Generic Name	Brand Name(s)	Class	Onset	Duration	Dosage Range
phenytoin*	Dilantin	1B	0.5–1 hr	>24 hrs	IV: 100–1,000 mg Oral: 100 mg q6–12h
procainamide	Pronestyl Procan SR	IA	0.5 hr	>3 hrs 6 hrs	Oral: 250–500 mg q3h SR: 250–750 mg q6h
propafenone	Rhythmol	IC	—	—	450–900 mg/day
propranolol*	Inderal	II	0.5 hr	3–5 hrs	10–30 mg 3–4×/day
quinidine	Cardioquin Quinaglute Quinidex	IA	0.5 hr —	6–8 hrs 8–12 hrs	Oral: 200–600 mg q2–4h SR: 300–600 mg q8h
sotalol*	Betapace	III	—	—	160–640 mg/day
tocainide	Tonocard	IB	1–2 hrs	8–12 hrs	1,200–1,800 mg/day
verapamil*	Calan Isoptin	IV	0.5 hr	6 hrs	IV: 5–10 mg

*These agents are also discussed with other classifications.

TOXIC EFFECTS/ADVERSE REACTIONS

Visual disturbances, tinnitus or difficulty hearing, vomiting, constipation or diarrhea, headache, confusion, diaphoresis, anginal attack, rapid rhythm, cardiac arrest. Other signs specific to each drug.

NURSING IMPLICATIONS

General: Use cardiac monitor for intravenous administration and preferably for initiation of oral therapy. **Baseline Assessment:** Initial B/P, apical pulse. **Intervention/Evaluation:** Monitor B/P and apical pulse before giving drug and p.r.n.; notify physician before administration if B/P or pulse is not within agreed parameters. Assess extremities for edema; weigh daily; check lungs for rales. Monitor I&O. Check lab results, esp. electrolytes and drug levels. Monitor frequency, consistency of stools; prevent constipation. **Patient/Family Teaching:** Teach how to take pulse correctly. Change position slowly to prevent orthostatic hypotension. Do not take other medications, including OTC, without consulting physician. Restrict sodium and alcohol as ordered.

ANTIBIOTICS

ACTION

Antibiotics (antimicrobial agents) are natural or synthetic compounds that have the ability to kill or suppress the growth of microorganisms. Narrow-spectrum agents are effective against few microorganisms, whereas broad-spectrum agents are effective against a wide variety. Antimicrobial agents may also be classified based on their mechanism of action.

1. Agents that inhibit cell wall synthesis or activate enzymes that disrupt cell wall, causing a weakening in the cell wall, cell lysis, and death. Includes penicillins, cephalosporins, vancomycin, and imidazole antifungal agents.
2. Agents that act directly on cell wall, affecting permeability of cell membranes, causing leakage of intracellular substances. Includes antifungal agents amphotericin and nystatin, polymixin, and colistin.
3. Agents that bind to ribosomal subunits, altering protein synthesis and eventually causing cell death. Includes aminoglycosides.
4. Agents that affect bacterial ribosome function, altering protein synthesis and causing slow microbial growth. Does not cause cell death. Includes chloramphenicol, clindamycin, erythromycin, tetracyclines.
5. Agents that inhibit nucleic acid metabolism by binding to nucleic acid or interacting with enzymes necessary for nucleic acid synthesis. Inhibits DNA or RNA synthesis. Includes rifampin, metronidazole, quinolones (e.g., ciprofloxacin).
6. Agents that inhibit specific metabolic steps necessary for microorganisms, causing a decrease in essential cell components or synthesis of nonfunctional analogues of normal metabolites. Includes trimethoprim and sulfonamides.
7. Agents that inhibit viral DNA synthesis by binding to viral enzymes necessary for DNA synthesis, preventing viral replication. Includes acyclovir, vidarabine.

