be determined. Contractions may be accompanied by a "bloody show" (passage of blood-tinged mucus from the dilating cervical os). Braxton Hicks contractions are often felt by patients during the last weeks of pregnancy. They are usually irregular, mild, and do not cause cervical change.
2. **Rupture of membranes.** Leakage of fluid may occur alone or in conjunction with uterine contractions. The patient may report a large gush of fluid or increased moisture. The color of the liquid should be determine, including the presence of blood or meconium.
3. **Vaginal bleeding** should be assessed. Spotting or blood-tinged mucus is common in normal labor. Heavy vaginal bleeding may be a sign of placental abruption.
4. **Fetal movement.** A progressive decrease in fetal movement from baseline, should prompt an assessment of fetal well-being with a nonstress test or biophysical profile.

B. History of present pregnancy

1. **Estimated date of confinement** (EDC) is calculated as 40 weeks from the first day of the LMP.
2. **Fetal heart tones** are first heard with a Doppler instrument 10-12 weeks from the LMP.
3. **Quickening** (maternal perception of fetal movement) occurs at about 17 weeks.
4. **Uterine size** before 16 weeks is an accurate measure of dates.
5. **Ultrasound** measurement of fetal size before 24 weeks of gestation is an accurate measure of dates.
6. **Prenatal history**. Medical problems during this pregnancy should be reviewed, including urinary tract infections, diabetes, or hypertension.
7. **Antepartum testing.** Nonstress tests, contraction stress tests, biophysical profiles.
8. **Review of systems.** Severe headaches, scotomas, hand and facial edema, or epigastric pain (preeclampsia) should be sought. Dysuria, urinary frequency or flank pain may indicate cystitis or pyelonephritis.

C. Obstetrical history. Past pregnancies, durations and outcomes, preterm deliveries, operative deliveries, prolonged labors, pregnancy-induced hypertension should be assessed.

D. Past medical history of asthma, hypertension, or renal disease should be sought.

II. Physical examination

A. Vital signs are assessed.

B. Head. Funduscopy should seek hemorrhages or exudates, which may suggest diabetes or hypertension. Facial, hand and ankle edema suggest preeclampsia.

C. Chest. Auscultation of the lungs for wheezes and crackles may indicate asthma or heart failure.

D. Uterine Size. Until the middle of the third trimester, the distance in centimeters from the pubic symphysis to the uterine fundus should correlate with the gestational age in weeks. Toward term, the measurement becomes progressively less reliable because of engagement of the presenting part.

E. Estimation of fetal weight is completed by palpation of the gravid uterus.

F. Leopold's maneuvers are used to determine the position of the fetus.

1. **The first maneuver** determines which fetal pole occupies the uterine fundus. The breech moves with the fetal body. The vertex is rounder and harder, feels more globular than the breech, and can be moved separately from the fetal body.
2. **Second maneuver.** The lateral aspects of the uterus are palpated to determine on which side the fetal back or fetal extremities (the small parts) are located.
3. **Third maneuver.** The presenting part is moved from side to side. If movement is difficult, engagement of the presenting part has occurred.
4. **Fourth maneuver.** With the fetus presenting by vertex, the cephalic prominence may be palpable on the side of the fetal small parts.

G. Pelvic examination. The adequacy of the bony pelvis, the integrity of the fetal membranes, the degree of cervical dilatation and effacement, and the station of the presenting part should be determined.

Labor History and Physical

Chief compliant: Contractions, rupture of membranes.
HPI: ___ year old Gravida (number of pregnancies) Para (number of deliveries).
Gestational age, last menstrual period, estimated date of confinement.
Contractions (onset, frequency, intensity), rupture of membranes (time, color). Vaginal bleeding (consistency, quantity, bloody show); fetal movement.
Fetal Heart Rate Strip: Baseline rate, accelerations, reactivity, decelerations, contraction frequency.
Dates: First day of last menstrual period, estimated date of confinement. Ultrasound dating.
Prenatal Care: Date of first exam, number of visits; has size been equal to dates? infections, hypertension, diabetes.
Obstetrical History: Dates of prior pregnancies, gestational age, route (C-section with indications and type of uterine incision), weight, complications, length of labor, hypertension.
Gynecologic History: Menstrual history (menarche, interval, duration), herpes, gonorrhea, chlamydia, abortions; oral contraceptives.
Past Medical History: Illnesses, asthma, hypertension, diabetes, renal disease, surgeries.
Medications: Iron, prenatal vitamins.
Allergies: Penicillin, codeine?
Social History: Smoking, alcohol, drug use.
Family History: Hypertension, diabetes, bleeding disorders.
Review of Systems: Severe headaches, scotomas, blurred vision, hand and face edema, epigastric pain, pruritus, dysuria, fever.

Physical Exam
General Appearance:
Vitals: BP, pulse, respirations, temperature.
HEENT: Funduscopy, facial edema, jugular venous distention.
Chest: Wheezes, rhonchi.
Cardiovascular: Rhythm, S1, S2, murmurs.
Abdomen: Fundal height, Leopold's maneuvers (lie, presentation). Estimated fetal weight (EFW), tenderness, scars.
Cervix: Dilatation, effacement, station, position, status of membranes, presentation. Vulvar herpes lesions.
Extremities: Cyanosis, clubbing, edema.
Neurologic: Deep tender reflexes, clonus.
Prenatal Labs: Obtain results of one hour post glucola, RPR/VDRL, rubella, blood type, Rh, CBC, Pap, PPD, hepatitis BsAg, UA, C and S.
Current Labs: Hemoglobin, hematocrit, glucose, UA; urine dipstick for protein.
Assessment: Intrauterine pregnancy (IUP) at 40 weeks, admitted with the following problems:
Plan: Anticipated type of labor and delivery. List plan for each problem.

H. Extremities. Severe lower extremity or hand edema suggests preeclampsia. Deep-tendon hyperreflexia and clonus may signal impending seizures.

I. Laboratory tests

1. Prenatal labs should be documented, including CBC, blood type, Rh, antibody screen, serologic test for syphilis, rubella antibody titer, urinalysis, culture, Pap smear, cervical cultures for gonorrhea and Chlamydia, and hepatitis B surface antigen (HbsAg).
2. During labor, the CBC, urinalysis and RPR are repeated. The HBSAG is repeated for high-risk patients. A clot of blood is placed on hold.

J. Fetal heart rate. The baseline heart rate, variability, accelerations, and decelerations are recorded.

III. Normal labor

A. Labor is characterized by uterine contractions of sufficient frequency, intensity, and duration to result in effacement and dilatation of the cervix.

B. The first stage of labor starts with the onset of regular contractions and ends with complete dilatation (10 cm). This stage is further subdivided into the latent and an active phases.

1. The latent phase starts with the onset of regular uterine contractions and is characterized by slow cervical dilatation to 4 cm. The latent phase is variable in length.
2. The active phase follows and is characterized by more rapid dilatation to 10 cm. During the active phase of labor, the average rate of cervical dilatation is 1.5 cm/hour in the multipara and 1.2 cm/hour in the nullipara.

C. The second stage of labor begins with complete dilatation of the cervix and ends with delivery of the infant. It is characterized by voluntary and involuntary pushing. The average second stage of labor is one-half hour in a multipara and 1 hour in the primipara.

D. The third stage of labor begins with the delivery of the infant and ends with the delivery of the placenta.

E. Intravenous fluids. IV fluid during labor is usually Ringer's lactate or 0.45% normal saline with 5% dextrose. Intravenous fluid infused rapidly or given as a bolus should be dextrose-free because maternal hyperglycemia can occur.

F. Activity. Patients in the latent phase of labor are usually allowed to walk.

G. Narcotic and analgesic drugs

1. Nalbuphine (Nubain) 5 to 10 mg SC or IV q2-3h.
2. Butorphanol (Stadol) 2 mg IM q3-4h or 0.5-1.0 mg IV q1.5-2.0h **OR**
3. Meperidine (Demerol) 50 to 100 mg IM q3-4h or 10 to 25 mg IV q1.5-3.0 h **OR**
4. Narcotics should be avoided if their peak action will not have diminished by the time of delivery. Respiratory depression is reversed with naloxone (Narcan): Adults, 0.4 mg IV or IM and neonates, 0.01 mg/kg.

H. Epidural anesthesia

1. Contraindications include infection in the lumbar area, clotting defect, active neurologic disease, sensitivity to the anesthetic, hypovolemia, and septicemia.
2. Risks include hypotension, respiratory arrest, toxic drug reaction, and rare neurologic complications. An epidural has no significant effect on the progress of labor.
3. Before the epidural is initiated, the patient is hydrated with 500-1000 mL of dextrose-free intravenous fluid.

Labor and Delivery Admitting Orders

Admit: Labor and Delivery
Diagnoses: Intrauterine pregnancy at ____ weeks.
Condition: Satisfactory
Vitals: q1 hr per routine
Activity: May ambulate as tolerated.
Nursing: I and O. Catheterize prn; external or internal monitors.
Diet: NPO except ice chips.
IV Fluids: Lactated Ringers with 5% dextrose at 125 cc/h.
Medications:
Epidural at 4-5 cm.
Nalbuphine (Nubain) 5-10 mg IV/SC q2-3h prn **OR**
Butorphanol (Stadol) 0.5-1 mg IV q1.5-2h prn **OR**
Meperidine (Demerol) 25-75 mg slow IV q1.5-3h prn pain **AND**
Promethazine (Phenergan) 25-50 mg, IV q3-4h prn nausea **OR**
Hydroxyzine (Vistaril) 25-50 mg IV q3-4h prn
Fleet enema PR prn constipation.
Labs: CBC, dipstick urine protein, blood type and Rh, antibody screen, VDRL, HBsAg, rubella, type and screen (C-section).

I. Intrapartum antibiotic prophylaxis for group B streptococcus is recommended for the following:
1. Pregnant women with a positive screening culture unless a planned Cesarean section is performed in the absence of labor or rupture of membranes
2. Pregnant women who gave birth to a previous infant with invasive GBS disease
3. Pregnant women with documented GBS bacteriuria during the current pregnancy
4. Pregnant women whose culture status is unknown (culture not performed or result not available) and who also have delivery at <37 weeks of gestation, amniotic membrane rupture for ≥18 hours, or intrapartum temperature ≥100.4ºF (≥38ºC)
5. The recommended IAP regimen is penicillin G (5 million units IV initial dose, then 2.5 million units IV Q4h). In women with non-immediate-type penicillin-allergy, cefazolin (Ancef, 2 g initial dose, then 1 g Q8h) is recommended. Clindamycin (900 mg IV Q8h) or erythromycin (500 mg IV Q6h) are recommended for patients at high risk for anaphylaxis to penicillins as long as their GBS isolate is documented to be susceptible to both clindamycin and erythromycin.

IV. Normal spontaneous vaginal delivery

A. Preparation. As the multiparous patient approaches complete dilatation or as the nulliparous patient begins to crown the fetal scalp, preparations are made for delivery.

B. Maternal position. The mother is usually placed in the dorsal lithotomy position with left lateral tilt.

C. Delivery of a fetus in an occiput anterior position

1. **Delivery of the head**
   - **a.** The fetal head is delivered by extension as the flexed head passes through the vaginal introitus.
   - **b.** Once the fetal head has been delivered, external rotation to the occiput transverse position occurs.
   - **c.** The oropharynx and nose of the fetus are suctioned with the bulb syringe. A finger is passed into the vagina along the fetal neck to check for a nuchal cord. If one is present, it is lifted over the vertex. If this cannot be accomplished, the cord is doubly clamped and divided.
   - **d.** If shoulder dystocia is anticipated, the shoulders should be delivered immediately.
2. **Episiotomy** consists of incision of the perineum, enlarging the vaginal orifice at the time of delivery. If indicated, an episiotomy should be performed when 3-4 cm of fetal scalp is visible.
   - **a.** With adequate local or spinal anesthetic in place, a medial episiotomy is completed by incising the perineum toward the anus and into the vagina.
   - **b.** Avoid cutting into the anal sphincter or the rectum. A short perineum may require a mediolateral episiotomy.
   - **c.** Application of pressure at the perineal apex with a towel-covered hand helps to prevent extension of the episiotomy.
3. **Delivery of the anterior shoulder** is accomplished by gentle downward traction on the fetal head. The posterior shoulder is delivered by upward traction.
4. **Delivery of the body.** The infant is grasped around the back with the left hand, and the right hand is placed, near the vagina, under the baby's buttocks, supporting the infant's body. The infant's body is rotated toward the operator and supported by the operator's forearm, freeing the right hand to suction the mouth and nose. The baby's head should be kept lower than the body to facilitate drainage of secretions.
5. **Suctioning** of the nose and oropharynx is repeated.
6. **The umbilical cord** is doubly clamped and cut, leaving 2-3 cm of cord.

D. Delivery of the placenta

1. The placenta usually separates spontaneously from the uterine wall within 5 minutes of delivery. Gentle fundal massage and gentle traction on the cord facilitates delivery of the placenta.
2. The placenta should be examined for missing cotyledons or blind vessels. The cut end of the cord should be examined for 2 arteries and a vein. The absence of one umbilical artery suggests a congenital anomaly.

3. Prophylaxis against excessive postpartum blood loss consists of external fundal massage and oxytocin (Pitocin), 20 units in 1000 mL of IV fluid at 100 drops/minute after delivery of the placenta. Oxytocin can cause marked hypotension if administered as a IV bolus.
4. After delivery of the placenta, the birth canal is inspected for lacerations.

Delivery Note

1. Note the age, gravida, para, and gestational age.
2. Time of birth, type of birth (spontaneous vaginal delivery), position (left occiput anterior).
3. Bulb suctioned, sex, weight, APGAR scores, nuchal cord, and number of cord vessels.
4. Placenta expressed spontaneously intact. Describe episiotomy degree and repair technique.
5. Note lacerations of cervix, vagina, rectum, perineum.
6. Estimated blood loss:
7. Disposition: Mother to recovery room in stable condition. Infant to nursery in stable condition.

Routine Postpartum Orders

Transfer: To recovery room, then postpartum ward when stable.
Vitals: Check vitals, bleeding, fundus q15min x 1 hr or until stable, then q4h.
Activity: Ambulate in 2 hours if stable
Nursing Orders: If unable to void, straight catheterize; sitz baths prn with 1:1000 Betadine prn, ice pack to perineum prn, record urine output.
Diet: Regular
IV Fluids: D5LR at 125 cc/h. Discontinue when stable and taking PO diet.
Medications:
Oxytocin (Pitocin) 20 units in 1 L D5LR at 100 drops/minute or 10 U IM.
FeS04 325 mg PO bid-tid.
Symptomatic Medications:
Acetaminophen/codeine (Tylenol #3) 1-2 tab PO q3-4h prn **OR**
Oxycodone/acetaminophen (Percocet) 1 tab q6h prn pain.
Milk of magnesia 30 mL PO q6h prn constipation.
Docusate Sodium (Colace) 100 mg PO bid.
Dulcolax suppository PR prn constipation.
A and D cream or Lanolin prn if breast feeding.
Breast binder or tight brazier and ice packs prn if not to breast feed.
Labs: Hemoglobin/hematocrit in AM. Give rubella vaccine if titer <1:10.

Active Management of Labor

The active management of labor refers to active control over the course of labor. There are three essential elements to active management are careful diagnosis of labor by strict criteria, constant monitoring of labor, and prompt intervention (eg, amniotomy, high dose oxytocin) if progress is unsatisfactory.

I. Criteria for active management of labor:
- **A.** Nulliparous
- **B.** Term pregnancy
- **C.** Singleton infant in cephalic presentation
- **D.** No pregnancy complications
- **E.** Experiencing spontaneous onset of labor.

II. Diagnosis of labor
- **A.** The diagnosis of labor is made only when contractions are accompanied by any one of the following:
  1. Bloody show
  2. Rupture of the membranes
  3. Full cervical effacement
- **B.** Women who meet these criteria are admitted to the labor unit.

III. Management of labor
- **A. Rupture of membranes**. Intact fetal membranes are artificially ruptured one hour after the diagnosis of labor is made to permit assessment of the quantity of fluid and the presence of meconium. Rupture of the membranes may accelerate labor.
- **B. Progress during the first stage of labor**
  1. Satisfactory progress in the first stage of labor is confirmed by cervical dilatation of at least 1 cm per hour after the membranes have been ruptured.
  2. In the absence of medical contraindications, labor that fails to progress at the foregoing rate is treated with oxytocin.
  3. **Progress during the second stage of labor** is measured by fetal descent and rotation.
     - **a.** The second stage of labor is divided into two phases: the first phase is the time from full dilatation until the fetal head reaches the pelvic floor; the second phase extends from the time the head reaches the pelvic floor to delivery of the infant.
     - **b.** The first phase of the second stage is characterized by descent of the fetal head. If the fetal head is high in the pelvis at full dilatation, the woman often has no urge to push and should not be encouraged to do so. Oxytocin treatment may be useful if the fetal head fails to descend after a period of observation.
- **C. Administration of oxytocin.** Oxytocin is administered for treatment of failure of labor to progress, unless its use is contraindicated. Oxytocin may only be administered if the following conditions are met:
  1. Fetal membranes are ruptured
  2. Absence of meconium in amniotic fluid
  3. Singleton fetus in a vertex position
  4. No evidence of fetal distress

High Dose Oxytocin (Pitocin) Regimen
Begin oxytocin 6 mU per minute IV Increase dose by 6 mU per minute every 15 minutes Maximum dose: 40 mU per minute

- **D. Failure to progress (dystocia)** is diagnosed when the cervix fails to dilate at least 1 cm per hour during the first stage of labor or when the fetal head fails to descend during the

second stage of labor. Three possible causes for failure to progress are possible (excluding malpresentations and hydrocephalus):
1. Inefficient uterine action
2. Occiput-posterior position
3. Cephalopelvic disproportion.

E. Inefficient uterine action is the most common cause of dystocia in the nulliparous gravida, especially early in labor. Secondary arrest of labor after previously satisfactory progress may be due to an occiput-posterior position or cephalopelvic disproportion. It is often difficult for the clinician to differentiate among these entities, thus oxytocin is administered in all cases of failure to progress (unless a contraindication exists).

F. In the first stage, progressive cervical dilatation of at least 1 cm per hour should occur within one hour of establishing efficient uterine contractions (five to seven contractions within 15 minutes) with oxytocin. The second stage is considered prolonged if it extends longer than two hours in women without epidural anesthesia and longer than three hours in women with epidural anesthesia despite adequate contractions and oxytocin augmentation.

References: See page 311.

Perineal Lacerations and Episiotomies

I. First-degree laceration

A. A first degree perineal laceration extends only through the vaginal and perineal skin.

B. Repair: Place a single layer of interrupted 3-O chromic or Vicryl sutures about 1 cm apart.

II. Second-degree laceration and repair of midline episiotomy

A. A second degree laceration extends deeply into the soft tissues of the perineum, down to, but not including, the external anal sphincter capsule. The disruption involves the bulbocavernosus and transverse perineal muscles.

B. Repair

1. Proximate the deep tissues of the perineal body by placing 3-4 interrupted 2-O or 3-O chromic or Vicryl absorbable sutures. Reapproximate the superficial layers of the perineal body with a running suture extending to the bottom of the episiotomy.
2. Identify the apex of the vaginal laceration. Suture the vaginal mucosa with running, interlocking, 3-O chromic or Vicryl absorbable suture.
3. Close the perineal skin with a running, subcuticular suture. Tie off the suture and remove the needle.