SELECTION OF ANTIMICROBIAL AGENTS

Goal of therapy is to produce a favorable therapeutic result by achieving antimicrobial action at the site of infection sufficient to inhibit the growth of the microorganism. The agent selected should be the most active against the most likely infecting organism, least likely to cause toxicity or allergic reaction. Factors to consider in selection of an antimicrobial agent include:

1. Sensitivity pattern of the infecting microorganism.
2. Location and severity of infection (may determine the route of administration).
3. Pt's ability to eliminate the drug (status of renal and liver function).
4. Pt's defense mechanisms (includes both cellular and humoral immunity).
5. Pt's age, pregnancy, genetic factors, allergy, disorder of CNS, preexisting medical problems.

USES

Treatment of wide range of gram-positive or gram-negative bacterial infections; suppression of intestinal flora before surgery; control of acne; prophylactically to prevent rheumatic fever; prophylactically in high-risk situations (e.g., some surgical procedures or medical states) to prevent bacterial infection.

PRECAUTIONS

Contraindications: Hypersensitivity to prescribed antibiotics, others in its family, or components of the drug. Some antibiotics are contraindicated in infants and children (e.g., tetracyclines, quinolones). **Extreme Caution:** Pregnancy and lactation (avoid unless benefits clearly outweigh risks). **Cautions:** Renal or hepatic dysfunction. Elderly and very young may be more sensitive to effects of these drugs and may require adjusted dosage. Extra care with gastrointestinal diseases and bleeding disorders.

INTERACTIONS

Concurrent use with other antibiotics or drugs that add to or potentiate toxic effects is to be avoided. Alcohol should not be taken with antibiotics; several may interact with alcohol to produce a disulfiram reaction. Antacids should be administered 2 hrs before or after oral antibiotics to prevent interference with absorption. Refer to specific classification pages or individual monographs.

SIDE EFFECTS

Side effects most commonly associated with antibiotics are anorexia, nausea, vomiting, and diarrhea. Some, such as tetracyclines, produce photosensitivity. Refer to individual monographs.

TOXIC EFFECTS/ADVERSE REACTIONS

Skin rash, seen most often with penicillins and cephalosporins, is a sign of hypersensitivity. Sensitivity reactions may range from mild rash to anaphylaxis. Superinfections may result from alteration of bacterial environment. Ototoxicity and nephrotoxicity are potential adverse reactions of a number of antibiotics, esp. the aminoglycosides. Tetracyclines combine with calcium in forming teeth and may produce discoloration. Severe diarrhea, antibiotic-associated colitis have occurred from several of the antimicrobials (clindamycin has a particular risk for this reaction).

NURSING IMPLICATIONS

General: Administer drugs on schedule to maintain blood levels. Initiate intravenous solutions slowly with close observation for sensitivity response. **Baseline Assessment:** Question for history of previous drug reaction. Culture/sensitivity must be done before first dose (may give before results are obtained). Assess WBC results, temperature, pulse, respiration. **Intervention/Evaluation:** Monitor lab results, particularly WBC and culture/sensitivity reports. Assess for adverse reactions. **Patient/Family Teaching:** Space doses evenly. Continue therapy for full duration. Avoid alcohol, antacids, or other medication without consulting physician. Notify physician of diarrhea, rash, or other new symptom.

ANTIBIOTIC: AMINOGLYCOSIDES

ACTION

Bactericidal. Transported across bacterial cell membrane, irreversibly binds to specific receptor proteins of bacterial ribosomes. Interferes with protein synthesis, preventing cell reproduction and eventually causing cell death.

ANTIBIOTIC: PENICILLINS

ACTION

Penicillins inhibit cell wall synthesis or activate enzymes, which disrupt cell wall, causing a weakening in the cell wall, cell lysis, and cell death. May be bacteriostatic or bactericidal. Most effective against rapidly dividing cells.

USES

Penicillins may be used to treat a large number of infections including pneumonia and other respiratory diseases, urinary tract infections, septicemia, meningitis, intra-abdominal infections, gonorrhea and syphilis, bone/joint infection.

PRECAUTIONS

Contraindications: Hypersensitivity to penicillin, cephalosporins, or components. **Cautions:** Extreme caution with history of allergies, asthma; gastrointestinal disease; renal dysfunction; bleeding disorders; and (for some penicillins) hepatic dysfunction.

INTERACTIONS

Bacteriostatic antibiotics (e.g., tetracyclines) may decrease bactericidal effects of penicillins. Concurrent use with allopurinol and ampicillin increases risk of skin rash. Pts should be advised that estrogen contraceptives may have decreased effectiveness when given with penicillin. Anticoagulants may increase potential for bleeding with high-dose penicillin therapy. Probenecid increases effects by interfering with excretion.

SIDE EFFECTS

Mild nausea, vomiting, or diarrhea; sore tongue or mouth.

PENICILLINS

Generic Name	Brand Name(s)	Rte Admin	Type	Dosage Range
amoxicillin	Amoxil Polymox Trimox Wymox	Broad spectrum	Oral	Adults: 0.75–1.5 g/day Children: 20–40 mg/kg/day
amoxicillin/ clavulanate	Augmentin	Broad spectrum	Oral	Adults: 0.75–1.5 g/day Children: 20–40 mg/kg/day
ampicillin	Omnipen Polycillin Principen	Broad spectrum	Oral, IM, IV	Adults: 1–12 g/day Children: 50–200 mg/kg/day
ampicillin/ sulbactam	Unasyn	Broad spectrum	IM, IV	Adults: 6–12 g/day
bacampicillin	Spectrobid	Broad spectrum	Oral	Adults: 800–1,600 mg/day Children: 25–50 mg/kg/day
carbenicillin	Geocillin	Extended spectrum	Oral	Adults: 382–764 mg 4×/day
cloxacillin	Cloxapen Tegopen	Penicillinase resistant	Oral	Adults: 1–2 g/day Children: 50–100 mg/kg/day
dicloxacillin	Dynapen Pathocil	Pencillinase resistant	Oral	Adults: 1–2 g/day Children: 12.5–25 mg/kg/day
methicillin	Staphcillin	Penicillinase resistant	IM, IV	Adults: 4–12 g/day Children: 100–300 mg/kg/day
mezlocillin	Mezlin	Extended spectrum	IM, IV	Adults: 6–18 g/day Children: 150–300 mg/kg/day

continued

Generic Name	Brand Name(s)	Rte Admin	Type	Dosage Range
nafcillin	Nafcil Unipen	Penicillinase resistant	Oral, IM, IV	Adults (Oral): 1–6 g/day Adults (IM, IV): 2–6 g/day Children (Oral): 25 50 mg/kg/day Children (IM, IV): 50 mg/kg/day
oxacillin	Bactocill Prostaphlin	Penicillinase resistant	Oral, IM, IV	Adults (Oral): 2–6 g/day Adults (IM, IV): 2–6 g/day Children (Oral): 50 100 mg/kg/day Children (IM, IV): 50–100 mg/kg/day
penicillin G benzathine	Bicillin Permapen	Natural	IM	Adults: 1.2 million units/day Children: 0.3–1.2 million units/day
penicillin G postassium	Pentids Pfizerpen	Natural	IM, IV	Adults: 2–24 million units/day Children: 100,000–250,000 units/kg/day
penicillin G procaine	Crysticillin A.S. Wycillin	Natural	IM	Adults: 0.6–1.2 million units/day Children: 0.6–1.2 million units/day
penicillin V potassium	Pen-Vee K V-Cillin K Veetids	Natural	Oral	Adults: 0.5–2 g/day Children: 25–50 mg/kg/day
piperacillin	Pipracil	Extended spectrum	IM, IV	Adults: 6–18 g/day Children: 200–300 mg/kg/day
piperacillin tazobactam	Zosyn	Extended spectrum	IV	Adults: 3.375 g q6h
ticarcillin	Ticar	Extended spectrum	IM, IV	Adults: 12–24 g/day Children: 50–300 mg/kg/day
ticarcillin clavulanate	Timentin	Extended spectrum	IM, IV	Adults: 3.1 g q4–6h

IM: Intramuscular. IV: Intravenous.