III. Third-degree laceration

A. This laceration extends through the perineum and through the anal sphincter.

B. Repair

1. Identify each severed end of the external anal sphincter capsule, and grasp each end with an Allis clamp.
2. Proximate the capsule of the sphincter with 4 interrupted sutures of 2-O or 3-O Vicryl suture, making sure the sutures do not penetrate the rectal mucosa.
3. Continue the repair as for a second degree laceration as above. Stool softeners and sitz baths are prescribed post-partum.

IV. Fourth-degree laceration

A. The laceration extends through the perineum, anal sphincter, and extends through the rectal mucosa to expose the lumen of the rectum.

B. Repair

1. Irrigate the laceration with sterile saline solution. Identify the anatomy, including the apex of the rectal mucosal laceration.
2. Approximate the rectal submucosa with a running suture using a 3-O chromic on a GI needle extending to the margin of the anal skin.
3. Place a second layer of running suture to invert the first suture line, and take some tension from the first layer closure.
4. Identify and grasp the torn edges of the external anal sphincter capsule with Allis clamps, and perform a repair as for a third-degree laceration. Close the remaining layers as for a second-degree laceration.
5. A low-residue diet, stool softeners, and sitz baths are prescribed post-partum.

References: See page 311.

Fetal Heart Rate Assessment

Fetal heart rate (FHR) assessment evaluates the fetal condition by identifying FHR patterns that may be associated with adverse fetal or neonatal outcome or are reassuring of fetal well-being.

I. Fetal monitoring techniques

A. Electronic fetal monitoring. The electronic fetal monitor determines the FHR and continuously records it in graphical form.

B. External fetal monitoring. The FHR is measured by focusing an ultrasound beam on the fetal heart. The fetal monitor interprets Doppler signals.

C. Internal fetal monitoring of FHR is an invasive procedure. A spiral electrode is inserted transcervically into the fetal scalp. The internal electrode detects the fetal (ECG) and calculates the fetal heart rate based upon the interval between R waves. This signal provides accurate measurement of beat-to-beat and baseline variability.

D. Biophysical profile. The biophysical profile (BPP) consists of electronic fetal heart rate evaluation combined with sonographically assessed fetal breathing movements, motor movement, gross fetal tone, and amniotic fluid volume.

II. Fetal heart rate patterns

A. The fetal heart rate pattern recorded by an electronic fetal monitor is categorized as reassuring or nonreassuring.

B. Reassuring fetal heart rate patterns

1. A baseline fetal heart rate of 120 to 160 bpm

2. Absence of FHR decelerations

3. Age appropriate FHR accelerations

4. Normal FHR variability (5 to 25 bpm).

C. Early decelerations (ie, shallow symmetrical decelerations in which the nadir of the deceleration occurs simultaneously with the peak of the contraction) and mild bradycardia of 100 to 119 bpm are caused by fetal head compression, and they are not associated with fetal acidosis or poor neonatal outcome.

D. The majority of fetal arrhythmias are benign and spontaneously convert to normal sinus rhythm by 24 hours after birth. Persistent tachyarrhythmias may cause fetal hydrops if present for many hours to days. Persistent bradyarrhythmias are often associated with fetal heart disease (eg, cardiomyopathy related to lupus), but seldom result in hypoxia or acidosis in fetal life.

E. FHR accelerations and mild variable decelerations are indicative of a normally functioning autonomic nervous system.

F. Nonreassuring fetal heart rate patterns

1. Nonreassuring FHR patterns are nonspecific and require further evaluation. The fetus may not be acidotic initially; however, continuation or worsening of the clinical situation may result in fetal acidosis.

2. Late decelerations are characterized by a smooth U-shaped fall in the fetal heart rate beginning after the contraction has started and ending after the contraction has ended. The nadir of the deceleration occurs after the peak of the contraction. Mild late decelerations are a reflex central nervous system response to hypoxia, while severe late decelerations suggest direct myocardial depression.

3. Sinusoidal heart rate is defined as a pattern of regular variability resembling a sine wave with a fixed periodicity of three to five cycles per minute and an amplitude of 5 to 40 bpm. The sinusoidal pattern is caused by moderate fetal hypoxemia, often secondary to fetal anemia.

4. Variable decelerations are characterized by the variable onset of abrupt slowing of the FHR in association with uterine contractions. Mild or moderate variable decelerations do not have a late component, are of short duration and depth, and end by rapid return to a normal baseline FHR. They are usually intermittent. This pattern is not associated with acidosis or low Apgar scores. Severe variable decelerations have a late component during which the fetal pH falls. They also may display loss of variability or rebound tachycardia and last longer than 60 seconds or fall to less than 70 bpm. They tend to become persistent and progressively deeper and longer lasting over time.

5. Fetal distress patterns

a. Fetal distress is likely to cause fetal or neonatal death or damage if left uncorrected. Fetal distress patterns are associated with fetal acidemia and hypoxemia.

b. Undulating baseline. Alternating tachycardia and bradycardia, often with reduced variability between the wide swings in heart rate.

c. Severe bradycardia. Fetal heart rate below 100 bpm for a prolonged period of time (ie, at least 10 minutes).

d. Tachycardia with diminished variability that is unrelated to drugs or additional non-reassuring periodic patterns (eg, late decelerations or severe variable decelerations)

III. Intrapartum fetal surveillance

A. Transient episodes of hypoxemia and hypoxia are generally well-tolerated by the fetus. Progressive or severe episodes may lead to fetal acidosis and subsequent asphyxia. One goal of intrapartum fetal surveillance is to distinguish the fetus with FHR abnormalities who is well compensated from one who is at risk for neurological impairment or death. Ancillary tests are useful for this purpose.

B. Ancillary tests

1. Fetal scalp stimulation. Fetal scalp stimulation is similar to the vibroacoustic stimulation test used antepartum. Absence of acidosis (ie, fetal pH greater than 7.20) is confirmed by elicitation of a FHR acceleration when an examiner stimulates the fetal vertex with the examining finger. Fetal scalp sampling is recommended to further evaluate positive test results.

2. Fetal scalp blood sampling. Capillary blood collected from the fetal scalp typically has a pH lower than arterial blood. A pH of 7.20 was initially thought to represent the critical value for identifying serious fetal stress and an increase in the incidence of low Apgar scores. The degree of technical skill required prohibits widespread use of this modality.

IV. Management of nonreassuring FHR patterns during labor

1. Determine the cause of the abnormality (eg, cord prolapse, maternal medication, abruption placenta)

2. Attempt to correct the problem or initiate measures to improve fetal oxygenation (eg, change maternal position, administer oxygen and intravenous fluids, consider amnioinfusion or tocolysis)

3. If the nonreassuring pattern does not resolve within a few minutes, perform ancillary tests to determine the fetal condition

4. Determine whether operative intervention is needed

B. The presence of accelerations almost always assures the absence of fetal acidosis. Therefore, if such accelerations are not observed, they should be elicited by manual or vibroacoustic stimulation. There is a 50 percent risk of fetal acidosis in fetuses in whom accelerations cannot be elicited, so further evaluation by fetal scalp sampling for pH is indicated to help clarify the fetal acid-base status. Serial evaluation every 20 to 30 minutes is necessary if the FHR pattern remains nonreassuring. Expeditious delivery is indicated for persistent nonreassuring FHR patterns.

FHR Pattern	Diagnosis	Action
Normal rate normal variability, accelerations, no decelerations	Fetus is well oxygenated	None
Normal variability, accelerations, mild nonreassuring pattern (bradycardia, late decelerations, variable decelerations)	Fetus is still well oxygenated centrally	Conservative management.
Normal variability, ± accelerations, moderate-severe nonreassuring pattern (bradycardia, late decelerations, variable decelerations)	Fetus is still well oxygenated centrally, but the FHR suggests hypoxia	Continue conservative management. Consider stimulation testing. Prepare for rapid delivery if pattern worsens
Decreasing variability, ± accelerations, moderate-severe nonreassuring patterns (bradycardia, late decelerations, variable decelerations)	Fetus may be on the verge of decompensation	Deliver if spontaneous delivery is remote, or if stimulation supports diagnosis of decompensation. Normal response to stimulation may allow time to await a vaginal delivery
Absent variability, no accelerations, moderate/severe nonreassuring patterns (bradycardia, late decelerations, variable decelerations)	Evidence of actual or impending asphyxia	Deliver. Stimulation or in-utero management may be attempted if delivery is not delayed

References: See page 311.

Antepartum Fetal Surveillance

I. Antepartum fetal surveillance techniques

A. Antepartum fetal surveillance should be initiated in pregnancies in which the risk of fetal demise is known to be increased. These problems can include maternal conditions such as antiphospholipid syndrome, chronic hypertension, renal disease, systemic lupus erythematosus, or type 1 diabetes mellitus. Monitoring should also be initiated in pregnancy-related conditions such as preeclampsia, intrauterine growth restriction (IUGR), multiple gestation, poor obstetrical history, or postterm pregnancy.

B. Antepartum fetal surveillance can include the nonstress test (NST), BPP, oxytocin challenge test (OCT), or modified BPP.

C. Nonstress test

1. A NST is performed using an electronic fetal monitor. Testing is generally begun at 32 to 34 weeks. Testing is performed at daily to weekly intervals as long as the indication for testing persists.

2. The test is reactive if there are two or more fetal heart rate accelerations of 15 bpm above the baseline rate lasting for 15 seconds in a 20 minute period. A nonreactive NST does not show such accelerations over a 40 minute period. Nonreactivity may be related to fetal immaturity, a sleep cycle, drugs, fetal anomalies, or fetal hypoxemia.

3. If the NST is nonreactive, it is considered nonreassuring and further evaluation or delivery of the fetus is indicated. At term, delivery rather than further evaluation is usually warranted. A nonreassuring NST preterm usually should be assessed with ancillary tests, since the false positive rate of an isolated NST may be 50 to 60 percent.

D. Fetal movement assessment ("kick counts")

1. A diminution in the maternal perception of fetal movement often but not invariably precedes fetal death, in some cases by several days.

2. The woman lies on her side and counts distinct fetal movements. Perception of 10 distinct movements in a period of up to 2 hours is considered reassuring. Once 10 movements have been perceived, the count may be discontinued. In the absence of a reassuring count, non stress testing is recommended.

Indications for Antepartum Fetal Surveillance	
Maternal	**Pregnancy complications**
antiphospholipid syndrome	preeclampsia
poorly controlled hyperthyroidism	decreased fetal movement
hemoglobinopathies	oligohydramnios
cyanotic heart disease	polyhydramnios
systemic lupus erythematosus	Intrauterine growth restriction
chronic renal disease	postterm pregnancy
type I diabetes mellitus	isoimmunization
hypertensive disorders	previous unexplained fetal demise
	multiple gestation

E. Ancillary tests

1. Vibroacoustic stimulation is performed by placing an artificial larynx on the maternal abdomen and delivering a short burst of sound to the fetus. The procedure can shorten the duration of time needed to produce reactivity and the frequency of nonreactive NSTs, without compromising the predictive value of a reactive NST.

2. Oxytocin challenge test

a. The oxytocin challenge test (OCT) is done by intravenously infusing dilute oxytocin until three contractions occur within ten minutes. The test is interpreted as follows:

b. A positive test is defined by the presence of late decelerations following 50 percent or more of the contractions

c. A negative test has no late or significant variable decelerations

d. An equivocal-suspicious pattern consists of intermittent late or significant variable decelerations, while an equivocal-hyperstimulatory pattern refers to fetal heart rate decelerations occurring with contractions more frequent than every two minutes or lasting longer than 90 seconds

e. An unsatisfactory test is one in which the tracing is uninterpretable or contractions are fewer than three in 10 minutes

f. A positive test indicates decreased fetal reserve and correlates with a 20 to 40 percent incidence of abnormal FHR patterns during labor. An equivocal-suspicious test with repetitive variable decelerations is also associated with abnormal FHR patterns in labor, which are often related to cord compression due to oligohydramnios.

3. Fetal biophysical profile

a. The fetal biophysical profile score refers to the sonographic assessment of four biophysical variables: fetal movement, fetal tone, fetal breathing, amniotic fluid volume and nonstress testing. Each of these five parameters is given a score of 0 or 2 points, depending upon whether specific criteria are met. Fetal BPS is a noninvasive, highly accurate means for predicting the presence of fetal asphyxia.

b. Criteria

(1) A normal variable is assigned a score of two and an abnormal variable a score of zero. The maximal score is 10/10 and the minimal score is 0/10.

(2) Amniotic fluid volume is based upon an ultrasound-based objective measurement of the largest visible pocket. The selected largest pocket must have a transverse diameter of at least one centimeter.

Components of the Biophysical Profile

Parameter	Normal (score = 2)	Abnormal (score = 0)
Nonstress test	≥2 accelerations ≥15 beats per minute above baseline during test lasting ≥15 seconds in 20 minutes	<2 accelerations
Amniotic fluid volume	Amniotic fluid index >5 or at least 1 pocket measuring 2 cm x 2 cm in perpendicular planes	AFI <5 or no pocket >2 cm x 2 cm
Fetal breathing movement	Sustained FBM (≥30 seconds)	Absence of FBM or short gasps only <30 seconds total
Fetal body movements	≥3 episodes of either limb or trunk movement	<3 episodes during test
Fetal tone	Extremities in flexion at rest and ≥1 episode of extension of extremity, hand or spine with return to flexion	Extension at rest or no return to flexion after movement

A total score of 8 to 10 is reassuring; a score of 6 is suspicious, and a score of 4 or less is ominous.
Amniotic fluid index = the sum of the largest vertical pocket in each of four quadrants on the maternal abdomen intersecting at the umbilicus.

c. Clinical utility

(1) The fetal BPS is noninvasive and highly accurate for predicting the presence of fetal asphyxia. The probability of fetal acidemia is virtually zero when the score is normal (8 to 10). The false negative rate (ie, fetal death within one week of a last test with a normal score) is exceedingly low. The likelihood of fetal compromise and death rises as the score falls.

(2) The risk of fetal demise within one week of a normal test result is 0.8 per 1000 women tested. The positive predictive value of the BPS for evidence of true fetal compromise is only 50 percent, with a negative predictive value greater than 99.9 percent.

d. Indications and frequency of testing

(1) ACOG recommends antepartum testing in the following situations:

(a) Women with high-risk factors for fetal asphyxia should undergo antepartum fetal surveillance with tests (eg, BPS, nonstress test)

(b) Testing may be initiated as early as 26 weeks of gestation when clinical conditions suggest early fetal compromise is likely. Initiating testing at 32 to 34 weeks of gestation is appropriate for most pregnancies at increased risk of stillbirth.

(c) A reassuring test (eg, BPS of 8 to 10) should be repeated periodically (weekly or twice weekly) until delivery when the high-risk condition persists.

(d) Any significant deterioration in the clinical status (eg, worsening preeclampsia, decreased fetal activity) requires fetal reevaluation.

(e) Severe oligohydramnios (no vertical pocket >2 cm or amniotic fluid index ≤5) requires either delivery or close maternal and fetal surveillance.

(f) Induction of labor may be attempted with abnormal antepartum testing as long as the fetal heart rate and contractions are monitored continuously and are reassuring. Cesarean delivery is indicated if there are repetitive late decelerations.

(2) The minimum gestational age for testing should reflect the lower limit that intervention with delivery

would be considered. This age is now 24 to 25 weeks.

(3) Modified biophysical profile. Assessment of amniotic fluid volume and nonstress testing appear to be as reliable a predictor of long-term fetal well-being as the full BPS. The rate of stillbirth within one week of a normal modified BPS is the same as with the full BPS, 0.8 per 1000 women tested.

Guidelines for Antepartum Testing

Indication	Initiation	Frequency
Post-term pregnancy	41 weeks	Twice a week
Preterm rupture of membranes	At onset	Daily
Bleeding	26 weeks or at onset	Twice a week
Oligohydramnios	26 weeks or at onset	Twice a week
Polyhydramnios	32 weeks	Weekly
Diabetes	32 weeks	Twice a week
Chronic or pregnancy-induced hypertension	28 weeks	Weekly. Increase to twice-weekly at 32 weeks.
Steroid-dependent or poorly controlled asthma	28 weeks	Weekly
Sickle cell disease	32 weeks (earlier if symptoms)	Weekly (more often if severe)
Impaired renal function	28 weeks	Weekly
Substance abuse	32 weeks	Weekly
Prior stillbirth	At 2 weeks before prior fetal death	Weekly
Multiple gestation	32 weeks	Weekly
Congenital anomaly	32 weeks	Weekly
Fetal growth restriction	26 weeks	Twice a week or at onset
Decreased fetal movement	At time of complaint	Once

F. Perinatal outcome. An abnormal NST result should be interpreted with caution. Further assessment of fetal condition using the NST, OCT, or BPP should usually be performed to help determine whether the fetus is in immediate jeopardy.

G. Management of abnormal test results

1. Maternal reports of decreased fetal movement should be evaluated by an NST, CST, BPP, or modified BPP. These results, if normal, usually are sufficient to exclude imminent fetal jeopardy. A nonreactive NST or an abnormal modified BPP generally should be followed by additional testing (either a CST or a full BPP). In many circumstances, a positive CST result generally indicates that delivery is warranted.

2. A BPP score of 6 is considered equivocal; in the term fetus, this score generally should prompt delivery, whereas in the preterm fetus, it should result in a repeat BPP in 24 hours. In the interim, maternal corticosteroid administration should be considered for pregnancies of less than 34 weeks of gestation. Repeat equivocal scores should result either in delivery or continued intensive surveillance. A BPP score of 4 usually indicates that delivery is warranted.

3. Preterm delivery is indicated for nonreassuring antepartum fetal testing results that have been confirmed by additional testing. At term, additional testing can be omitted since the risk from delivery is small. Depending on the fetal heart rate pattern, induction of labor with continuous FHR and contraction monitoring may be attempted in the absence of obstetrical contraindications. Repetitive late decelerations or severe variable decelerations usually require cesarean delivery.

References: See page 311.

Brief Postoperative Cesarean Section Note

Pre-op diagnosis:
1. 23 year old G_1P_0, estimated gestational age = 40 weeks
2. Dystocia
3. Non-reassuring fetal tracing

Post-op diagnosis: Same as above
Procedure: Primary low segment transverse cesarean section
Attending Surgeon, Assistant:
Anesthesia: Epidural
Operative Findings: Weight and sex of infant, APGARs at 1 min and 5 min; normal uterus, tubes, ovaries.
Cord pH:
Specimens: Placenta, cord blood (type and Rh).

Estimated Blood Loss: 800 cc; no blood replaced.
Fluids, blood and urine output:
Drains: Foley to gravity.
Complications: None
Disposition: Patient sent to recovery room in stable condition.

Cesarean Section Operative Report

Preoperative Diagnosis:
1. 23 year old G_1P_0, estimated gestational age = 40 weeks
2. Dystocia
3. Non-reassuring fetal tracing

Postoperative Diagnosis: Same as above
Title of Operation: Primary low segment transverse cesarean section
Surgeon:
Assistant:
Anesthesia: Epidural
Findings At Surgery: Male infant in occiput posterior presentation. Thin meconium with none below the cords, pediatrics present at delivery, APGAR's 6/8, weight 3980 g. Normal uterus, tubes, and ovaries.
Description of Operative Procedure:

After assuring informed consent, the patient was taken to the operating room and spinal anesthesia was initiated. The patient was placed in the dorsal, supine position with left lateral tilt. The abdomen was prepped and draped in sterile fashion.

A Pfannenstiel skin incision was made with a scalpel and carried through to the level of the fascia. The fascial incision was extended bilaterally with Mayo scissors. The fascial incision was then grasped with the Kocher clamps, elevated, and sharply and bluntly dissected superiorly and inferiorly from the rectus muscles.

The rectus muscles were then separated in the midline, and the peritoneum was tented up, and entered sharply with Metzenbaum scissors. The peritoneal incision was extended superiorly and inferiorly with good visualization of the bladder.

A bladder blade was then inserted, and the vesicouterine peritoneum was identified, grasped with the pick-ups, and entered sharply with the Metzenbaum scissors. This incision was then extended laterally, and a bladder flap was created. The bladder was retracted using the bladder blade. The lower uterine segment was incised in a transverse fashion with the scalpel, then extended bilaterally with bandage scissors. The bladder blade was removed, and the infants head was delivered atraumatically. The nose and mouth were suctioned and the cord clamped and cut. The infant was handed off to the pediatrician. Cord gases and cord blood were sent.

The placenta was then removed manually, and the uterus was exteriorized, and cleared of all clots and debris. The uterine incision was repaired with 1-O chromic in a running locking fashion. A second layer of 1-O chromic was used to obtain excellent hemostasis. The bladder flap was repaired with a 3-O Vicryl in a running fashion. The cul-de-sac was cleared of clots and the uterus was returned to the abdomen. The peritoneum was closed with 3-0 Vicryl. The fascia was reapproximated with O Vicryl in a running fashion. The skin was closed with staples.

The patient tolerated the procedure well. Needle and sponge counts were correct times two. Two grams of Ancef was given at cord clamp, and a sterile dressing was placed over the incision.
Estimated Blood Loss (EBL): 800 cc; no blood replaced (normal blood loss is 500-1000 cc).
Specimens: Placenta, cord pH, cord blood specimens.
Drains: Foley to gravity.
Fluids: Input - 2000 cc LR; Output - 300 cc clear urine.
Complications: None.
Disposition: The patient was taken to the recovery room then postpartum ward in stable condition.

Postoperative Management after Cesarean Section

I. Post Cesarean Section Orders
- **A. Transfer:** to post partum ward when stable.
- **B. Vital signs:** q4h x 24 hours, I and O.
- **C. Activity:** Bed rest x 6-8 hours, then ambulate; if given spinal, keep patient flat on back x 8h. Incentive spirometer q1h while awake.
- **D. Diet:** NPO x 8h, then sips of water. Advance to clear liquids, then to regular diet as tolerated.
- **E. IV Fluids:** IV D5 LR or D5 ½ NS at 125 cc/h. Foley to gravity; discontinue after 12 hours. I and O catheterize prn.
- **F. Medications**
  1. Cefazolin (Ancef) 1 gm IVPB x one dose at time of cesarean section.
  2. Nalbuphine (Nubain) 5 to 10 mg SC or IV q2-3h **OR**
  3. Meperidine (Demerol) 50-75 mg IM q3-4h prn pain.
  4. Hydroxyzine (Vistaril) 25-50 mg IM q3-4h prn nausea.
  5. Prochlorperazine (Compazine) 10 mg IV q4-6h prn nausea **OR**
  6. Promethazine (Phenergan) 25-50 mg IV q3-4h prn nausea
- **G. Labs:** CBC in AM.

II. Postoperative Day #1
- **A.** Assess pain, lungs, cardiac status, fundal height, lochia, passing of flatus, bowel movement, distension, tenderness, bowel sounds, incision.
- **B.** Discontinue IV when taking adequate PO fluids.
- **C.** Discontinue Foley, and I and O catheterize prn.
- **D.** Ambulate tid with assistance; incentive spirometer q1h while awake.
- **E.** Check hematocrit, hemoglobin, Rh, and rubella status.
- **F. Medications**
  1. Acetaminophen/codeine (Tylenol #3) 1-2 PO q4-6h prn pain **OR**
  2. Oxycodone/acetaminophen (Percocet) 1 tab q6h prn pain.
  3. FeSO4 325 mg PO bid-tid.
  4. Multivitamin PO qd, Colace 100 mg PO bid. Mylicon 80 mg PO qid prn bloating.

III. Postoperative Day #2

A. If passing gas and/or bowel movement, advance to regular diet.

B. Laxatives: Dulcolax supp prn or Milk of magnesia 30 cc PO tid prn. Mylicon 80 mg PO qid prn bloating.

IV. Postoperative Day #3

A. If transverse incision, remove staples and place steri-strips on day 3. If a vertical incision, remove staples on post op day 5.

B. Discharge home on appropriate medications; follow up in 2 and 6 weeks.

Prevention of D Isoimmunization

The morbidity and mortality of Rh hemolytic disease can be significantly reduced by identification of women at risk for isoimmunization and by administration of D immunoglobulin. Administration of D immunoglobulin [RhoGAM, Rho(D) immunoglobulin, RhIg] is very effective in the preventing isoimmunization to the D antigen.

I. Prenatal testing

A. Routine prenatal laboratory evaluation includes ABO and D blood type determination and antibody screen.

B. At 28-29 weeks of gestation woman who are D negative but not D isoimmunized should be retested for D antibody. If the test reveals that no D antibody is present, prophylactic D immunoglobulin [RhoGAM, Rho(D) immunoglobulin, RhIg] is indicated.

C. If D antibody is present, D immunoglobulin will not be beneficial, and specialized management of the D isoimmunized pregnancy is undertaken to manage hemolytic disease of the fetus and hydrops fetalis.

II. Routine administration of D immunoglobulin

A. Abortion. D sensitization may be caused by abortion. D sensitization occurs more frequently after induced abortion than after spontaneous abortion, and it occurs more frequently after late abortion than after early abortion. D sensitization occurs following induced abortion in 4-5% of susceptible women. All unsensitized, D-negative women who have an induced or spontaneous abortion should be treated with D immunoglobulin unless the father is known to be D negative.

B. Dosage of D immunoglobulin is determined by the stage of gestation. If the abortion occurs before 13 weeks of gestation, 50 mcg of D immunoglobulin prevents sensitization. For abortions occurring at 13 weeks of gestation and later, 300-mcg is given.

C. Ectopic pregnancy can cause D sensitization. All unsensitized, D-negative women who have an ectopic pregnancy should be given D immunoglobulin. The dosage is determined by the gestational age, as described above for abortion.

D. Amniocentesis

1. D isoimmunization can occur after amniocentesis. D immunoglobulin, 300 mcg, should be administered to unsensitized, D-negative, susceptible patients following first- and second-trimester amniocentesis.

2. Following third-trimester amniocentesis, 300 mcg of D immunoglobulin should be administered. If amniocentesis is performed and delivery is planned within 48 hours, D immunoglobulin can be withheld until after delivery, when the newborn can be tested for D positivity. If the amniocentesis is expected to precede delivery by more than 48 hours, the patient should receive 300 mcg of D immunoglobulin at the time of amniocentesis.

E. Antepartum prophylaxis

1. Isoimmunized occurs in 1-2% of D-negative women during the antepartum period. D immunoglobulin, administered both during pregnancy and postpartum, can reduce the incidence of D isoimmunization to 0.3%.

2. Antepartum prophylaxis is given at 28-29 weeks of gestation. Antibody-negative, Rh-negative gravidas should have a repeat assessment at 28 weeks. D immunoglobulin (RhoGAM, RhIg), 300 mcg, is given to D-negative women. However, if the father of the fetus is known with certainty to be D negative, antepartum prophylaxis is not necessary.

F. Postpartum D immunoglobulin

1. D immunoglobulin is given to the D negative mother as soon after delivery as cord blood findings indicate that the baby is Rh positive.

2. A woman at risk who is inadvertently not given D immunoglobulin within 72 hours after delivery should still receive prophylaxis at any time up until two weeks after delivery. If prophylaxis is delayed, it may not be effective.

3. A quantitative Kleihauer-Betke analysis should be performed in situations in which significant maternal bleeding may have occurred (eg, after maternal abdominal trauma, abruptio placentae, external cephalic version). If the quantitative determination is thought to be more than 30 mL, D immune globulin should be given to the mother in multiples of one vial (300 mcg) for each 30 mL of estimated fetal whole blood in her circulation, unless the father of the baby is known to be D negative.

G. Abruptio placentae, placenta previa, cesarean delivery, intrauterine manipulation, or manual removal of the placenta may cause more than 30 mL of fetal-to-maternal bleeding. In these conditions, testing for excessive bleeding (Kleihauer-Betke test) or inadequate D immunoglobulin dosage (indirect Coombs test) is necessary.

References: See page 311.

Complications of Pregnancy

Nausea and Vomiting of Pregnancy and Hyperemesis Gravidarum

Nausea and vomiting to affects about 70% to 85% of pregnant women. Symptoms of nausea and vomiting of pregnancy (NVP) are most common during the first trimester; however, some women have persistent nausea for their entire pregnancy. Hyperemesis often occurs in association with high levels of human chorionic gonadotropin (hCG), such as with multiple pregnancies, trophoblastic disease, and fetal anomalies such as triploidy.

Conditions that Predispose to Excessive Nausea and Vomiting
Viral gastroenteritis Gestational trophoblastic disease Hepatitis Urinary tract infection Multifetal gestation Gallbladder disease Migraine

I. Treatment of nausea and vomiting of pregnancy

A. Patients should avoid odors or foods that seem to be aggravating the nausea. Useful dietary modifications include avoiding fatty or spicy foods, and stopping iron supplements. Frequent small meals also may improve symptoms. Recommendations include bland and dry foods, high-protein snacks, and crackers at the bedside to be taken first thing in the morning.

B. Cholecystitis, peptic ulcer disease, or hepatitis can cause nausea and vomiting and should be excluded. Gastroenteritis, appendicitis, pyelonephritis, and pancreatitis also should be excluded. Obstetric explanations for nausea and vomiting may include multiple pregnancies or a hydatidiform mole.

C. Non-pharmacologic remedies are adequate for up to 90% of patients with NVP. However, about 10% will require medication and about 1% have severe enough vomiting that they require hospitalization.

D. Vitamin therapy. Pyridoxine is effective as first-line therapy and is recommended up to 25 mg three times daily. Pyridoxine serum levels do not appear to correlate with the prevalence or degree of nausea and vomiting. Multivitamins also are effective for prevention of NVP. Premesis Rx is a prescription tablet with controlled-release vitamin B6, 75 mg, so it can be given once a day. It also contains vitamin B12 (12 mcg), folic acid (1 mg), and calcium carbonate (200 mg).

E. Over-the-Counter Therapy. If pyridoxine alone is not efficacious, an alternative is to combine over-the-counter doxylamine 25 mg (Unisom) and pyridoxine 25 mg. One could combine the 25 mg of pyridoxine three times daily with doxylamine 25 mg, 1 tablet every bedtime, and ½ tablet morning and afternoon. There is no evidence that doxylamine is a teratogen.

Drug Therapy for Nausea and Vomiting of Pregnancy	
Generic name (trade name)	**Dosage**
Antihistamines	
Doxylamine (Unisom)	25 mg ½ tab BID, 1 tab qhs
Dimenhydrinate (Dramamine)	25 to 100 mg po/im/iv every 4 to 6 hr
Diphenhydramine (Benadryl)	25 to 50 mg po/im/iv every 4 to 6 hr
Trimethobenzamide (Tigan)	250 mg po every 6 to 8 hr or 200 mg im/pr every 6 to 8 hr
Meclizine (Antivert)	12.5 to 25 mg BID/TID
Phenothiazines	
Promethazine (Phenergan)	12.5 to 25 mg po/iv/pr every 4 to 6 hr
Prochlorperazine (Compazine)	5 to 10 mg po/iv every 6 to 8 hr or 25 mg pr every 6 to 8 hr
Prokinetic agents	
Metoclopramide (Reglan)	10 to 20 mg po/iv every 6 hr
Serotonin (5-HT_3) antagonists	
Ondansetron (Zofran)	8 mg po/iv every 8 hr
Corticosteroids	
Methylprednisolone (Medrol)	16 mg po TID for 3 days then ½ dose every 3 days for 2 wks

F. Pharmacologic Therapy

1. Prescribed medication is the next step if dietary modifications and vitamin B6 therapy with doxylamine are ineffec-

tive. The phenothiazines are safe and effective, and promethazine (Phenergan) often is tried first. One of the disadvantages of the phenothiazines is their potential for dystonic effects.

2. **Metoclopramide (Reglan)** is the antiemetic drug of choice in pregnancy in several European countries. There was no increased risk of birth defects.
3. **Ondansetron (Zofran)** has been compared with promethazine (Phenergan), and the two drugs are equally effective, but ondansetron is much more expensive. No data have been published on first trimester teratogenic risk with ondansetron.

II. Hyperemesis gravidarum

A. Hyperemesis gravidarum occurs in the extreme 0.5% to 1% of patients who have intractable vomiting. Patients with hyperemesis have abnormal electrolytes, dehydration with high urine-specific gravity, ketosis and acetonuria, and untreated have weight loss >5% of body weight. Intravenous hydration is the first line of therapy for patients with severe nausea and vomiting. Administration of vitamin B1 supplements may be necessary to prevent Wernicke's encephalopathy.

References: See page 311.

Spontaneous Abortion

Abortion is defined as termination of pregnancy resulting in expulsion of an immature, nonviable fetus. A fetus of <20 weeks gestation or a fetus weighing <500 gm is considered an abortus. Spontaneous abortion occurs in 15% of all pregnancies.

I. Threatened abortion is defined as vaginal bleeding occurring in the first 20 weeks of pregnancy, without the passage of tissue or rupture of membranes.

A. Symptoms of pregnancy (nausea, vomiting, fatigue, breast tenderness, urinary frequency) are usually present.

B. Speculum exam reveals blood coming from the cervical os without amniotic fluid or tissue in the endocervical canal.

C. The internal cervical os is closed, and the uterus is soft and enlarged appropriate for gestational age.

D. Differential diagnosis

1. **Benign and malignant lesions.** The cervix often bleeds from an ectropion of friable tissue. Hemostasis can be accomplished by applying pressure for several minutes with a large swab or by cautery with a silver nitrate stick. Atypical cervical lesions are evaluated with colposcopy and biopsy.
2. **Disorders of pregnancy**
   a. **Hydatidiform mole** may present with early pregnancy bleeding, passage of grape-like vesicles, and a uterus that is enlarged in excess of that expected from dates. An absence of heart tones by Doppler after 12 weeks is characteristic. Hyperemesis, preeclampsia, or hyperthyroidism may be present. Ultrasonography confirms the diagnosis.
   b. **Ectopic pregnancy** should be excluded when first trimester bleeding is associated with pelvic pain. Orthostatic light-headedness, syncope or shoulder pain (from diaphragmatic irritation) may occur.
      (1) Abdominal tenderness is noted, and pelvic examination reveals cervical motion tenderness.
      (2) Serum beta-HCG is positive.

E. Laboratory tests

1. **Complete blood count.** The CBC will not reflect acute blood loss.
2. **Quantitative serum beta-HCG level** may be positive in nonviable gestations since beta-HCG may persist in the serum for several weeks after fetal death.
3. **Ultrasonography** should detect fetal heart motion by 7 weeks gestation or older. Failure to detect fetal heart motion after 9 weeks gestation should prompt consideration of curettage.

F. Treatment of threatened abortion

1. Bed rest with sedation and abstinence from intercourse.
2. The patient should report increased bleeding (>normal menses), cramping, passage of tissue, or fever. Passed tissue should be saved for examination.

II. Inevitable abortion is defined as a threatened abortion with a dilated cervical os. Menstrual-like cramps usually occur.

A. Differential diagnosis

1. **Incomplete abortion** is diagnosed when tissue has passed. Tissue may be visible in the vagina or endocervical canal.
2. **Threatened abortion** is diagnosed when the internal os is closed and will not admit a fingertip.
3. **Incompetent cervix** is characterized by dilatation of the cervix without cramps.

B. Treatment of inevitable abortion

1. Surgical evacuation of the uterus is necessary.
2. D immunoglobulin (RhoGAM) is administered to Rh-negative, unsensitized patients to prevent isoimmunization. Before 13 weeks gestation, the dosage is 50 mcg IM; at 13 weeks gestation, the dosage is 300 mcg IM.

III. Incomplete abortion is characterized by cramping, bleeding, passage of tissue, and a dilated internal os with tissue present in the vagina or endocervical canal. Profuse bleeding, orthostatic dizziness, syncope, and postural pulse and blood pressure changes may occur.

A. Laboratory evaluation

1. **Complete blood count.** CBC will not reflect acute blood loss.
2. **Rh typing**
3. **Blood typing and cress-matching.**
4. **Karyotyping** of products of conception is completed if loss is recurrent.

B. Treatment

1. **Stabilization.** If the patient has signs and symptoms of heavy bleeding, at least 2 large-bore IV catheters (<16

gauge) are placed. Lactate Ringer's or normal saline with 40 U oxytocin/L is given IV at 200 mL/hour or greater.

2. Products of conception are removed from the endocervical canal and uterus with a ring forceps. Immediate removal decreases bleeding. Curettage is performed after vital signs have stabilized.
3. **Suction dilation and curettage**
   - **a.** Analgesia consists of meperidine (Demerol), 35-50 mg IV over 3-5 minutes until the patient is drowsy.
   - **b.** The patient is placed in the dorsal lithotomy position in stirrups, prepared, draped, and sedated.
   - **c.** A weighted speculum is placed intravaginally, the vagina and cervix are cleansed, and a paracervical block is placed.
   - **d.** Bimanual examination confirms uterine position and size, and uterine sounding confirms the direction of the endocervical canal.
   - **e.** Mechanical dilatation is completed with dilators if necessary. Curettage is performed with an 8 mm suction curette, with a single-tooth tenaculum on the anterior lip of the cervix.
4. **Post-curettage.** After curettage, a blood count is ordered. If the vital signs are stable for several hours, the patient is discharged with instructions to avoid coitus, douching, or the use of tampons for 2 weeks. Ferrous sulfate and ibuprofen are prescribed for pain.
5. **Rh-negative**, unsensitized patients are given IM RhoGAM.
6. **Methylergonovine (Methergine)**, 0.2 mg PO q4h for 6 doses, is given if there is continued moderate bleeding.

IV. Complete abortion

- **A.** A complete abortion is diagnosed when complete passage of products of conception has occurred. The uterus is well contracted, and the cervical os may be closed.
- **B. Differential diagnosis**
  1. **Incomplete abortion**
  2. **Ectopic pregnancy.** Products of conception should be examined grossly and submitted for pathologic examination. If no fetal tissue or villi are observed grossly, ectopic pregnancy must be excluded by ultrasound.
- **C. Management of complete abortion**
  1. Between 8 and 14 weeks, curettage is necessary because of the high probability that the abortion was incomplete.
  2. D immunoglobulin (RhoGAM) is administered to Rh-negative, unsensitized patients.
  3. Beta-HCG levels are obtained weekly until zero. Incomplete abortion is suspected if beta-HCG levels plateau or fail to reach zero within 4 weeks.