Natural penicillins are very active against gram-positive cocci but ineffective against most strains of *Staphylococcus aureus* (inactivated by enzyme penicillinase).

Penicillinase-resistant penicillins are effective against penicillinase-producing *Staphylococcus aureus* but are less effective against gram-positive cocci than the natural penicillins.

Broad-spectrum penicillins are effective against gram-positive cocci and some gram-negative bacteria (e.g., *Hemophilus influenzae, Escherichia coli, Proteus mirabilis*).

Extended-spectrum penicillins are effective against *Pseudomonas aeruginosa, Enterobacter, Proteus* species, *Klebsiella,* and some other gram-negative microorganisms.

TOXIC EFFECTS/ADVERSE REACTIONS

Hypersensitivity/allergic reactions ranging from skin rashes, urticaria, itching to full anaphylaxis. Superinfections, including antibiotic-associated colitis. Neurotoxicity, hematologic effects may occur in select drugs.

NURSING IMPLICATIONS

General: Administer drugs on proper schedule to maintain blood levels. Initiate intravenous solutions slowly at first with close observation for sensitivity response. **Baseline Assessment:** Question for history of hypersensitivity to penicillin or cephalosporins. With history of cephalosporin reaction, have emergency equipment, medications available. Culture/sensitivity must be done before first dose (may give before results are obtained). Assess WBC results, temperature, pulse, respiration. **Intervention/Evaluation:** Monitor temperature, lab results, particularly WBC and culture/sensitivity reports. Assess for adverse reactions, esp. allergic reactions, superinfection. **Patient/Family Teaching:** Space doses evenly. Continue therapy for full duration, usually 7–10 days. Avoid alcohol, antacids, or other medications without consulting physician. Promptly notify physician of rash or diarrhea.

Generic Name (Brand Name)	Side Effects	Dosage Range (mg/day)
Monoamine Oxidase Inhibitors		
Phenelzine (Nardil)	Sedation, hypertensive crisis, weight gain, orthostatic hypotension	Oral: 15–90
Tranylcypromine (Parnate)	Sedation, hypertensive crisis, weight gain, orthostatic hypotension	Oral: 30–60
Selective Serotonin Reuptake Inhibitiors		
Citalopram (Celexa)	Insomnia or sedation, nausea, agitation, headache	Oral: 25–60
Fluoxetine (Prozac)	Insomnia or sedation, nausea, agitation, headache	Oral: 10–80
Fluvoxamine (Luvox)	Insomnia or sedation, nausea, agitation, headache	Oral: 100–300
Paroxetine (Paxil)	Insomnia or sedation, nausea, agitation, headache	Oral: 20–50
Sertraline (Zoloft)	Insomnia or sedation, nausea, agitation, headache	Oral: 50–200
Atypical Antidepressants		
Bupropion (Wellbutrin)	Insomnia, irritability, seizures	Oral: 150–450
Mirtazepine (Remeron)	Sedation, dry mouth, weight gain, agranulocytosis, liver toxicity	Oral: 15–45
Nefazodone (Serzone)	Sedation, orthostatic hypotension, nausea	Oral: 200–600
Trazodone (Desyrel)	Sedation, orthostatic hypotension, priapism	Oral: 50–600
Venlafaxine (Effexor)	Increased blood pressure, agitation, sedation, insomnia, nausea	Oral: 75–375