V. Missed abortion is diagnosed when products of conception are retained after the fetus has expired. If products are retained, a severe coagulopathy with bleeding often occurs.

- **A.** Missed abortion should be suspected when the pregnant uterus fails to grow as expected or when fetal heart tones disappear.
- **B.** Amenorrhea may persist, or intermittent vaginal bleeding, spotting, or brown discharge may be noted.
- **C. Ultrasonography** confirms the diagnosis.
- **D. Management of missed abortion**
  1. CBC with platelet count, fibrinogen level, partial thromboplastin time, and ABO blood typing and antibody screen are obtained.
  2. **Evacuation** of the uterus is completed after fetal death has been confirmed. Dilation and evacuation by suction curettage is appropriate when the uterus is less than 12-14 weeks gestational size.
  3. **D immunoglobulin (RhoGAM)** is administered to Rh-negative, unsensitized patients.

References: See page 311.

Urinary Tract Infections in Pregnancy

Urinary tract infection (UTI) is common in pregnancy. Although asymptomatic bacteriuria occurs with similar frequency in pregnant and nonpregnant women, bacteriuria progresses to symptomatic infection more frequently during pregnancy.

I. Incidence

- **A.** The prevalence of asymptomatic bacteriuria in pregnant and nonpregnant women is 5 to 9 percent. If asymptomatic bacteriuria is not treated, pyelonephritis will develop in 20 to 40 percent of pregnant patients. This rate of progression to symptomatic disease is three- to fourfold higher than in nonpregnant women.
- **B. Microbiology.** Escherichia coli is responsible for 60 to 90 percent of cases of asymptomatic bacteriuria, cystitis, and pyelonephritis.
- **C. Asymptomatic Bacteriuria** refers to the isolation of $\geq$100,000 CFU of a single organism/mL from a midstream-voided specimen in a woman without UTI symptoms. It occurs in 5 to 9 percent of pregnancies, usually developing in the first month of gestation.

II. Diagnosis

- **A.** A single clean-catch midstream urine culture detects 80 percent of patients with asymptomatic bacteriuria; two such cultures approach the sensitivity of catheterization (96 percent). A positive urine culture is $\geq 10^5$ CFU/mL. Isolation of more than one species or the presence of lactobacillus or propiobacterium indicates a contaminated specimen.
- **B.** Screening for asymptomatic bacteriuria is standard practice at the first prenatal visit.

III. Treatment of asymptomatic bacteriuria

- **A.** Amoxicillin-clavulanate (Augmentin) 500 mg PO BID for three days.
- **B.** Nitrofurantoin (Macrodantin) 50 mg PO QID for seven days.
- **C.** Cefixime (Suprax) 250 mg PO QD for three days.
- **D.** Fosfomycin (Monural) 3 g PO as a single dose.
- **E. Relapse** typically occurs in the first two weeks after treatment. Such infections should be treated with two weeks of oral antibiotics.

F. Suppressive therapy is recommended for women with persistent bacteriuria (ie, ≥2 positive urine cultures). Nitrofurantoin (Macrodantin) 50 to 100 mg orally at bedtime, for the duration of the pregnancy is one option, or cephalexin (Keflex) 250 to 500 mg orally at bedtime. A culture for test of cure is obtained one week after completion of therapy and then repeated monthly until completion of the pregnancy.

IV. Cystitis occurs in 0.3 to 1.3 percent of pregnant women. Bacteria are confined to the lower urinary tract in these patients.

A. Acute cystitis should be considered in any gravida with frequency, urgency, dysuria, hematuria, or suprapubic pain in the absence of fever and flank pain. Urine culture with a CFU count $\geq 10^2$/mL should be considered positive on a midstream urine specimen with pyuria.

B. Empiric treatment regimens:

1. Nitrofurantoin (Macrodantin) 100 mg BID

2. Cephalexin (Keflex) 500 mg BID to QID

C. Each of these drugs is given for three to seven days.

D. Other regimens which have a broader spectrum of activity include amoxicillin-clavulanate (Augmentin) 500 mg BID or 250 mg TID, trimethoprim-sulfamethoxazole (Bactrim) 1 DS BID but not in the third trimester of pregnancy, cefpodoxime proxetil (Vantin) 100 mg BID, and cefixime (Suprax) 400 mg QD. All of these drugs can be used for three to seven days. Fluoroquinolones should be avoided in pregnancy.

E. Monthly urine cultures should be performed beginning one to two weeks after completion of treatment.

V. Pyelonephritis complicates 1 to 2 percent of all pregnancies. Risk factors include asymptomatic bacteriuria, previous pyelonephritis, renal and collecting system anomalies, and renal calculi.

A. Presentation consists of fever, chills, and costovertebral angle tenderness. Other symptoms include dysuria, nausea, vomiting, and respiratory distress.

B. Urinalysis reveals one or two bacteria per high-power field in an unspun catheterized specimen or 20 bacteria per HPF in a spun specimen; white cell casts confirm the diagnosis. Urine culture and antimicrobial susceptibility testing should be performed.

C. Blood cultures are positive in 10 to 20 percent of patients.

D. Outpatient treatment, with one of the above regimens, may be considered in the absence of underlying medical conditions, anatomic abnormalities, pregnancy complications, or signs of sepsis.

E. Inpatient treatment

1. Fluoroquinolones should not be used because of adverse effects on growing cartilage. Parenteral beta lactams or gentamicin are the preferred antibiotics. Symptoms that persist for more than 48 hours, despite intravenous antibiotic therapy, require further evaluation with a renal ultrasound to assess for perinephric abscess or renal calculi.

2. Intravenous treatment should continue until the patient is afebrile for 48 hours. Inpatient therapy is followed by oral antibiotics to complete 10 to 14 days of treatment.

Parenteral Regimens for Empiric Treatment of Acute Pyelonephritis in Pregnancy

Antibiotic, dose	Interval
Ceftriaxone, 1 g	Q24 hours
Gentamicin, 1 mg/kg (+ ampicillin)	Q8 hours
Ampicillin, 1-2 g (plus gentamicin)*	Q6 hours
Ticarcillin-clavulanate (Timentin) 3.2 g	Q8 hours
Piperacillin-tazobactam 3.375 g*	Q8-12 hours
Imipenem-cilastatin, 250-500 mg	Q6-8 hours

* Recommended regimen if enterococcus suspected

3. Low-dose antimicrobial prophylaxis, such as nitrofurantoin (Macrodantin) 50 to 100 mg PO QHS or cephalexin (Keflex) 250 to 500 mg PO QHS, and periodic urinary surveillance for infection are recommended for the remainder of the pregnancy.

References: See page 311.

Gestational Diabetes Mellitus

Poorly controlled gestational diabetes is associated with an increase in the incidence of preeclampsia, polyhydramnios, fetal macrosomia, birth trauma, operative delivery, and neonatal hypoglycemia. There is an increased incidence of hyperbilirubinemia, hypocalcemia, and erythremia. Later development of diabetes mellitus in the mother is also more frequent. The prevalence of gestational diabetes is higher in black, Hispanic, Native American, and Asian women than white women. The prevalence of gestational diabetes is 1.4 to 14 percent.

Risk Factors for Gestational Diabetes

- A family history of diabetes, especially in first degree relatives
- Prepregnancy weight of 110 percent of ideal body weight (pregravid weight more than 90 kg) or more or weight gain in early adulthood.
- Age greater than 25 years
- A previous large baby (greater than 9 pounds [4.1 kg])
- History of abnormal glucose tolerance
- Hispanic, African, Native American, South or East Asian, and Pacific Island ancestry
- A previous unexplained perinatal loss or birth of a malformed child
- The mother was large at birth (greater than 9 pounds [4.1 kg])
- Polycystic ovary syndrome

I. Screening and diagnostic criteria

A. Screening for gestational diabetes should be performed at 24 to 28 weeks of gestation. However, it can be done as early as the first prenatal visit if there is a high degree of suspicion that the pregnant woman has undiagnosed type 2 diabetes (eg, obesity, previous gestational diabetes or fetal macrosomia, age >25 years, family history of diabetes).

B. 50-g oral glucose challenge is given for screening and glucose is measured one hour later; a value ≥140 mg/dL (7.8 mmol/L) is considered abnormal. Women with an abnormal value are then given a 100-g, three-hour oral glucose tolerance test (GTT).

Criteria for Gestational Diabetes with Three Hour Oral Glucose Tolerance Test

Fasting	>95 mg/dL
1 hour	>180 mg/dL
2 hour	>155 mg/dL
3 hour	>140 mg/dL

Any two or more abnormal results are diagnostic of gestational diabetes.

II. Treatment of gestational diabetes mellitus

A. Diet

1. Moderate caloric restriction may be useful in treating obese women (body mass index greater than 30 km/m^2) with gestational diabetes. However, ketosis should be avoided.

2. Caloric allotment. The recommended caloric intake is 30 kcal per present weight in kg per day in pregnant women who are 80 to 120 percent of ideal body weight at the start of pregnancy. 24 kcal per present weight in kg per day in overweight pregnant women (120 to 150 percent of ideal body weight). 12 to 15 kcal per present weight in kg per day for morbidly obese pregnant women (>150 percent of ideal body weight). 40 kcal per present weight in kg per day in pregnant women who are less than 80 percent of ideal body weight.

3. Carbohydrate intake. Recommendations for calorie and carbohydrate distribution are 40 percent carbohydrate, 20 percent protein, and 40 percent fat.

4. Calorie distribution

a. Distribution of calories should be three meals and three snacks. In overweight women, however, the snacks are eliminated.

b. The remaining calories should be distributed as 30 percent at both lunch and dinner, with the leftover calories distributed as snacks. With this calorie distribution, 75 to 80 percent of women with gestational diabetes can achieve normoglycemia.

5. Women should be encouraged to choose lean, low-fat foods and to avoid excessive weight gain. Obesity can cause excessive fetal growth and worsens glucose intolerance.

B. Glucose monitoring and goal concentrations

1. Women with gestational diabetes should measure blood glucose at home and keep a diet diary. Blood glucose should be measured upon awakening and one hour after each meal. Two criteria should be met to assure that the degree of glycemic control is adequate to prevent macrosomia:

a. The fasting blood glucose concentration should be less than 90 mg/dL. The one-hour postprandial blood glucose concentration should be less than 120 mg/dL.

b. Glycosylated hemoglobin (HbA1c) should be measured every two to four weeks.

C. Control of blood glucose

1. Insulin

a. Fifteen percent of women with gestational diabetes require insulin therapy because of elevated blood glucose concentrations despite dietary therapy. Insulin should be initiated when the fasting blood glucose is greater than 90 mg/dL and the one-hour postprandial blood glucose is greater than 120 mg/dL on two or more occasions within a two-week interval despite dietary therapy.

b. Preprandial blood glucose concentrations below 90 mg/dL and one-hour postprandial concentrations below 120 mg/dL minimize the incidence of macrosomia.

c. If insulin is required because the fasting blood glucose concentration is high, an intermediate-acting insulin, such as NPH insulin, is given before bedtime. The initial dose should be 0.15 U/kg body weight. If postprandial blood glucose concentrations are high, then regular insulin or insulin lispro should be given before meals in a dose calculated to be 1.5 U per 10 grams carbohydrate in the breakfast meal and 1.0 U per 10 grams carbohydrate in the lunch and dinner meals. If both preprandial and postprandial blood glucose concentrations are high, then a four-injection per day regimen should be initiated.

d. The total dose is 0.7 U/kg for weeks six to 18, 0.8 U/kg for weeks 19 to 26, 0.9 U/kg for weeks 27 to 36, and 1.0 U/kg for weeks 37 to term. The insulin should be divided about 45 percent as NPH insulin, 30 percent before breakfast and 15 percent before bedtime, and about 55 percent as preprandial regular insulin, 22 percent before breakfast, 16.5 percent before lunch, and 16.5 percent before dinner.

e. Adjustments in the insulin doses are based upon the results of self blood glucose monitoring. Insulin resistance increases as gestation proceeds, requiring an increase in insulin dose.

D. Peripartum concerns

1. Fetal surveillance. Counting fetal movements is a simple way to assess fetal well-being. Fewer than ten fetal movements in a 12-hour period is associated with a poor outcome. Fetal surveillance should be initiated in women in whom gestational diabetes is not well-controlled, who require insulin, or have other complications of pregnancy (eg, hypertension, adverse obstetric history).

2. Early delivery. Women with good glycemic control and no other complications ideally will deliver at 39 to 40 weeks of gestation.

3. Macrosomia and cesarean delivery. The risk of macrosomia among women with untreated GDM is 17 to 29 percent. Cesarean delivery for the prevention of shoulder dystocia is recommended when the estimated fetal weight is greater than 4.5 kg.

E. Delivery. The great majority of women with gestational diabetes proceed to term and have a spontaneous vaginal delivery. The maternal blood glucose concentration should be maintained between 70 and 90 mg/dL. Insulin can usually be withheld during delivery, and an infusion of normal saline is usually sufficient to maintain normoglycemia.

F. Postpartum concerns

1. Nearly all women with gestational diabetes are normoglycemic after delivery. However, they are at risk for recurrent gestational diabetes, impaired glucose tolerance, and overt diabetes. One-third to two-thirds of women will have gestational diabetes in a subsequent pregnancy. Women with gestational diabetes have an incidence of type 2 diabetes in the first five years postpartum of 47 to 50 percent.

2. After delivery, blood glucose should be measured to ensure that the mother no longer has hyperglycemia. Fasting blood glucose concentrations should be below 115 mg/dL and one-hour postprandial concentrations should be below 140 mg/dL. A woman with gestational diabetes should be able to resume a regular diet. However, she should continue to measure blood glucose at home for a few weeks after discharge.

3. Six to eight weeks after delivery, or shortly after cessation of breast feeding, all women with previous gestational diabetes should undergo an oral glucose tolerance test. A two-hour 75 gram oral glucose tolerance test is recommended.

References: See page 311.

Group B Streptococcal Infection in Pregnancy

Group B streptococcus (GBS; Streptococcus agalactiae), a Gram positive coccus, is an important cause of infection in neonates, causing sepsis, pneumonia, and meningitis. GBS infection is acquired in utero or during passage through the vagina. Vaginal colonization with GBS during pregnancy may lead to premature birth, and GBS is a frequent cause of maternal urinary tract infection, chorioamnionitis, postpartum endometritis, and bacteremia.

I. Clinical evaluation

A. The primary risk factor for GBS infection is maternal GBS genitourinary or gastrointestinal colonization.

B. The rate of transmission from colonized mothers to infants is approximately 50 percent. However, only 1 to 2 percent of all colonized infants develop early-onset GBS disease.

C. Maternal obstetrical factors associated with neonatal GBS disease:

1. Delivery at less than 37 weeks of gestation

2. Premature rupture of membranes

3. Rupture of membranes for 18 or more hours before delivery

4. Chorioamnionitis

5. Temperature greater than 38°C during labor

6. Sustained intrapartum fetal tachycardia

7. Prior delivery of an infant with GBS disease

D. Manifestations of early-onset GBS disease. Early-onset disease results in bacteremia, generalized sepsis, pneumonia, or meningitis. The clinical signs usually are apparent in the first hours of life.

II. 2002 CDC guidelines for intrapartum antibiotic prophylaxis:

A. All pregnant women should be screened for GBS colonization with swabs of both the lower vagina and rectum at 35 to 37 weeks of gestation. Patients are excluded from screening if they had GBS bacteriuria earlier in the pregnancy or if they gave birth to a previous infant with invasive GBS disease. These latter patients should receive intrapartum antibiotic prophylaxis regardless of the colonization status.

B. Intrapartum antibiotic prophylaxis is recommended for the following:

1. Pregnant women with a positive screening culture unless a planned Cesarean section is performed in the absence of labor or rupture of membranes

2. Pregnant women who gave birth to a previous infant with invasive GBS disease

3. Pregnant women with documented GBS bacteriuria during the current pregnancy

4. Pregnant women whose culture status is unknown (culture not performed or result not available) and who also have delivery at <37 weeks of gestation, amniotic membrane rupture for ≥18 hours, or intrapartum temperature ≥100.4ºF (≥38ºC)

C. Intrapartum antibiotic prophylaxis is not recommended for the following patients:
1. Positive GBS screening culture in a previous pregnancy (unless the infant had invasive GBS disease or the screening culture is also positive in the current pregnancy)
2. Patient who undergoes a planned Cesarean section without labor or rupture of membranes
3. Pregnant women with negative GBS screening cultures at 35 to 37 weeks of gestation even if they have one or more of the above intrapartum risk factors

D. Recommended IAP regimen
1. **Penicillin G** (5 million units IV initial dose, then 2.5 million units IV Q4h) is recommended for most patients.
2. **In women with non-immediate-type penicillin-allergy**, cefazolin (Ancef, 2 g initial dose, then 1 g Q8h) is recommended.
3. **Patients at high risk for anaphylaxis to penicillins** are treated with clindamycin (900 mg IV Q8h) or erythromycin (500 mg IV Q6h) as long as their GBS isolate is documented to be susceptible to both clindamycin and erythromycin.
4. **For patients at high risk for anaphylaxis and a GBS resistant isolate** (or with unknown susceptibility) to clindamycin or erythromycin, vancomycin (1 g Q12h) should be given.
5. Antibiotic therapy is continued from hospital admission through delivery.

E. Approach to threatened preterm delivery at <37 weeks of gestation: A patient with negative GBS cultures (after 35 weeks of gestation) should not be treated during threatened labor. If GBS cultures have not been performed, these specimens should be obtained and penicillin G administered as above; if cultures are negative at 48 hours, penicillin can be discontinued. If such a patient has not delivered within four weeks, cultures should be repeated.

F. If screening cultures taken at the time of threatened delivery or previously performed (after 35 weeks of gestation) are positive, penicillin should be continued for at least 48 hours unless delivery supervenes. Patients who have been treated for ≥48 hours and have not delivered should receive IAP as above when delivery occurs.

References: See page 311.

Premature Rupture of Membranes

Premature rupture of the membranes (PROM) refers to rupture of membranes prior to the onset of labor or regular uterine contractions. It can occur at term or prior to term, in which case it is designated preterm premature rupture of the membranes (PPROM). The frequencies of term, preterm, and midtrimester PROM are 8, 1 to 3, and less than 1 percent of pregnancies, respectively.
The incidence of this disorder to be 7-12%. In pregnancies of less than 37 weeks of gestation, preterm birth (and its sequelae) and infection are the major concerns after PROM.

I. Pathophysiology

A. Premature rupture of membranes is defined as rupture of membranes prior to the onset of labor.

B. Preterm premature rupture of membranes is defined as rupture of membranes prior to term.

C. Prolonged rupture of membranes consists of rupture of membranes for more than 24 hours.

D. The latent period is the time interval from rupture of membranes to the onset of regular contractions or labor.

E. Many cases of preterm PROM are caused by idiopathic weakening of the membranes, many of which are caused by subclinical infection. Other causes of PROM include hydramnios, incompetent cervix, abruptio placentae, and amniocentesis.