NURSING IMPLICATIONS

General: Closely supervise patients (potential for suicide increases when emerging from depression). Elderly should be observed carefully for increased response; small doses are usually indicated. **Baseline Assessment:** Determine initial B/P. Assess patient and environment for support needed. **Intervention/Evaluation:** Monitor B/P. Assess mental status. Check bowel activity; avoid constipation. **Patient/Family Teaching:** Change positions slowly to avoid orthostatic hypotension. Take medication as ordered; do not stop taking or increase dosage. Avoid driving or performing tasks that require mental acuity until response to drug controlled. Extremely important to refrain from alcohol and other medications during therapy and for 2–3 wks thereafter. Omit foods rich in tyramine, such as products containing yeast, beer/wine, aged cheese (list of foods to avoid should be given); ingestion of such foods and antidepressant may cause hypertensive crisis. Inform other physicians or dentist of antidepressant therapy. Use protection from sunlight with specific drugs. To the extent possible, drugs that cause drowsiness should be taken at bedtime, those causing insomnia in the morning.

ANTIDIABETICS

Medications that are currently available in the treatment of diabetes mellitus include insulin, sulfonylureas, alpha-glucosidase inhibitors, biguanides, meglitinides, and thiazolinediones.

ACTION

Insulin: A hormone synthesized and secreted by beta cells of Langerhans' islet in the pancreas. Controls storage and utilization of glucose, amino acids, and fatty acids by activated transport systems/enzymes. Inhibits breakdown of glycogen, fat, protein. Insulin lowers blood glucose by inhibiting glycogenolysis and gluconeogenesis in liver; stimulates glucose uptake by muscle, adipose tissue. Activity of insulin is initiated by binding to cell surface receptors.

Sulfonylureas: Stimulate release of insulin from beta cells; increase circulating insulin levels. Bind to specific receptors on the beta cells when stimulated, allowing influx of calcium through the ATP-sensitive K-channels. Endogenous insulin must be present for oral hypoglycemics to be effective.

Alpha-glucosidase inhibitors: By inhibiting alpha glucosidase enzymes in small intestine, lower post-prandial blood glucose by slowing down digestion and absorption of carbohydrates.

Biguanides: Decrease glucose production in the liver, increase glucose uptake into muscle tissues, possibly by increasing sensitivity of insulin receptors.

Thiazolinediones: Decrease insulin resistance at target tissue; require the presence of insulin.

Meglitinides: Similar acitivity to sulfonylureas, stimulating the release of insulin from beta cells.

USES

Insulin: Treatment of insulin-dependent diabetes (type 1) and noninsulin-dependent diabetes (type 2). Also used in acute situations such as ketoacidosis, severe infections, major surgery in otherwise noninsulin-dependent diabetics. Administered to pts receiving parenteral nutrition. Drug of choice during pregnancy.

Sulfonylureas/meglitinides: Control hyperglycemia in type 2 diabetes not controlled by weight and diet alone. Chlorpropamide also used in adjunctive treatment of neurogenic diabetes insipidus.

Alpha-glucosidase inhibitors: Adjunct to diet to lower blood glucose in pts with noninsulin-dependent diabetes mellitus (NIDDM) whose hyperglycemia cannot be managed by diet alone.

Biguanides: Adjunct to diet to lower blood glucose in patients with NIDDM whose hyperglycemia cannot be managed by diet alone.

Thiazolinediones: Adjunct in patients with NIDDM currently on insulin therapy.

INSULIN

		Hypoglycemic Effect		
	Brand Name(s)	Onset	Peak (hrs)	Duration (hrs)
Rapid Acting				
regular insulin	Humulin R Novolin R	30–60 min	2–4	5–7
insulin lispro	Humalog	10–15 min	0.75–1	5
Intermediate Acting				
lente insulin	Humulin L Novolin L	1–2.5 hrs	7–15	24
NPH	Humulin N Novolin N	1–1.5 hrs	4–12	24
Long Acting				
ultralente	Humulin U	4–8 hrs	10–30	>36

PRECAUTIONS

Contraindications: *Insulin:* Hypersensitivity to animal proteins (human insulin available). Hypoglycemia. *Sulfonylureas:* Hypersensitivity to sulfonamides, pregnancy, severe stress or infection, before surgical procedures, in type 1 insulin-dependent diabetes; hepatic or renal dysfunction; hypoglycemia; lactation. *Alpha-glucosidase inhibitors:* Hypersensitivity to drug, diabetic ketoacidosis, cirrhosis, inflammatory bowel disease, colonic ulceration, partial intestinal obstruction, chronic intestinal disease associated with disorders of digestion or absorption. *Biguanides:* Renal disease/dysfunction, hypersensitivity to drug, acute or chronic metabolic acidosis. **Caution:** Elderly or debilitated patients. Renal or hepatic impairment; alcoholics; cardiac impairment.

INTERACTION

Insulin: Glucocorticoids, thiazide diuretics may increase blood glucose. Alcohol may increase insulin effect. Beta-adrenergic blockers may increase risk of hypo/hyperglycemia, mask signs of hypoglycemia, prolong period of hypoglycemia.

Sulfonylureas: May increase effects of oral anticoagulants. Chloramphenicol, MAO inhibitors, salicylates, sulfonamides may increase effects. Beta blockers may increase hypoglycemic effect, mask signs of hypoglycemia.

Alpha-glucosidase inhibitors: Digestive enzymes, intestinal absorbents (e.g., charcoal) may decrease effect.

Biguanides: Alcohol potentiates effect on lactate metabolism. Cimetidine, furosemide, nifedipine may increase concentration. Iodinated contrast material may lead to acute renal failure, associated with lactic acidosis.

ORAL ANTIDIABETIC AGENTS

		Usual Daily Dosage	
Generic Name	Brand Name(s)	Initially	Average Range
Sulfonylureas			
acetohexamide	Dymelor	250 mg	250–1,500 mg
chlorpropamide	Diabinese	100 mg	100–750 mg
glimepiride	Amaryl	1–2 mg	1–4 mg
glipizide	Glucotrol	2.5–5 mg	2.5–40 mg
glyburide	Diabeta Micronase Glynase	1.25–5mg	1.25–20 mg
tolazamide	Tolinase	100 mg	100–1,000 mg
tolbutamide	Orinase	500 mg	500–3,000 mg
Biguanides			
metformin	Glucophage	500 mg	500–2,550 mg
Alpha glucosidase inhibitors			
acarbose	Precose	75 mg	150–300 mg
miglitol	Glyset	75 mg	75–300 mg
Meglitinide			
repaglinide	Prandin	—	1–16 mg/day
Thiazolinediones			
pioglitazone	Actos	15–30 mg	15–45 mg
rosiglitazone	Avandia	4 mg	4–8 mg

NURSING IMPLICATIONS

General: Administer per schedule; rotate insulin injection sites. Recognize peak action times (see table) as hypoglycemic reactions may occur at these times. Provide meals on time. **Intervention/Evaluation:** Monitor blood glucose levels, food consumption. Check for hypoglycemia: cool, wet skin; tremors; dizziness; headache; anxiety; tachycardia; numbness in mouth; hunger; diplopia; restlessness, diaphoresis in sleeping pt. Check for hyperglycemia: polyuria, polyphagia, polydipsia, nausea and vomiting, dim vision, fatigue, deep, rapid breathing. **Patient/Family Teaching:** Diabetes mellitus requires lifelong control. Prescribed diet is an essential part of treatment; do not skip or delay meals. Weight control, exercise, hygiene (including foot care), and nonsmoking are integral parts of therapy. Understand significance of illness, stress, and exercise on regime. Teach how to handle, administer insulin. Carry candy, sugar packets, or other sugar supplements for immediate response to hypoglycemia. Wear/carry medical alert identification. Avoid alcohol; do not take other medication without consulting physician. Protect skin; limit sun exposure. Select clothing, positions that do not restrict blood flow. Avoid injuries, exposure to infections. Inform dentist, physician of this medication before any treatment.

dal symptoms (EPS) may increase with EPS-producing medications. Hypotensives may increase hypotension. May decrease levodopa effects. Lithium may decrease absorption, produce adverse neurologic effects.