F. At term, about 8% of patients will present with ruptured membranes prior to the onset of labor.

II. Maternal and neonatal complications

A. Labor usually follows shortly after the occurrence of PROM. Ninety percent of term patients and 50% of preterm patients go into labor within 24 hours after rupture.

B. Patients who do not go into labor immediately are at increasing risk of infection as the duration of rupture increases. Chorioamnionitis, endometritis, sepsis, and neonatal infections may occur.

C. Perinatal risks with preterm PROM are primarily complications from immaturity, including respiratory distress syndrome, intraventricular hemorrhage, patent ductus arteriosus, and necrotizing enterocolitis.

D. Premature gestational age is a more significant cause of neonatal morbidity than is the duration of membrane rupture.

III. Diagnosis of premature rupture of membranes

A. Diagnosis is based on history, physical examination, and laboratory testing. The patient's history alone is correct in 90% of patients. Urinary leakage or excess vaginal discharge is sometimes mistaken for PROM.

B. Sterile speculum exam is the first step in confirming the suspicion of PROM. Digital examination should be avoided because it increases the risk of infection.
1. The general appearance of the cervix should be assessed visually, and prolapse of the umbilical cord or a fetal extremity should be excluded. Cultures for group B streptococcus, gonorrhea, and chlamydia are obtained.
2. A pool of fluid in the posterior vaginal fornix supports the diagnosis of PROM.
3. The presence of amniotic fluid is confirmed by nitrazine testing for an alkaline pH. Amniotic fluid causes nitrazine paper to turn dark blue because the pH is above 6.0-6.5.

Nitrazine may be false-positive with contamination from blood, semen, or vaginitis.

4. If pooling and nitrazine are both non-confirmatory, a swab from the posterior fornix should be smeared on a slide, allowed to dry, and examined under a microscope for "ferning," indicating amniotic fluid.
5. **Ultrasound examination** for oligohydramnios is useful to confirm the diagnosis, but oligohydramnios may be caused by other disorders besides PROM.

C. Laboratory diagnosis

1. **Alpha-fetoprotein** (AFP) is present at high concentrations in amniotic fluid, but not in vaginal secretions, urine, or semen.
2. **Ultrasonography** may be of value in the diagnosis of PROM. The finding of anhydramnios or severe oligohydramnios combined with a characteristic history is highly suggestive, but not diagnostic, of rupture of membranes.
3. **Gestational age assessment** should be calculated. Ultrasonography on admission is useful for determining presentation, residual amniotic fluid volume, fetal size and anatomic survey, and fetal well-being.
4. **Assessment of fetal well-being.** Fetal well-being is generally assessed via an external fetal monitor. A reactive nonstress test is reassuring. Patients with nonreassuring fetal heart rate testing should be delivered or further evaluated.

IV. Assessment of premature rupture of membranes

A. The gestational age must be carefully assessed. Menstrual history, prenatal exams, and previous sonograms are reviewed. An ultrasound examination should be performed.

B. The patient should be evaluated for the presence of chorioamnionitis [fever (over 38°C), leukocytosis, maternal and fetal tachycardia, uterine tenderness, foul-smelling vaginal discharge].

C. The patient should be evaluated for labor, and a sterile speculum examination should assess cervical change.

D. The fetus should be evaluated with heart rate monitoring because PROM increases the risk of umbilical cord prolapse and fetal distress caused by oligohydramnios.

V. Management of premature rupture of membranes

A. Management of term patients

1. At 36 weeks and beyond, management of PROM consists of delivery. Patients in active labor should be allowed to progress.
2. Patients with chorioamnionitis, who are not in labor, should be immediately induced with oxytocin (Pitocin).
3. Patients who are not yet in active labor (in the absence of fetal distress, meconium, or clinical infection) may be discharged for 48 hours, and labor usually follows. If labor has not begun within a reasonable time after rupture of membranes, induction with oxytocin (Pitocin) is appropriate. Use of prostaglandin E2 is safe for cervical ripening.

B. Management of Preterm Premature Rupture of Membranes

1. Women with PPROM should be hospitalized until delivery. Expeditious delivery is indicated for abruptio placentae, intrauterine infection, or evidence of fetal compromise (eg, repetitive FHR decelerations or an unstable fetal presentation that poses a risk of cord prolapse). Pregnancies $\geq$32 weeks of gestation with documented fetal lung maturity will achieve better outcomes with immediate delivery than with expectant management.
2. **Group beta-hemolytic streptococcal (GBS) status** should be determined and intrapartum antibiotic prophylaxis considered for pregnant women whose GBS culture status is unknown (culture not performed or result not available) and who also are likely to deliver before 37 weeks of gestation, have amniotic membranes that have been ruptured for $\geq$18 hours, or have an intrapartum temperature $\geq$100.4ºF.
3. Patients are typically kept at modified bedrest and frequently assessed for evidence of infection or labor.
4. **Tocolytics** can be given to allow administration of antenatal corticosteroids and antibiotics.
5. **Fetal surveillance** consists of kick counts, nonstress tests, biophysical profiles (BPP). Abnormalities of these tests are predictive of fetal infection and umbilical cord compression related to oligohydramnios.
6. **Fetal lung maturity.** Antenatal corticosteroid administration is recommended for pregnancies complicated by PPROM at less than 32 weeks of gestation, as long as there is no clinical evidence of chorioamnionitis. A single course of corticosteroids should be administered. In more advanced gestations, fetal lung maturity tests may be performed via amniocentesis or on amniotic fluid samples aspirated from the vagina.
7. All patients with PPROM should be delivered at $\geq$32 weeks after confirmation of fetal lung maturity or a course of corticosteroids.
8. When there is confirmed fetal lung maturation at or beyond 32 weeks of gestation, the risks of expectant management often exceed those of delivery. Women with PPROM who are $\geq$32 weeks of gestation with a mature fetal lung profile are best managed by prompt induction of labor. Antibiotic prophylaxis for possible GBS colonization should be given during labor in the absence of a documented, recent negative GBS culture.
9. **Contraindications to expectant management.** Women are not candidates for expectant management if they have advanced labor, intrauterine infection, significant vaginal bleeding, or nonreassuring fetal testing.
10. **Antibiotic prophylaxis**
    - **a.** Antibiotic therapy is important in the management of patients with PPROM.
    - **b.** Ampicillin (1 or 2 g IV every 6 hours for 24 hours, then 500 mg PO every 6 hours until delivery) plus erythromycin or azithromycin is recommended.
      - **(1)** Azithromycin (Zithromax, 1 g orally as a single dose) may be substituted for erythromycin because of

improved oral absorption, a broader spectrum of antibacterial properties, and better tolerance.

(2) Women with bacterial vaginosis should be treated with metronidazole (250 mg PO three times daily for seven days).

Sample Antibiotic Regimens Used for Prophylaxis in Women with PPROM

Antibiotic	Dose
Ampicillin	1 or 2 g IV every 6 hours for 24 hours, then 500 mg PO every 6 hours until delivery
Ampicillin Gentamicin Clindamycin Amoxicillin plus clavulanic acid (Augmentin)	2 g IV every 6 hours for 4 doses and 90 mg IV initially, then 60 mg IV every 8 hours for three doses and 900 mg IV every 8 hours for three doses, followed by 500 mg PO TID for 7 days
Erythromycin base	333 mg PO every 8 hours until delivery
Piperacillin	3 g IV every 6 hours for 3 days
Ampicillin-sulbactam (Unasyn)	3 g every 6 hours for 7 days
Ampicillin	2 g IV every 6 hours for 7 days
Ampicillin-sulbactam Amoxicillin-clavulante	1.5 g IV every 6 hours for 72 hours, followed by 500 mg PO every 8 hours until delivery

References: See page 311.

Preterm Labor

Preterm labor is the leading cause of perinatal morbidity and mortality in the United States. It usually results in preterm birth, a complication that affects 8 to 10 percent of births.

Risk Factors for Preterm Labor

- Previous preterm delivery
- Low socioeconomic status
- Non-white race
- Maternal age <18 years or >40 years
- Preterm premature rupture of the membranes
- Multiple gestation
- Maternal history of one or more spontaneous second-trimester abortions
- Maternal complications
  - --Maternal behaviors
  - --Smoking
  - --Illicit drug use
  - --Alcohol use
  - --Lack of prenatal care
- Uterine causes
  - --Myomata (particularly submucosal or subplacental)
  - --Uterine septum
  - --Bicornuate uterus
  - --Cervical incompetence
  - --Exposure to diethylstilbestrol (DES)
- Infectious causes
  - --Chorioamnionitis
  - --Bacterial vaginosis
  - --Asymptomatic bacteriuria
  - --Acute pyelonephritis
  - --Cervical/vaginal colonization
- Fetal causes
  - --Intrauterine fetal death
  - --Intrauterine growth retardation
  - --Congenital anomalies
- Abnormal placentation
- Presence of a retained intrauterine device

I. Clinical evaluation of preterm labor

A. Diagnosis of preterm labor is based upon the presence of regular, painful uterine contractions accompanied by cervical dilation and/or effacement that occurs before 37 weeks of gestation. Criteria include persistent uterine contractions (four every 20 minutes or eight every 60 minutes) with documented cervical change or cervical effacement of at least 80 percent, or cervical dilatation greater than 1 cm.

B. Women with a history of previous preterm delivery carry the highest risk of recurrence, estimated to be between 17 and 37 percent.

Preterm Labor, Threatened or Actual

II. Initial assessment to determine whether patient is experiencing preterm labor
- **A.** Assess for the following:
  - **1.** Uterine activity
  - **2.** Rupture of membranes
  - **3.** Vaginal bleeding
  - **4.** Presentation
  - **5.** Cervical dilation and effacement
  - **6.** Station
- **B.** Reassess estimate of gestational age

III. Search for a precipitating factor/cause

IV. Consider specific management strategies, which may include the following:
- **A.** Intravenous tocolytic therapy (decision should be influenced by gestational age, cause of preterm labor and contraindications)
- **B.** Corticosteroid therapy (eg, betamethasone, in a dosage of 12 mg IM every 24 hours for a total of two doses)
- **C.** Antibiotic therapy if specific infectious agent is identified or if preterm premature rupture of the membranes

V. Management of preterm labor

A. Tocolysis

1. Tocolytic therapy may offer some short-term benefit in the management of preterm labor. A delay in delivery can be used to administer corticosteroids to enhance pulmonary maturity and reduce the severity of fetal respiratory distress syndrome, and to reduce the risk of intraventricular hemorrhage. No study has convincingly demonstrated an improvement in survival or neonatal outcome with the use of tocolytic therapy alone. **Gestational age under 34 weeks** is a prerequisite for inhibiting labor. Fifteen weeks gestational age is the lowest gestational age for which inhibition of labor should be considered.

Tocolytic Therapy for the Management of Preterm Labor

Medication	**Mechanism of action**	**Dosage**
Terbutaline (Bricanyl)	$Beta_2$-adrenergic receptor agonist sympathomimetic; decreases free intracellular calcium ions	2.5 to 5 µg/min; increased by 2.5 to 5 µg/min every 20 to 30 minutes to a maximum of 25 µg/min, or until the contractions have abated. 0.25 mg subcutaneously every 20 to 30 minutes for up to four doses or until tocolysis is achieved. 0.25 mg every 3 to 4 hours.
Nifedipine (Procardia)	Calcium channel blocker	30 mg orally, followed by 20 mg orally in 90 minutes, followed by 20 mg orally every four to eight hours.

Medication	Mechanism of action	Dosage
Indomethacin (Indocin)	Prostaglandin inhibitor	50- to 100-mg rectal suppository, then 25 to 50 mg orally every six hours

Complications Associated With the Use of Tocolytic Agents

Beta-adrenergic agents
- Hypokalemia
- Hyperglycemia
- Hypotension
- Pulmonary edema
- Arrhythmias
- Cardiac insufficiency
- Myocardial ischemia
- Maternal death

Indomethacin (Indocin)
- Renal failure
- Hepatitis
- Gastrointestinal bleeding

Nifedipine (Procardia)
- Transient hypotension

VI. Contraindications to tocolysis

A. Contraindications to labor inhibition are intrauterine fetal demise, lethal fetal anomaly, nonreassuring fetal assessment, severe intrauterine growth restriction, chorioamnionitis, maternal hemorrhage with hemodynamic instability, and severe preeclampsia or eclampsia.

B. Inhibition of preterm labor is less effective when cervical dilatation is advanced (greater than 3 to 4 cm). Tocolysis can be considered in these cases, especially when the goal is to administer antenatal corticosteroids.

VII. Inhibition of preterm labor

A. Bedrest, hydration, and sedation. Bedrest has not been shown to prolong gestation. Intravenous hydration and sedation do not reduce the rate of preterm birth.

B. Beta-adrenergic receptor agonists

1. Maternal side effects include tachycardia, palpitations, and lowered blood pressure. Myocardial ischemia is rare. Common side effects include chest discomfort (10 percent), shortness of breath (15 percent), palpitations (18 percent), tremor (39 percent) and anxiety. Pulmonary edema is an uncommon maternal complication, occurring in 0.3 percent.

2. Beta-adrenergic-receptor agonists may cause hypokalemia (39 percent), hyperglycemia (30 percent), and lipolysis. Glucose and potassium should be monitored. Neonatal hypoglycemia may result from fetal hyperinsulinemia due to prolonged maternal hyperglycemia.

3. Contraindications to beta-agonists. Beta-adrenergic-receptor agonists are relatively contraindicated among women with cardiac disease. Women with poorly controlled hyperthyroidism or diabetes mellitus should not receive these agents. Well-controlled diabetes mellitus is not a contraindication.

4. Dose

a. Terbutaline is the most commonly used beta-agonist for labor inhibition. It is typically given as a continuous intravenous infusion started at 2.5 to 5 µg/min; increased by 2.5 to 5 µg/min every 20 to 30 minutes to a maximum of 25 µg/min, or until the contractions have abated. At this point, the infusion may be reduced by decrements of 2.5 to 5 µg/min to the lowest dose that maintains uterine quiescence.

b. Terbutaline can also be administered subcutaneously as 0.25 mg every 20 to 30 minutes for up to four doses or until tocolysis is achieved. It should be withheld if the maternal heart rate exceeds 120 beats/min. Once labor is inhibited, 0.25 mg can be administered every 3 to 4 hours until the uterus is quiescent for 24 hours.

C. Calcium channel blockers

1. Nifedipine is more effective than betamimetics for delaying delivery at least 48 hours. Dosage is 30 mg orally, followed by 20 mg orally in 90 minutes, followed by 20 mg orally every four to eight hours.

2. Maternal side effects. Nifedipine may cause nausea, flushing, headache, dizziness, and palpitations. Nifedipine also decreases mean arterial pressure and increases heart rate.

3. Contraindications. Calcium channel blockers should be used with caution in women with left ventricular dysfunction or congestive heart failure.

D. Indomethacin

1. Indomethacin is a nonspecific cyclooxygenase inhibitor. Indomethacin is significantly more effective than placebo.

2. Maternal side effects include nausea, esophageal reflux, gastritis, and emesis.

3. Fetal side effects. The primary fetal concerns with use of indomethacin are constriction of the ductus arteriosus and oligohydramnios.

4. Contraindications. Maternal contraindications include platelet dysfunction or bleeding disorder, hepatic dysfunction, gastrointestinal ulcerative disease, renal dysfunction, and asthma (in women with hypersensitivity to aspirin).

E. Recommendations. Beta-adrenergic agonists are the first-line agents for treatment of preterm labor. Indomethacin is recommended for women in PTL with gestations less than 32 weeks in which beta-agonists cannot be administered.

VIII. Corticosteroid therapy

A. Dexamethasone and betamethasone are the preferred corticosteroids for antenatal therapy. Corticosteroid therapy for fetal maturation reduces mortality, respiratory distress syndrome and intraventricular hemorrhage in infants between 24 and 34 weeks of gestation.

Recommended Antepartum Corticosteroid Regimens for Fetal Maturation in Preterm Infants

Medication	Dosage
Betamethasone (Celestone)	12 mg IM every 24 hours for two doses
Dexamethasone	6 mg IM every 12 hours for four doses

IX. Intrapartum antibiotic prophylaxis against group B streptococcus is recommended for the following:
- **A.** Pregnant women with a positive screening culture unless a planned Cesarean section is performed in the absence of labor or rupture of membranes
- **B.** Pregnant women who gave birth to a previous infant with invasive GBS disease
- **C.** Pregnant women with documented GBS bacteriuria during the current pregnancy
- **D.** Pregnant women whose culture status is unknown (culture not performed or result not available) and who also have delivery at <37 weeks of gestation, amniotic membrane rupture for ≥18 hours, or intrapartum temperature ≥100.4ºF (≥38ºC)
- **E.** The recommended IAP regimen is penicillin G (5 million units IV initial dose, then 2.5 million units IV Q4h). In women with non-immediate-type penicillin-allergy, cefazolin (Ancef, 2 g initial dose, then 1 g Q8h) is recommended.

References: See page 311.

Bleeding in the Second Half of Pregnancy

Bleeding in the second half of pregnancy occurs in 4% of all pregnancies. In 50% of cases, vaginal bleeding is secondary to placental abruption or placenta previa.

I. Clinical evaluation of bleeding second half of pregnancy
- **A. History** of trauma or pain and the amount and character of the bleeding should be assessed.
- **B. Physical examination**
  1. Vital signs and pulse pressure are measured. Hypotension and tachycardia are signs of serious hypovolemia.
  2. Fetal heart rate pattern and uterine activity are assessed.
  3. Ultrasound examination of the uterus, placenta and fetus should be completed.
  4. Speculum and digital pelvic examination should not be done until placenta previa has been excluded.
- **C. Laboratory Evaluation**
  1. **Hemoglobin** and hematocrit.
  2. **INR, partial thromboplastin time, platelet count, fibrinogen level, and fibrin split products** are checked when placental abruption is suspected or if there has been significant hemorrhage.
  3. **A red-top tube** of blood is used to perform a bedside clot test.
  4. **Blood type** and cross-match.
  5. **Urinalysis** for hematuria and proteinuria.
  6. The **Apt test** is used to distinguish maternal or fetal source of bleeding. (Vaginal blood is mixed with an equal part 0.25% sodium hydroxide. Fetal blood remains red; maternal blood turns brown.)
  7. **Kleihauer-Betke test** of maternal blood is used to quantify fetal to maternal hemorrhage.