ANTIPSYCHOTICS

		Side Effects				
Generic Name	Brand Name(s)	Sedation	Hypotension	Anticholinergic	EPS	Dosage (mg/day)
chlorpromazine	Thorazine	High	High	Moderate	Moderate	30–800
clozapine	Clozaril	High	High	High	Low	25–900
fluphenazine	Prolixin	Low	Low	Low	High	0.5–50
haloperidol	Haldol	Low	Low	Low	High	1–100
loxapine	Loxitane	Moderate	Moderate	Low	High	20–250
mesoridazine	Serentil	High	Moderate	High	Low	30–400
molindone	Moban	Low	Low	Low	High	50–225
olanzapine	Zyprexa	Moderate	Low	Moderate	Low	5–20
perphenazine	Trilafon	Low	Low	Low	High	12–64
pimozide	Orap	Moderate	Low	Moderate	High	1–10
quetiapine	Seroquel	Moderate	Moderate	Moderate	Low	150–750
risperidone	Risperdal	Low	Low	Low	Moderate	4–6
thioridazine	Mellaril	High	High	High	Low	150–800
thiothixene	Navane	Low	Low	Low	High	6–60
trifluoperazine	Stelazine	Low	Low	Low	High	4–40

EPS = extrapyramidal symptoms.

SIDE EFFECTS

Orthostatic hypotension, drowsiness, blurred vision, constipation, nasal congestion, photosensitivity.

TOXIC EFFECTS/ADVERSE REACTIONS

Hyperpyrexia, depression, insomnia, convulsions, hypertension, adynamic ileus, laryngospasm, bronchospasm, urticaria, menstrual irregularities, impotence, urinary retention, blood dyscrasias, systemic lupus-like reaction, extrapyramidal reactions.

NURSING IMPLICATIONS

General: Do not mix parenteral solution with other drugs in the same syringe; give deep intramuscular injections. Have pt remain recumbent for at least 30 min; following parenteral dose, arise slowly and with assistance. Avoid skin contact with solutions (contact dermatitis). **Baseline Assessment:** Determine initial B/P, pulse, respirations. Assess pt and environment for necessary supports. **Intervention/Evaluation:** Monitor B/P. Assess mental status, response to surroundings. Be alert to suicide potential as energy increases. Assure that oral medication is swallowed. Check bowel activity; avoid constipation. Promptly notify physician of extrapyramidal reactions (usually dose related; more frequent in female geriatric pts). **Patient/Family Teaching:** Take medication as ordered; do not stop taking or increase dosage. Do not drive or perform activities requiring motor skills until response has been controlled. Side effects usually subside after approximately 2 wks of therapy or can be eliminated/minimized by dosage adjustment. Avoid temperature extremes. Avoid alcohol, other medications. Inform other physicians, dentist of drug therapy. Change positions slowly to prevent orthostatic hypotension.

ANTIVIRALS

Antiviral medications have recently expanded in number due primarily to the increased number of anti-retroviral agents available for treating patients with HIV infection and its complications. Many of the antivirals are directed toward disrupting one of the many steps in viral infection and replication. Viruses consist of either a single- or double-stranded DNA or RNA enclosed in

a protein coat (capsid). Some viruses also have a lipoprotein envelope that may also contain antigenic proteins; other viruses contain enzymes that initiate viral replication inside a host cell. Viruses reproduce or replicate within cells of the host depending on metabolic processes of the host cell. They cannot reproduce independent of a host cell because viruses have no metabolic machinery of their own.