II. Placental abruption (abruptio placentae) is defined as complete or partial placental separation from the decidua basalis after 20 weeks gestation.
- **A.** Placental abruption occurs in 1 in 100 deliveries.
- **B. Factors associated with placental abruption**
  1. Preeclampsia and hypertensive disorders
  2. History of placental abruption
  3. High multiparity
  4. Increasing maternal age
  5. Trauma
  6. Cigarette smoking
  7. Illicit drug use (especially cocaine)
  8. Excessive alcohol consumption
  9. Preterm premature rupture of the membranes
  10. Rapid uterine decompression after delivery of the first fetus in a twin gestation or rupture of membranes with polyhydramnios
  11. Uterine leiomyomas
- **C. Diagnosis of placental abruption**
  1. Abruption is characterized by vaginal bleeding, abdominal pain, uterine tenderness, and uterine contractions.
     - **a.** Vaginal bleeding is visible in 80%; bleeding is concealed in 20%.
     - **b.** Pain is usually of sudden onset, constant, and localized to the uterus and lower back.
     - **c.** Localized or generalized uterine tenderness and increased uterine tone are found with severe placental abruption.
     - **d.** An increase in uterine size may occur with placental abruption when the bleeding is concealed. Concealed bleeding may be detected by serial measurements of abdominal girth and fundal height.
     - **e.** Amniotic fluid may be bloody.
     - **f.** Fetal monitoring may detect distress.
     - **g.** Placental abruption may cause preterm labor.
  2. **Uterine contractions** by tocodynamometry is the most sensitive indicator of abruption.
  3. **Laboratory findings** include proteinuria and a consumptive coagulopathy, characterized by decreased fibrinogen, prothrombin, factors V and VIII, and platelets. Fibrin split products are elevated.
  4. **Ultrasonography** has a sensitivity in detecting placental abruption of only 15%.

D. Management of placental abruption

1. Mild placental abruption

a. If maternal stability and reassuring fetal surveillance are assured and the fetus is immature, close expectant observation with fetal monitoring is justified.

b. Maternal hematologic parameters are monitored and abnormalities corrected.

c. Tocolysis with magnesium sulfate is initiated if the fetus is immature.

2. Moderate to severe placental abruption

a. Shock is aggressively managed.

b. Coagulopathy

(1) Blood is transfused to replace blood loss.

(2) Clotting factors may be replaced using cryoprecipitate or fresh-frozen plasma. One unit of fresh-frozen plasma increases fibrinogen by 10 mg/dL. Cryoprecipitate contains 250 mg fibrinogen/unit; 4 gm (15-20 U) is an effective dose.

(3) Platelet transfusion is indicated if the platelet count is less than 50,000/mcL. One unit of platelets raises the platelet count 5000-10,000/mcL; 4 to 6 U is the smallest useful dose.

c. Oxygen should be administered and urine output monitored with a Foley catheter.

d. Vaginal delivery is expedited in all but the mildest cases once the mother has been stabilized. Amniotomy and oxytocin (Pitocin) augmentation may be used. Cesarean section is indicated for fetal distress, severe abruption, or failed trial of labor.

III. Placenta previa occurs when any part of the placenta implants in the lower uterine segment. It is associated with a risk of serious maternal hemorrhage. Placenta previa occurs in 1 in 200 pregnancies. Ninety percent of placenta previas diagnosed in the second trimester resolve spontaneously.

A. Total placenta previa occurs when the internal cervical os is completely covered by placenta.

B. Partial placenta previa occurs when part of the cervical os is covered by placenta.

C. Marginal placenta previa occurs when the placental edge is located within 2 cm of the cervical os.

D. Clinical evaluation

1. Placenta previa presents with a sudden onset of painless vaginal bleeding in the second or third trimester. The peak incidence occurs at 34 weeks. The initial bleeding usually resolves spontaneously and then recurs later in pregnancy.

2. One fourth of patients present with bleeding and uterine contractions.

E. Ultrasonography is accurate in diagnosing placenta previa.

F. Management of placenta previa

1. In a pregnancy $\geq$36 weeks with documented fetal lung maturity, the neonate should be immediately delivered by cesarean section.

2. Low vertical uterine incision is probably safer in patients with an anterior placenta. Incisions through the placenta should be avoided.

3. If severe hemorrhage jeopardizes the mother or fetus, cesarean section is indicated regardless of gestational age.

4. Expectant management is appropriate for immature fetuses if bleeding is not excessive, maternal physical activity can be restricted, intercourse and douching can be prohibited, and the hemoglobin can be maintained at $\geq$10 mg/dL.

5. Rh immunoglobulin is administered to Rh-negative-unsensitized patients.

6. Delivery is indicated once fetal lung maturity has been documented.

7. Tocolysis with magnesium sulfate may be used for immature fetuses.

IV. Cervical bleeding

A. Cytologic sampling is necessary.

B. Bleeding can be controlled with cauterization or packing.

C. Bacterial and viral cultures are sometimes diagnostic.

V. Cervical polyps

A. Bleeding is usually self-limited.

B. Trauma should be avoided.

C. Polypectomy may control bleeding and yield a histologic diagnosis.

VI. Bloody show is a frequent benign cause of late third trimester bleeding. It is characterized by blood-tinged mucus associated with cervical change.

References: See page 311.

Preeclampsia

Preeclampsia is characterized by new onset of hypertension and proteinuria after 20 weeks of gestation. It complicates 5 to 8 percent of pregnancies and is associated with iatrogenic prematurity. Clinical manifestations of preeclampsia can appear anytime between the second trimester and the first few days postpartum.

I. Clinical evaluation

A. Screening. Pregnant women are routinely screened for signs and symptoms of preeclampsia at each prenatal visit. Women at high risk for preeclampsia should be seen in early pregnancy to assess blood pressure, establish accurate pregnancy dating, and perform baseline laboratory tests.

B. Risk factors for preeclampsia:

1. Primigravid state.

2. History of preeclampsia.

3. A higher blood pressure at the initiation of pregnancy and a large body size.

4. A family history of preeclampsia is associated with a two to fivefold increase in risk.

5. Multiple pregnancy.

6. Preexisting maternal hypertension.

7. Pregestational diabetes.

8. Antiphospholipid antibody syndrome.

9. Vascular or connective tissue disease.
10. Advanced maternal age (>35 to 40 years).

C. Late pregnancy screening. Measurement of blood pressure and urine protein at regular intervals in the late second and third trimesters is critical for diagnosis of preeclampsia. A rising blood pressure is usually the first sign of disease. Women should report possible signs of preeclampsia, such as persistent or severe headache, visual changes, right upper quadrant or epigastric pain, sudden large weight gain, or facial edema.

Diagnosis of Preeclampsia

Systolic blood pressure ≥140 mm Hg
or
Diastolic blood pressure ≥ 90 mm Hg
AND
A random urine protein determination of 1+ on dipstick or 30 mg/dL or proteinuria of 0.3 g or greater in a 24-hour urine specimen

Criteria for Gestational Hypertension

Systolic blood pressure ≥140 mm Hg
Diastolic blood pressure ≥90 mm Hg
AND no proteinuria
Developing AFTER the 20th week of gestation in women known to be normotensive before pregnancy

Criteria for Severe Preeclampsia

New onset proteinuria hypertension and at least one of the following:
Symptoms of central nervous system dysfunction: Blurred vision, scotomata, altered mental status, severe headache
Symptoms of liver capsule distention: Right upper quadrant or epigastric pain
Hepatocellular injury: Serum transaminase concentration at least twice normal
Severe blood pressure elevation: Systolic blood pressure ≥160 mm Hg or diastolic ≥110 mm Hg on two occasions at least six hours apart
Thrombocytopenia: Less than 100,000 platelets per mm^3
Proteinuria: Over 5 grams in 24 hours or 3+ or more on two random samples four hours apart
Oliguria <500 mL in 24 hours
Intrauterine fetal growth restriction
Pulmonary edema or cyanosis
Cerebrovascular accident
Coagulopathy

D. Maternal assessment of women with hypertension after midpregnancy. Mild preeclampsia includes those women who satisfy the criteria for preeclampsia but do not have any features of severe disease.
1. Hypertension should be confirmed by at least two measurements at least several six hours apart.
2. Laboratory evaluation consists of hematocrit (hemoconcentration suggests preeclampsia), platelet count, protein excretion, serum creatinine, serum uric acid, serum alanine and aspartate aminotransferase concentrations (ALT, AST), and lactic acid dehydrogenase concentration (LDH).

E. Eclampsia refers to the development of grand mal seizures in a woman with preeclampsia. Preeclampsia-eclampsia is caused by generalized vasospasm, activation of the coagulation system, and changes in autoregulatory systems related to blood pressure control.

F. Edema and intravascular volume. Most women with preeclampsia have edema. Although peripheral edema is common in normal pregnancy, sudden and rapid weight gain and facial edema often occur in women who develop preeclampsia.

G. Hematologic changes. Increased platelet turnover is a consistent feature of preeclampsia. The most common coagulation abnormality in preeclampsia is thrombocytopenia.

H. Liver involvement may present as right upper quadrant or epigastric pain, elevated liver enzymes and subcapsular hemorrhage or hepatic rupture.

I. Central nervous system. Headache, blurred vision, scotomata, and, rarely, cortical blindness are manifestations of preeclampsia; seizures in a preeclamptic woman are defined as eclampsia.

J. Fetus and placenta. The fetal consequences are fetal growth restriction and oligohydramnios. Severe or early onset preeclampsia result in the greatest decrements in birth weight.

II. Management of preeclampsia

A. The definitive treatment of preeclampsia is delivery. Delivery is recommended for women with mild preeclampsia at or near term and for most women with severe preeclampsia or severe gestational hypertension regardless of gestational age. Exceptions may be made for women remote from term (less than 32 to 34 weeks of gestation) who improve after hospitalization and do not have significant end-organ dysfunction or fetal deterioration.

B. Fetal assessment consists of daily fetal movement counts and nonstress testing and/or biophysical profiles at periodic intervals. A sonographic estimation of fetal weight should be performed to look for growth restriction and oligohydramnios, and it should be repeated serially.

Fetal Assessment in Preeclampsia	
Mild preeclampsia	Daily fetal movement counting Ultrasound examination for estimation of fetal weight and amniotic fluid determination at diagnosis. Repeat in three weeks if the initial examination is normal, twice weekly if there is evidence of fetal growth restriction or oligohydramnios. Nonstress test and/or biophysical profile once or twice weekly. Testing should be repeated immediately if there is an abrupt change in maternal condition.
Severe preeclampsia	Daily nonstress testing and/or biophysical profile

C. Antenatal corticosteroids to promote fetal lung maturation should be administered to women less than 34 weeks of gestation who are at high risk for delivery within the next seven days. Betamethasone (two doses of 12 mg given intramuscularly 24 hours apart) or dexamethasone (four doses of 6 mg given intramuscularly 12 hours apart) may be used.

D. Maternal monitoring. Laboratory evaluation (eg, hematocrit, platelet count, creatinine, urine protein, LDH, AST, ALT, uric acid) should be repeated once or twice weekly in women with mild stable preeclampsia.

E. Symptoms. Patients should call immediately if they develop severe or persistent headache, visual changes, right upper quadrant or epigastric pain, nausea or vomiting, shortness of breath, or decreased urine output. Decreased fetal movement, vaginal bleeding, abdominal pain, rupture of membranes, or uterine contractions should be reported immediately.

F. Women with severe preeclampsia should be delivered or hospitalized for the duration of pregnancy. Prolonged antepartum management may be considered in selected women under 32 weeks of gestation, such as those whose condition improves after hospitalization and who have no evidence of end-organ dysfunction or fetal deterioration.

G. Timing and indications for delivery. Delivery at or by 40 weeks of gestation should be considered for all women with preeclampsia. Women with mild disease and a favorable cervix may benefit from induction as early as 38 weeks, while those with stable severe disease should be delivered after 32 to 34 weeks if possible (with demonstration of fetal pulmonary maturity).

Indications for Delivery in Preeclampsia	
Maternal indications	Gestational age greater than or equal to 38 weeks of gestation Platelet count less than 100,000 cells per mm^3 Deteriorating liver function Progressive deterioration in renal function Abruptio placentae Persistent severe headaches or visual changes Persistent severe epigastric pain, nausea, or vomiting
Fetal indications	Severe fetal growth restriction Nonreassuring results from fetal testing Oligohydramnios

H. Laboratory

1. Platelet count, creatinine, urine protein, and liver enzymes, should be repeated once or twice weekly in women with mild stable preeclampsia. Protein excretion can be quantified with a protein-to-creatinine ratio.

2. A rising hematocrit suggests progression to more severe disease, while a falling hematocrit may be a sign of hemolysis. An elevated lactic acid dehydrogenase (LDH) concentration is a better sign of hemolysis, and a marker of severe disease or HELLP syndrome (ie, Hemolysis, Elevated Liver enzymes, Low Platelets). Hemolysis can be confirmed by observation of schistocytes on a blood smear.

III. Severe preeclampsia

A. All women with severe preeclampsia should be delivered or hospitalized for the duration of pregnancy. Prolonged antepartum management may be considered in women under 32 to 34 weeks of gestation who have:

1. Severe proteinuria (greater than 5 g in 24 hours).

2. Mild intrauterine fetal growth restriction (fifth to tenth percentile), as long as antepartum fetal testing remains reassuring, oligohydramnios is not severe, umbilical artery diastolic flow is not reversed on Doppler velocimetry, and there is progressive fetal growth.

3. Severe hypertension with blood pressure reduction after hospitalization.

4. Asymptomatic laboratory abnormalities that quickly resolve after hospitalization.

B. Delivery should be initiated, after a course of antenatal corticosteroid therapy if possible, when there is poorly controlled, severe hypertension, eclampsia, thrombocytopenia (less than 100,000 platelets/microL), elevated liver function tests with epigastric or right upper quadrant pain, pulmonary edema, rise in serum creatinine concentration by 1 mg/dL over baseline, placental abruption, or persistent severe headache or visual changes. Fetal indications for delivery include nonreassuring fetal testing, severe oligohydramnios, or severe fetal growth restriction (less than the 5th percentile).

C. Timing and indications for delivery

1. Timing of delivery is based upon the maternal and fetal condition and gestational age.
2. Women who develop severe preeclampsia at or beyond 32 to 34 weeks of gestation should be delivered.
3. Women with mild disease remote from term can be managed expectantly to enable fetal growth and maturation.
4. Women with mild disease and a favorable cervix or who are noncompliant may benefit from induction as early as 37 weeks; otherwise, delivery by 40 weeks of gestation should be considered.
5. Women with stable, severe disease under 32 to 34 weeks may be managed expectantly with daily maternal and fetal monitoring. Delivery can be delayed until either a course of glucocorticoids to accelerate fetal lung maturation can be completed or there is evidence of fetal pulmonary maturity or 34 weeks of gestation are completed.
6. Delivery should be undertaken if there are signs of worsening disease (eg, severe hypertension not controlled with antihypertensive therapy, cerebral/visual symptoms, platelet count <100,000 cells/microL, deterioration in liver or renal function, abdominal pain, severe fetal growth restriction, abruption, nonreassuring fetal testing).
7. Eclampsia is also an indication for delivery.

D. Route of delivery. Delivery is usually by the vaginal route, with cesarean delivery reserved for the usual obstetrical indications. Severe preeclampsia does not mandate immediate cesarean birth.

IV. Anticonvulsant therapy is generally initiated during labor or while administering corticosteroids or prostaglandins prior to planned delivery and continued until 24 to 48 hours postpartum, when the risk of seizures is low. Magnesium sulfate is the drug of choice for seizure prevention.

A. Magnesium sulfate is given as a loading dose of 6 g intravenously, followed by 2 g per hour as a continuous infusion. Magnesium sulfate should be considered for prevention of eclampsia in all women with preeclampsia.

B. Magnesium toxicity is related to serum concentration: loss of deep tendon reflexes occurs at 8 to 10 mEq/L, respiratory paralysis at 10 to 15 mEq/L, and cardiac arrest at 20 to 25 mEq/L. Calcium gluconate (1 g intravenously over at 5 to 10 minutes) is administered to counteract magnesium toxicity.

V. Treatment of hypertension in preeclampsia

A. Severe hypertension should be treated. In adult women, diastolic blood pressures ≥105 to 110 mm Hg or systolic pressures ≥160 to 180 mm Hg are considered severe hypertension. In adolescents, treatment is initiated at diastolic pressures of ≥100 mm Hg.

B. Intravenous labetalol is both effective and safe (beginning with 20 mg intravenously followed at 10- to 15-minute intervals by 40 mg, then 80 mg up to a maximum total cumulative dose of 220 mg).

C. Occasionally, preeclamptic women with severe hypertension are stabilized and not delivered. In these patients, oral antihypertensive therapy is often indicated. The only oral drugs that have been proven to be safe in pregnant women are methyldopa (250 mg twice daily orally, maximum dose 4 g/day), and beta-blockers, such as labetalol (100 mg twice daily orally, maximum dose 2400 mg/day).

D. Blood pressure goal. The goal of therapy is a systolic pressure of 140 to 155 mm Hg and diastolic pressure of 90 to 105 mm Hg.

Treatment of Severe Hypertension in Preeclampsia
The goal is a gradual reduction of blood pressure to a level below 160/105 mm Hg. Sudden and severe hypotension should be avoided.
Hydralazine: 5 mg IV, repeat 5 to 10 mg IV every 20 minutes to maximum cumulative total of 20 mg or until blood pressure is controlled.
Labetalol (Trandate): 20 mg IV, followed by 40 mg, then 80 mg, then 80 mg at 10 minute intervals until the desired response is achieved or a maximum total dose of 220 mg is administered.
Methyldopa (Aldomet) 250 mg BID orally, maximum dose 4 g/day

II. Management of eclampsia

A. Maintenance of airway patency and prevention of aspiration are the initial management priorities. The patient should be rolled onto her left side and a padded tongue blade placed in her mouth, if possible.

B. Control of convulsions. Magnesium sulfate, 2 to 4 g IV push repeated every 15 minutes to a maximum of 6 g**. Maintenance dose of magnesium sulfate:** 2 to 3 g/hour by continuous intravenous infusion. Diazepam may also be given as 5 mg IV push repeated as needed to a maximum cumulative dose of 20 mg to stop the convulsions; however, benzodiazepines have profound depressant effects on the fetus.

C. Postpartum course. Hypertension due to preeclampsia resolves postpartum, often within a few days, but sometimes taking a few weeks. Severe hypertension should be treated; antihypertensive medications can be discontinued when blood pressure returns to normal.

III. Postpartum hypertension. A small rise in blood pressure is common, with an average increase in systolic and diastolic pressure of 6 and 4 mm Hg, respectively, in the first four postpartum days.

A. Preeclampsia-related hypertension usually resolves within a few weeks (average 16 days) and should always be gone by

12 weeks postpartum. Mild hypertension that persists beyond this period should be evaluated and treated.

B. Angiotensin converting enzyme (ACE) inhibitors, beta-blockers, and calcium channel blockers are suitable choices for nonbreastfeeding mothers. ACE inhibitors should be avoided during lactation. Diuretics may reduce milk volume and should be avoided.

IV. Pre-existent hypertension

A. There is a threefold increase in perinatal mortality, a twofold increase in abruptio placentae, and an increased rate of impaired fetal growth in pregnant women with preexisting hypertension. There is also a higher rate of preterm delivery before 35 weeks.

B. Maternal evaluation

1. Baseline laboratory tests include urinalysis and urine culture, serum creatinine, blood urea nitrogen, glucose, electrolytes, and 24-hour urine collection for total protein and creatinine clearance. An electrocardiogram should be obtained in women with long-standing hypertension.
2. Periodic reassessment of serum creatinine and quantitative testing for urine protein is recommended every trimester.

C. Indications for treatment. Women with chronic hypertension who are normotensive or mildly hypertensive on medication may continue their therapy or have their antihypertensive agents tapered and/or stopped during pregnancy.

1. **Mild essential hypertension.** Indications for initiating or reinstituting antihypertensive therapy are a diastolic pressure persistently above 100 mm Hg, systolic pressure ≥150 to 160 mm Hg, or signs of hypertensive end-organ damage.
2. **Severe hypertension** (blood pressure ≥180/110 mm Hg), particularly if associated with signs of early hypertensive encephalopathy, should be treated to protect the mother from stroke, heart failure, or renal failure.

D. Choice of drug

1. Methyldopa and hydralazine have been most widely used in pregnant women and their long-term safety for the fetus has been demonstrated. ACE inhibitors should not be continued in pregnancy.
2. Beta-blockers are generally considered to be safe, although they may impair fetal growth when used early in pregnancy, particularly atenolol. Labetalol is the preferred agent. Nifedipine (30 to 90 mg once daily as sustained-release tablet, increase at 7 to 14 day intervals, maximum dose 120 mg/day) has been used.
3. The normal fall in blood pressure during the second trimester may allow a reduction in drug dosage or even cessation of therapy.
4. Start treatment with either labetolol or methyldopa. A long-acting calcium channel blocker (eg, nifedipine or amlodipine) can be added as either second- or third-line treatment.
5. **Blood pressure goal.** The goal of therapy in women without end-organ damage is systolic pressure between 140 and 150 mm Hg and diastolic pressure between 90 and 100 mm Hg. However, in women with end-organ damage, the blood pressure should be below 140/90 mm Hg.

E. Other management issues

1. Frequent prenatal visits for monitoring maternal blood pressure, proteinuria, and fundal growth and by periodic sonographic estimation of fetal size are recommended.
2. **Fetal evaluation.** A baseline ultrasound examination is recommended at 16 to 20 weeks of gestation to confirm gestational age. A nonstress test or biophysical profile should be performed weekly starting at 32 weeks.
3. **Delivery.** Woman with mild, uncomplicated chronic hypertension can be allowed to go into spontaneous labor and deliver at term. Earlier delivery can be considered for women with severe hypertension, superimposed preeclampsia, or pregnancy complications (eg, fetal growth restriction, previous stillbirth).

F. Treatment of hypertension. Antihypertensive treatment is indicated if the systolic blood pressure is ≥170 mm Hg. The preferred agents are methyldopa for prolonged antenatal therapy, and hydralazine, labetalol or nifedipine for peripartum treatment of acute hypertensive episodes. Sodium restriction and diuretics have no role in therapy. Restricted physical activity can lower blood pressure.

References: See page 311.

Herpes Simplex Virus Infections in Pregnancy

Herpes simplex virus (HSV) is a major source of morbidity and mortality for newborns infected with HSV. HSV-2 is primarily responsible for genital HSV disease. Spread is principally through sexual contact. The incidence is 22 percent. The majority of cases are asymptomatic or symptoms are unrecognized. HSV-1 infection generally involves the mucosal surfaces of the mouth, pharynx, lips and eyes, but the virus can also be recovered from genital lesions.

I. Clinical presentation

A. Primary genital episode genital HSV is characterized by multiple painful vesicles in clusters. They may be associated with pruritus, dysuria, vaginal discharge, and tender regional adenopathy. Fever, malaise, and myalgia often occur one to two days prior to the appearance of lesions. The lesions may last four to five days prior to crusting. The skin will reepithelialize in about 10 days. Viral shedding may last for 10 to 12 days after reepithelialization.

B. Nonprimary first-episode genital HSV refers to patients with preexisting antibodies to one of the two types of virus who acquire the other virus and develop genital lesions. Nonprimary disease is less severe with fewer systemic symptoms, and less local pain.

C. Recurrent HSV episodes are characterized by local pain or paresthesia followed by vesicular lesions. Lesions are generally fewer in number and often unilateral but may be painful.

II. Diagnosis

A. PCR to detect HSV DNA from lesions or genital secretions is recommended for diagnosis. The gold standard for diagnosis of acute HSV infection is viral culture. Although the highest yield is from vesicular fluid of skin lesions, cultures may be obtained from the eyes, mouth, cerebral spinal fluid, rectum, urine, and blood.

Clinical Designation of Genital Herpes Simplex Virus Infection
Primary genital HSV infection Antibodies to both HSV-1 and HSV-2 are absent at the time the patient acquires genital HSV due to HSV-1 or HSV-2
Nonprimary first episode genital HSV infection Acquisition of genital HSV-1 with pre-existing antibodies to HSV-2 or acquisition of genital HSV-2 with pre-existed antibodies to HSV-1
Recurrent genital HSV infection Reactivation of genital HSV in which the HSV type recovered from the lesion is the same type as antibodies in the serum

III. Maternal treatment

A. Primary infection. Acyclovir therapy (200 mg PO five times per day or 400 mg PO TID for 7 to 14 days) is recommended. Acyclovir is safe in pregnancy. Acyclovir should be administered to pregnant women experiencing a first episode of HSV during pregnancy to reduce the duration of active lesions. Suppressive therapy (400 mg PO BID) for the remainder of pregnancy should also be considered.

B. Recurrent infection. Women with one or more HSV recurrence during pregnancy benefit from suppression given at 36 weeks of gestation through delivery.

C. Cesarean delivery should be offered to women who have active lesions or symptoms of vulvar pain or burning at the time of delivery in those with a history of genital herpes. However, delivery by cesarean birth does not prevent all infections. Approximately 20 to 30 percent of HSV-infected infants are born by cesarean. Prophylactic cesarean delivery is not recommended for women with recurrent HSV and no evidence of active lesions at the time of delivery. Lesions which have crusted fully are considered healed and not active.

D. Prevention

1. Nongenital invasive procedures (eg, amniocentesis) should be delayed if there is evidence of systemic disease. Use of fetal scalp electrodes should be avoided among women who are known to have recurrent HSV, and who are in labor.

2. Mothers with active lesions should cover their lesions, and hands should be washed before touching the baby. Breastfeeding is not contraindicated as long as there are no breast lesions.

References: See page 311.

Dystocia and Augmentation of Labor

I. Normal labor

A. First stage of labor

1. The first stage of labor consists of the period from the onset of labor until complete cervical dilation (10 cm). This stage is divided into the latent phase and the active phase.

2. Latent phase

a. During the latent phase, uterine contractions are infrequent and irregular and result in only modest discomfort. They result in gradual effacement and dilation of the cervix.

b. A prolonged latent phase is one that exceeds 20 hours in the nullipara or one that exceeds 14 hours in the multipara.

3. Active phase

a. The active phase of labor occurs when the cervix reaches 3-4 cm of dilatation.

b. The active phase of labor is characterized by an increased rate of cervical dilation and by descent of the presenting fetal part.

B. Second stage of labor

1. The second stage of labor consists of the period from complete cervical dilation (10 cm) until delivery of the infant. This stage is usually brief, averaging 20 minutes for parous women and 50 minutes for nulliparous women.

2. The duration of the second stage of labor is unrelated to perinatal outcome in the absence of a nonreassuring fetal heart rate pattern as long as progress occurs.

II. Abnormal labor

A. Dystocia is defined as difficult labor or childbirth resulting from abnormalities of the cervix and uterus, the fetus, the maternal pelvis, or a combination of these factors.

B. Cephalopelvic disproportion is a disparity between the size of the maternal pelvis and the fetal head that precludes vaginal delivery. This condition can rarely be diagnosed in advance.

C. Slower-than-normal (protraction disorders) or complete cessation of progress (arrest disorder) are disorders that can be diagnosed only after the parturient has entered the active phase of labor.

III. Assessment of labor abnormalities

A. Labor abnormalities caused by inadequate uterine contractility (powers). The minimal uterine contractile pattern of women in spontaneous labor consists of 3 to 5 contractions in a 10-minute period.

B. Labor abnormalities caused by fetal characteristics (passenger)

1. Assessment of the fetus consists of estimating fetal weight and position. Estimations of fetal size, even those obtained by ultrasonography, are frequently inaccurate.
2. In the first stage of labor, the diagnosis of dystocia can not be made unless the active phase of labor and adequate uterine contractile forces have been present.
3. Fetal anomalies such as hydrocephaly, encephalocele, and soft tissue tumors may obstruct labor. Fetal imaging should be considered when malpresentation or anomalies are suspected based on vaginal or abdominal examination or when the presenting fetal part is persistently high.

C. Labor abnormalities due to the pelvic passage (passage)

1. Inefficient uterine action should be corrected before attributing dystocia to a pelvic problem.
2. The bony pelvis is very rarely the factor that limits vaginal delivery of a fetus in cephalic presentation. Radiographic pelvimetry is of limited value in managing most cephalic presentations.
3. Clinical pelvimetry can only be useful to qualitatively identify the general architectural features of the pelvis.

IV. Augmentation of labor

A. Uterine hypocontractility should be augmented only after both the maternal pelvis and fetal presentation have been assessed.

B. Contraindications to augmentation include placenta or vasa previa, umbilical cord prolapse, prior classical uterine incision, pelvic structural deformities, and invasive cervical cancer.

C. Oxytocin (Pitocin)

1. The goal of oxytocin administration is to stimulate uterine activity that is sufficient to produce cervical change and fetal descent while avoiding uterine hyperstimulation and fetal compromise.
2. **Minimally effective uterine activity** is 3 contractions per 10 minutes averaging greater than 25 mm Hg above baseline. A maximum of 5 contractions in a 10-minute period with resultant cervical dilatation is considered adequate.
3. **Hyperstimulation** is characterized by more than five contractions in 10 minutes, contractions lasting 2 minutes or more, or contractions of normal duration occurring within 1 minute of each other.
4. Oxytocin is administered when a patient is progressing slowly through the latent phase of labor or has a protraction or an arrest disorder of labor, or when a hypotonic uterine contraction pattern is identified.
5. A pelvic examination should be performed before initiation of oxytocin infusion.
6. Oxytocin is usually diluted 10 units in 1 liter of normal saline IVPB.

Labor Stimulation with Oxytocin (Pitocin)

Starting Dose (mU/min)	Incremental Increase (mU/min)	Dosage Interval (min)	Maximum Dose (mU/min)
6	6	15	40

7. **Management of oxytocin-induced hyperstimulation**
   - **a.** The most common adverse effect of hyperstimulation is fetal heart rate deceleration associated with uterine hyperstimulation. Stopping or decreasing the dose of oxytocin may correct the abnormal pattern.
   - **b.** Additional measures may include changing the patient to the lateral decubitus position and administering oxygen or more intravenous fluid.
   - **c.** If oxytocin-induced uterine hyperstimulation does not respond to conservative measures, intravenous terbutaline (0.125-0.25 mg) or magnesium sulfate (2-6 g in 10-20% dilution) may be used to stop uterine contractions.

References: See page 311.

Fetal Macrosomia

Excessive birth weight is associated with an increased risk of maternal and neonatal injury. Macrosomia is defined as a fetus with an estimated weight of more than 4,500 grams, regardless of gestational age.

I. Diagnosis of macrosomia

A. Clinical estimates of fetal weight based on Leopold's maneuvers or fundal height measurements are often inaccurate.

B. Diagnosis of macrosomia requires ultrasound evaluation; however, estimation of fetal weight based on ultrasound is associated with a large margin of error.

C. Maternal weight, height, previous obstetric history, fundal height, and the presence of gestational diabetes should be evaluated.

II. Factors influencing fetal weight

A. Gestational age. Post-term pregnancy is a risk factor for macrosomia. At 42 weeks and beyond, 2.5% of fetuses weigh more than 4,500 g. Ten to twenty percent of macrosomic infants are post-term fetuses.

B. Maternal weight. Heavy women have a greater risk of giving birth to excessively large infants. Fifteen to 35% of women who deliver macrosomic fetuses weigh 90 kg or more.

C. Multiparity. Macrosomic infants are 2-3 times more likely to be born to parous women.

D. Macrosomia in a prior infant. The risk of delivering an infant weighing more than 4,500 g is increased if a prior infant weighed more than 4,000 g.

E. Maternal diabetes

1. Maternal diabetes increases the risk of fetal macrosomia and shoulder dystocia.

2. Cesarean delivery is indicated when the estimated fetal weight exceeds 4,500 g.

III. Morbidity and mortality

A. Abnormalities of labor. Macrosomic fetuses have a higher incidence of labor abnormalities and instrumental deliveries.

B. Maternal morbidity. Macrosomic fetuses have a two- to threefold increased rate of cesarean delivery.

C. Birth injury

1. The incidence of birth injuries occurring during delivery of a macrosomic infant is much greater with vaginal than with cesarean birth. The most common injury is brachial plexus palsy, often caused by shoulder dystocia.
2. The incidence of shoulder dystocia in infants weighing more than 4,500 g is 8-20%. Macrosomic infants also may sustain fractures of the clavicle or humerus.

IV. Management of delivery

A. If the estimated fetal weight is greater than 4500 gm in the nondiabetic or greater than 4000 gm in the diabetic patient, delivery by cesarean section is indicated.

B. Management of shoulder dystocia

1. If a shoulder dystocia occurs, an assistant should provide suprapubic pressure to dislodge the impacted anterior fetal shoulder from the symphysis. McRoberts maneuver (extreme hip flexion) should be done simultaneously.
2. If the shoulder remains impacted anteriorly, an ample episiotomy should be cut and the posterior arm delivered.
3. In almost all instances, one or both of these procedures will result in successful delivery. The Zavanelli maneuver consists of replacement of the fetal lead into the vaginal canal and delivery by emergency cesarean section.
4. Fundal pressure is not recommended because it often results in further impaction of the shoulder against the symphysis.

References: See page 311.

Shoulder Dystocia

Shoulder dystocia, defined as failure of the shoulders to deliver following the head, is an obstetric emergency. The incidence varies from 0.6% to 1.4% of all vaginal deliveries. Up to 30% of shoulder dystocias can result in brachial plexus injury; many fewer sustain serious asphyxia or death. Most commonly, size discrepancy secondary to fetal macrosomia is associated with difficult shoulder delivery. Causal factors of macrosomia include maternal diabetes, postdates gestation, and obesity. The fetus of the diabetic gravida may also have disproportionately large shoulders and body size compared with the head.

I. Prediction

A. The diagnosis of shoulder dystocia is made after delivery of the head. The "turtle" sign is the retraction of the chin against the perineum or retraction of the head into the birth canal. This sign demonstrates that the shoulder girdle is resisting entry into the pelvic inlet, and possibly impaction of the anterior shoulder.

B. Macrosomia has the strongest association. ACOG defines macrosomia as an estimated fetal weight (EFW) greater than 4500 g.

C. Risk factors for macrosomia include maternal birth weight, prior macrosomia, preexisting diabetes, obesity, multiparity, advanced maternal age, and a prior shoulder dystocia. The recurrence rate has been reported to be 13.8%, nearly seven times the primary rate. Shoulder dystocia occurs in 5.1% of obese women. In the antepartum period, risk factors include gestational diabetes, excessive weight gain, short stature, macrosomia, and postterm pregnancy. Intrapartum factors include prolonged second stage of labor, abnormal first stage, arrest disorders, and instrumental (especially midforceps) delivery. Many shoulder dystocias will occur in the absence of any risk factors.

II. Management

A. Shoulder dystocia is a medical and possibly surgical emergency. Two assistants should be called for if not already present, as well as an anesthesiologist and pediatrician. A generous episiotomy should be cut. The following sequence is suggested:

1. **McRoberts maneuver:** The legs are removed from the lithotomy position and flexed at the hips, with flexion of the knees against the abdomen. Two assistants are required. This maneuver may be performed prophylactically in anticipation of a difficult delivery.
2. **Suprapubic pressure:** An assistant is requested to apply pressure downward, above the symphysis pubis. This can be done in a lateral direction to help dislodge the anterior shoulder from behind the pubic symphysis. It can also be performed in anticipation of a difficult delivery. Fundal pressure may increase the likelihood of uterine rupture and is contraindicated.
3. **Rotational maneuvers:** The Woods' corkscrew maneuver consists of placing two fingers against the anterior aspect of the posterior shoulder. Gentle upward rotational pressure is applied so that the posterior shoulder girdle rotates anteriorly, allowing it to be delivered first. The Rubin maneuver is the reverse of Woods's maneuver. Two fingers are placed against the posterior aspect of the posterior (or anterior) shoulder and forward pressure applied. This results in adduction of the shoulders and displacement of the anterior shoulder from behind the symphysis pubis.
4. **Posterior arm release:** The operator places a hand into the posterior vagina along the infant's back. The posterior arm is identified and followed to the elbow. The elbow is then swept across the chest, keeping the elbow flexed. The fetal forearm or hand is then grasped and the posterior arm delivered, followed by the anterior shoulder. If the fetus still remains undelivered, vaginal delivery should be abandoned and the Zavanelli maneuver performed followed by cesarean delivery.

5. **Zavanelli maneuver:** The fetal head is replaced into the womb. Tocolysis is recommended to produce uterine relaxation. The maneuver consists of rotation of the head to occiput anterior. The head is then flexed and pushed back into the vagina, followed abdominal delivery. Immediate preparations should be made for cesarean delivery.
6. If cephalic replacement fails, an emergency symphysiotomy should be performed. The urethra should be laterally displaced to minimize the risk of lower urinary tract injury.

B. The McRoberts maneuver alone will successfully alleviate the shoulder dystocia in 42% to 79% of cases. For those requiring additional maneuvers, vaginal delivery can be expected in more than 90%. Finally, favorable results have been reported for the Zavanelli maneuver in up to 90%.

References: See page 311.

Postdates Pregnancy

A term gestation is defined as one completed in 38 to 42 weeks. Pregnancy is considered prolonged or postdates when it exceeds 294 days or 42 weeks from the first day of the last menstrual period (LMP). About 10% of those pregnancies are postdates. The incidence of patients reaching the 42nd week is 3-12%.

I. Morbidity and mortality

A. The rate of maternal, fetal, and neonatal complications increases with gestational age. The cesarean delivery rate more than doubles when passing the 42nd week compared with 40 weeks because of cephalopelvic disproportion resulting from larger infants and by fetal intolerance of labor.

B. Neonatal complications from postdates pregnancies include placental insufficiency, birth trauma from macrosomia, meconium aspiration syndrome, and oligohydramnios.

II. Diagnosis

A. The accurate diagnosis of postdates pregnancy can be made only by proper dating. The estimated date of confinement (EDC) is most accurately determined early in pregnancy. An EDC can be calculated by subtracting 3 months from the first day of the last menses and adding 7 days (Naegele's rule). Other clinical parameters that should be consistent with the EDC include maternal perception of fetal movements (quickening) at about 16 to 20 weeks; first auscultation of fetal heart tones with Doppler ultrasound by 12 weeks; uterine size at early examination (first trimester) consistent with dates; and, at 20 weeks, a fundal height 20 cm above the symphysis pubis or at the umbilicus.

Clinical Estimates of Gestational Age

Parameter	Gestational age (weeks)
Positive urine hCG	5
Fetal heart tones by Doppler	11 to 12
Quickening Primigravida Multigravida	 20 16
Fundal height at umbilicus	20

B. In patients without reliable clinical data, ultrasound is beneficial. Ultrasonography is most accurate in early gestation. The crown-rump length becomes less accurate after 12 weeks in determining gestational age because the fetus begins to curve.

III. Management of the postdates pregnancy

A. A postdates patient with a favorable cervix should receive induction of labor. Only 8.2% of pregnancies at 42 weeks have a ripe cervix (Bishop score >6). Induction at 41 weeks with cervical ripening lowers the cesarean delivery rate.

B. Placement of a balloon catheter immediately followed by vaginal or intracervical prostaglandin E2 administration is recommended. Oxytocin, if required, can be started six hours after the last prostaglandin dose.

C. Stripping of membranes, starting at 38 weeks and repeated weekly may be an effective method of inducing labor in postterm women with a favorable cervix. Stripping of membranes is performed by placing a finger in the cervical os and circling 3 times in the plane between the fetal head and cervix.

D. Expectant management with antenatal surveillance

1. Begin testing near the end of the 41st week of pregnancy. Antepartum testing consists of the nonstress test (NST) combined with the amniotic fluid index (AFI) twice weekly. The false-negative rate is 6.1/1000 (stillbirth within 1 week of a reassuring test) with twice weekly NSTs.
2. The AFI involves measuring the deepest vertical fluid pocket in each uterine quadrant and summing the four together. Less than 5 cm is considered oligohydramnios, 5 to 8 cm borderline, and greater than 8 cm normal.

E. Fetal movement counting (kick counts). Fetal movement has been correlated with fetal health. It consist of having the mother lie on her side and count fetal movements. Perception of 10 distinct movements in a period of up to 2 hours is considered reassuring. After 10 movements have been perceived, the count may be discontinued.

F. Delivery is indicated if the amniotic fluid index is less than 5 cm, a nonreactive non-stress test is identified, or if decelerations are identified on the nonstress test.

G. Intrapartum management

1. **Meconium staining** is more common in postdates pregnancies. If oligohydramnios is present, amnioinfusion dilutes meconium and decreases the number of infants with meconium below the vocal cords. Instillation of normal saline through an intrauterine pressure catheter may reduce variable decelerations.

2. **Macrosomia** should be suspected in all postdates gestations. Fetal weight should be estimated prior to labor in all postdates pregnancies. Ultrasonographic weight predictions generally fall within 20% of the actual birth weight.
3. **Management of suspected macrosomia.** The pediatrician and anesthesiologist should be notified so that they can prepare for delivery. Cesarean delivery should be considered in patients with an estimated fetal weight greater than 4500 g and a marginal pelvis, or someone with a previous difficult vaginal delivery with a similarly sized or larger infant.
4. Intrapartum asphyxia is also more common in the postdates pregnancy. Therefore, close observation of the fetal heart rate tracing is necessary during labor. Variable decelerations representing cord compression are frequently seen in postdates pregnancies
5. Cord compression can be treated with amnioinfusion, which can reduce variable decelerations. Late decelerations are more direct evidence of fetal hypoxia. If intermittent, late decelerations are managed conservatively with positioning and oxygen. If persistent late decelerations are associated with decreased variability or an elevated baseline fetal heart rate, immediate evaluation or delivery is indicated. This additional evaluation can include observation for fetal heart acceleration following fetal scalp or acoustic stimulation, or a fetal scalp pH.

References: See page 311.

Induction of Labor

Induction of labor refers to stimulation of uterine contractions prior to the onset of spontaneous labor. Between 1990 and 1998, the rate of labor induction doubled from 10 to 20 percent.

I. Indications for labor induction:
- **A.** Preeclampsia/eclampsia, and other hypertensive diseases
- **B.** Maternal diabetes mellitus
- **C.** Prelabor rupture of membranes
- **D.** Chorioamnionitis
- **E.** Intrauterine fetal growth restriction (IUGR)
- **F.** Isoimmunization
- **G.** In-utero fetal demise
- **H.** Postterm pregnancy

II. Absolute contraindications to labor induction:
- **A.** Prior classical uterine incision
- **B.** Active genital herpes infection
- **C.** Placenta or vasa previa
- **D.** Umbilical cord prolapse
- **E.** Fetal malpresentation, such as transverse lie

II. Requirements for induction
- **A.** Prior to undertaking labor induction, assessments of gestational age, fetal size and presentation, clinical pelvimetry, and cervical examination should be performed. Fetal maturity should be evaluated, and amniocentesis for fetal lung maturity may be needed prior to induction.
- **B. Clinical criteria that confirm term gestation:**
  1. Fetal heart tones documented for 30 weeks by Doppler.
  2. Thirty-six weeks have elapsed since a serum or urine human chorionic gonadotropin (hCG) pregnancy test was positive.
  3. Ultrasound measurement of the crown-rump length at 6 to 11 weeks of gestation or biparietal diameter/femur length at 12 to 20 weeks of gestation support a clinically determined gestational age equal to or greater than 39 weeks.
- **C. Assessment of cervical ripeness**
  1. A cervical examination should be performed before initiating attempts at labor induction.
  2. The modified Bishop scoring system is most commonly used to assess the cervix. A score is calculated based upon the station of the presenting part and cervical dilatation, effacement, consistency, and position.

Modified Bishop Scoring System

	0	**1**	**2**	**3**
Dilation, cm	Closed	1-2	3-4	5-6
Effacement, percent	0-30	40-50	60-70	≥80
Station*	-3	-2	-1, 0	+1, +2
Cervical consistency	Firm	Medium	Soft	
Position of the cervix	Posterior	Midposition	Anterior	

* Based on a -3 to +3 scale.

3. The likelihood of a vaginal delivery after labor induction is similar to that after spontaneous onset of labor if the Bishop score is ≥8.

III. Induction of labor with oxytocin
- **A.** The uterine response to exogenous oxytocin administration is periodic uterine contractions.
- **B. Oxytocin regimen (Pitocin)**
  1. Oxytocin is given intravenously. Oxytocin is diluted by placing 10 units in 1000 mL of normal saline, yielding an oxytocin concentration of 10 mU/mL. Begin at 6 mU/min and increase by 6 mU/min every 15 minutes.
  2. Active management of labor regimens use a high-dose oxytocin infusion with short incremental time intervals.

High Dose Oxytocin Regimen
Begin oxytocin 6 mU per minute intravenously Increase dose by 6 mU per minute every 15 minutes Maximum dose: 40 mU per minute Maximum total dose administered-during-labor: 10 U Maximum duration of administration: six hours

3. The dose of maximum oxytocin is usually 40 mU/min. The dose is typically increased until contractions occur at two to three minute intervals.

IV. Cervical ripening agents

A. A ripening process should be considered prior to use of oxytocin use when the cervix is unfavorable.

B. Mechanical methods

1. **Membrane stripping** is a widely utilized technique, which causes release of either prostaglandin F2-alpha from the decidua and adjacent membranes or prostaglandin E2 from the cervix. Weekly membrane stripping beginning at 38 weeks of gestation results in delivery within a shorter period of time (8.6 versus 15 days).
2. **Amniotomy** is an effective method of labor induction when performed in women with partially dilated and effaced cervices. Caution should be exercised to ensure that the fetal vertex is well-applied to the cervix and the umbilical cord or other fetal part is not presenting.
3. **Foley catheter.** An uninflated Foley catheter can be passed through an undilated cervix and then inflated. This technique is as effective as prostaglandin E2 gel. The use of extra-amniotic saline infusion with a balloon catheter or a double balloon catheter (Atad ripener) also appears to be effective for cervical ripening.

C. Prostaglandins

1. Local administration of prostaglandins to the vagina or the endocervix is the route of choice because of fewer side effects and acceptable clinical response. Uncommon side effects include fever, chills, vomiting, and diarrhea.
2. **Prepidil** contains 0.5 mg of dinoprostone in 2.5 mL of gel for intracervical administration. The dose can be repeated in 6 to 12 hours if there is inadequate cervical change and minimal uterine activity following the first dose. The maximum cumulative dose is 1.5 mg (ie, 3 doses) within a 24-hour period. The time interval between the final dose and initiation of oxytocin should be 6 to 12 hours because of the potential for uterine hyperstimulation with concurrent oxytocin and prostaglandin administration.
3. **Cervidil** is a vaginal insert containing 10 mg of dinoprostone in a timed-release formulation. The vaginal insert administers the medication at 0.3 mg/h and should be left in place for 12 hours. Oxytocin may be initiated 30 to 60 minutes after removal of the insert.
4. An advantage of the vaginal insert over the gel formulation is that the insert can be removed in cases of uterine hyperstimulation or abnormalities of the fetal heart rate tracing.

V. Complications of labor induction

A. Hyperstimulation and tachysystole may occur with use of prostaglandin compounds or oxytocin. Hyperstimulation is defined as uterine contractions lasting at least two minutes or five or more uterine contractions in 10 minutes. Tachysystole is defined as six or more contractions in 20 minutes.

B. Prostaglandin E2 (PGE2) preparations have up to a 5 percent rate of uterine hyperstimulation. Fetal heart rate abnormalities can occur, but usually resolve upon removal of the drug. Rarely hyperstimulation or tachysystole can cause uterine rupture. Removing the PGE2 vaginal insert will usually help reverse the effects of the hyperstimulation and tachysystole. Cervical and vaginal lavage after local application of prostaglandin compounds is not helpful.

C. If oxytocin is being infused, it should be discontinued to achieve a reassuring fetal heart rate pattern. Placing the woman in the left lateral position, administering oxygen, and increasing intravenous fluids may also be of benefit. Terbutaline 0.25 mg subcutaneously (a tocolytic) may be given.

References: See page 311.

Postpartum Hemorrhage

Obstetric hemorrhage remains a leading causes of maternal mortality. Postpartum hemorrhage is defined as the loss of more than 500 mL of blood following delivery. However, the average blood loss in an uncomplicated vaginal delivery is about 500 mL, with 5% losing more than 1,000 mL.

I. Clinical evaluation of postpartum hemorrhage

A. Uterine atony is the most common cause of postpartum hemorrhage. Conditions associated with uterine atony include an overdistended uterus (eg, polyhydramnios, multiple gestation), rapid or prolonged labor, macrosomia, high parity, and chorioamnionitis.

B. Conditions associated with bleeding from trauma include forceps delivery, macrosomia, precipitous labor and delivery, and episiotomy.

C. Conditions associated with bleeding from coagulopathy and thrombocytopenia include abruptio placentae, amniotic fluid embolism, preeclampsia, coagulation disorders, autoimmune thrombocytopenia, and anticoagulants.

D. Uterine rupture is associated with previous uterine surgery, internal podalic version, breech extraction, multiple gestation, and abnormal fetal presentation. High parity is a risk factor for both uterine atony and rupture.

E. Uterine inversion is detected by abdominal vaginal examination, which will reveal a uterus with an unusual shape after delivery.

II. Management of postpartum hemorrhage

A. Following delivery of the placenta, the uterus should be palpated to determine whether atony is present. If atony is present, vigorous

fundal massage should be administered. If bleeding continues despite uterine massage, it can often be controlled with bimanual uterine compression.

B. Genital tract lacerations should be suspected in patients who have a firm uterus, but who continue to bleed. The cervix and vagina should be inspected to rule out lacerations. If no laceration is found but bleeding is still profuse, the uterus should be manually examined to exclude rupture.

C. The placenta and uterus should be examined for retained placental fragments. Placenta accreta is usually manifest by failure of spontaneous placental separation.

D. Bleeding from non-genital areas (venous puncture sites) suggests coagulopathy. Laboratory tests that confirm coagulopathy include INR, partial thromboplastin time, platelet count, fibrinogen, fibrin split products, and a clot retraction test.

E. Medical management of postpartum hemorrhage

1. **Oxytocin (Pitocin)** is usually given routinely immediately after delivery to stimulate uterine firmness and diminish blood loss. 20 units of oxytocin in 1,000 mL of normal saline or Ringer's lactate is administered at 100 drops/minute. Oxytocin should not be given as a rapid bolus injection because of the potential for circulatory collapse.
2. **Methylergonovine (Methergine)** 0.2 mg can be given IM if uterine massage and oxytocin are not effective in correcting uterine atony and provided there is no hypertension.
3. **15-methyl prostaglandin F2-alpha (Hemabate)**, one ampule (0.25 mg), can be given IM, with repeat injections every 20min, up to 4 doses can be given if hypertension is present; it is contraindicated in asthma.

Treatment of Postpartum Hemorrhage Secondary to Uterine Atony

Drug	Protocol
Oxytocin	20 U in 1,000 mL of lactated Ringer's as IV infusion
Methylergonovine (Methergine)	0.2 mg IM
Prostaglandin (15 methyl PGF2-alpha [Hemabate, Prostin/15M])	0.25 mg as IM every 15-60 minutes as necessary

F. Volume replacement

1. Patients with postpartum hemorrhage that is refractory to medical therapy require a second large-bore IV catheter. If the patient has had a major blood group determination and has a negative indirect Coombs test, type-specific blood may be given without waiting for a complete cross-match. Lactated Ringer's solution or normal saline is generously infused until blood can be replaced. Replacement consists of 3 mL of crystalloid solution per 1 mL of blood lost.
2. A Foley catheter is placed, and urine output is maintained at greater than 30 mL/h.

G. Surgical management of postpartum hemorrhage. If medical therapy fails, ligation of the uterine or uteroovarian artery, infundibulopelvic vessels, or hypogastric arteries, or hysterectomy may be indicated.

H. Management of uterine inversion

1. The inverted uterus should be immediately repositioned vaginally. Blood and/or fluids should be administered. If the placenta is still attached, it should not be removed until the uterus has been repositioned.
2. Uterine relaxation can be achieved with a halogenated anesthetic agent. Terbutaline is also useful for relaxing the uterus.
3. Following successful uterine repositioning and placental separation, oxytocin (Pitocin) is given to contract the uterus.

References: See page 311.

Acute Endometritis

Acute endometritis is characterized by the presence of microabscesses or neutrophils within the endometrial glands.

I. Classification of endometritis

A. Acute endometritis in the nonobstetric population is usually related to pelvic inflammatory disease (PID) secondary to sexually transmitted infections or gynecologic procedures. Acute endometritis in the obstetric population occurs as a postpartum infection, usually after a labor concluded by cesarean delivery.

B. Chronic endometritis in the nonobstetric population is due to infections (eg, chlamydia, tuberculosis, and other organisms related to cervicitis and PID), intrauterine foreign bodies (eg, intrauterine device, submucous leiomyoma), or radiation therapy. In the obstetric population, chronic endometritis is associated with retained products of conception after a recent pregnancy.

C. Symptoms in both acute and chronic endometritis consist of abnormal vaginal bleeding and pelvic pain. However, patients with acute endometritis frequently have fevers in contrast to chronic endometritis.

II. Postpartum endometritis

A. Endometritis in the postpartum period refers to infection of the decidua (ie, pregnancy endometrium), frequently with extension into the myometrium (endomyometritis) and parametrial tissues (parametritis).

B. The single most important risk factor for postpartum endometritis is route of delivery. The incidence of endometritis after a vaginal birth is less than three percent, but is 5 to 10 times higher after cesarean delivery.

C. Other proposed risk factors include prolonged labor, prolonged rupture of membranes, multiple vaginal examinations, internal fetal monitoring, maternal diabetes, presence of meconium, and low socioeconomic status.

D. Microbiology. Postpartum endometritis is usually a polymicrobial infection, produced by a mixture of aerobes and anaerobes from the genital tract.

Type and Frequency of Bacterial Isolates in Postpartum Endometritis*

Isolate	Frequency (percent)
Gram positive	
Group B streptococci	8
Enterococci	7
S. epidermidis	9
Lactobacilli	4
Diphtheroids	2
S. Aureus	1
Gram negative	
G. vaginalis	15
E. Coli	6
Enterobacterium spp.	2
P. mirabilis	2
Others	3
Anaerobic	
S. bivius	11
Other Bacteroides spp.	9
Peptococci-peptostreptocci	22
Mycoplasma	
U. urealyticum	39
M. hominis	11
C. trachomatis	2

E. Vaginal colonization with group B streptococcus (GBS) is a risk factor for postpartum endometritis; GBS colonized women at delivery have an 80 percent greater likelihood of developing postpartum endometritis.

F. Clinical manifestations and diagnosis. Endometritis is characterize, by fever, uterine tenderness, foul lochia, and leukocytosis that develop within five days of delivery. A temperature greater than or equal to 100.4 ºF (38 ºC) in the absence of other causes of fever, such as pneumonia, wound cellulitis, and urinary tract infection is the most common sign.

G. Laboratory studies are not diagnostic since leukocytosis occurs frequently in all postpartum patients. However, a rising neutrophil count associated with elevated numbers of bands is suggestive of infectious disease. Bacteremia occurs in 10 to 20 percent of patients; usually a single organism is identified despite polymicrobial infection. Blood cultures should be obtained in febrile patients following delivery.

H. Treatment

1. Postpartum endometritis is treated with broad spectrum parenteral antibiotics including coverage for beta-lactamase producing anaerobes. The standard treatment of clindamycin (900 mg q8h) plus gentamicin (1.5 mg/kg q8h) is safe and effective, with reported cure rates of 90 to 97 percent.

Antibiotic Regimens for Endometritis

Clindamycin (900 mg IV Q 8 hours) plus gentamicin (1.5 mg/kg IV Q 8 hours)
Ampicillin-sulbactam (Unasyn) 3 grams IV Q 6 hours
Ticarcillin-clavulanate (Timentin)3.1 grams IV Q 4 hours
Cefoxitin (Mefoxin) 2 grams IV Q 6 hours
Ceftriaxone (Rocephin) 2 grams IV Q 24 hours plus metronidazole 500 mg PO or IV Q 8 hours*
Levofloxacin (Levaquin) 500 mg IV Q 24 hours plus metronidazole 500 mg PO or IV Q 8 hours*

* Should not be given to breastfeeding mothers
If chlamydia infection is suspected, azithromycin 1 gram PO for one dose should be added to the regimen

2. Treatment should continue until the patient is clinically improved and afebrile for 24 to 48 hours. Oral antibiotic therapy is not necessary after successful parenteral treatment, unless bacteremia is present.

3. Modifications in therapy may be necessary if there is no response to the initial antibiotic regimen after 48 to 72 hours. Approximately 20 percent of treatment failures are due to resistant organisms, such as enterococci which are not covered by cephalosporins or clindamycin plus gentamicin. The addition of ampicillin (2 g q4h) to the regimen can improve the response rate. Metronidazole (500 mg PO or IV q8h) may be more effective than clindamycin against Gram negative anaerobes but is generally not used in mothers who will be breastfeeding.

References: See page 311.

Postpartum Fever Workup

History: Postpartum fever is ≥100.4 F (38 degrees C) on 2 occasions >6h apart after the first postpartum day (during the first 10 days postpartum), or ≥101 on the first postpartum day. Dysuria, abdominal pain, distention, breast pain, calf pain.

Predisposing Factors: Cesarean section, prolonged labor, premature rupture of membranes, internal monitors, multiple vaginal exams, meconium, manual placenta extraction, anemia, poor nutrition.

Physical Examination: Temperature, throat, chest, lung exams; breasts, abdomen. Costovertebral angle tenderness, uterine tenderness, phlebitis, calf tenderness; wound exam. Speculum exam.

Differential Diagnosis: UTI, upper respiratory infection, atelectasis, pneumonia, wound infection, mastitis, episiotomy abscess; uterine infection, deep vein thrombosis, pyelonephritis, pelvic abscess.

Labs: CBC, SMA7, blood C&S x 2, catheter UA, C&S. Gonococcus culture, chlamydia; wound C&S, CXR.