Stages of viral replication include cell entry (attachment, penetration); uncoating (release of viral genome); transcription of viral genome (transcription of viral mRNA, replication of viral genome); translation of viral proteins; post-translational modifications; assembly of virion components; release (budding). Replication cycle begins when a virion (viral particle) binds to a receptor site on the plasma membrane of a host cell. Once bound, the virus releases enzymes weakening the plasma membrane, allowing penetration of the virus. Inside the host cell, the outer coat of the virus dissolves releasing viral genetic material (viral genome), which regulates metabolic activity of the host cell by directing its own replication (synthesis of new messenger RNA [mRNA]) using host ribosomes and viral proteins. After viral nucleic acids/proteins (virion compound) are assembled to form a mature virus, it is released from the host cell (budding) for transmission to other host cells, spreading viral infection.

Viruses are DNA or RNA. DNA viruses include herpesvirus (chicken pox, shingles, herpes) and adenoviruses (conjunctivitis, sore throat). Usually DNA viruses enter the host cell nucleus where viral DNA is transcribed into mRNA of host cell by host cell mRNA polymerase; mRNA is then translated into virus-specific protein following the usual host cell mechanisms. RNA viruses include rubella (German measles), orthomyxoviruses (influenza), and paramyxoviruses (measles, mumps). RNA virus replication in the host cell relies on enzymes in the virion to synthesize its mRNA or on the viral RNA serving as its own mRNA. The mRNA is then translated into various viral proteins, including RNA polymerase that directs the synthesis of more viral mRNA. Most RNA viruses do not involve the host cell in viral replication.

One special group of RNA viruses, known as retroviruses, are responsible for diseases such as AIDS and T-cell leukemias. Retroviruses contain a reverse transcriptase enzyme activity that makes a DNA copy of the viral RNA template. This DNA copy is then integrated into the host genome and transcribed into both genome RNA and mRNA for translation into viral proteins, giving rise to new virus particles.

ACTION

Effective antivirals must inhibit virus-specific nucleic acid/protein synthesis. Possible mechanisms of action of antivirals used for non-HIV infection may include interfering with viral DNA synthesis and viral replication, inactivation of viral DNA polymerases, incorporation and termination of the growing viral DNA chain, prevention of release of viral nucleic acid into the host cell, or interference with viral penetration into cells.

Currently three classes of agents are available for the treatment of HIV infection: nucleoside analogues (reverse transcriptase inhibitors), protease inhibitors, and non-nucleoside reverse transcriptase inhibitors (NNRT).

Nucleoside analogues inhibit viral enzyme reverse transcriptase, reducing replication of cell-included HIV virus.

Protease inhibitors suppress viral replication by inhibiting protease, an enzyme responsible for cleaving viral precursor polypeptides with mature/infective virions.

NNRT inhibits catalytic reaction of reverse transcriptase that is independent of nucleoside binding.

USES

Treatment of HIV infection. Treatment of CMV retinitis in patients with AIDS, acute herpes zoster (shingles), genital herpes (recurrent), mucosal and cutaneous herpes simplex virus, chicken pox, and influenza A viral illness.

ANTIVIRALS

Generic Name	Brand Name(s)	Labeled Uses
abacavir	Ziagen	HIV infection
acyclovir	Zovirax	*Parenteral:*
		Mucosal/cutaneous HSV-1 and HSV-2
		Varicella zoster (shingles)
		Genital herpes
		Herpes simplex encephalitis
		Oral:
		Genital herpes
		Herpes zoster (shingles)
		Chicken pox (varicella)
adefovir	Preveon	HIV infection

Generic Name	Brand Name(s)	Labeled Uses
amantadine	Symmetrel	Influenza A virus respiratory tract illness
amprenavir	Agenerase	HIV infection
cidofovir	Vistide	CMV retinitis in pts with AIDS
delavirdine	Rescriptor	HIV infection
didanosine	Videx	HIV infection
efavirenz	Sustiva	HIV infection
famciclovir	Famvir	Acute herpes zoster (shingles)
		Genital herpes (recurrent)
fomivirsen	Vitravene	CMV retinitis
foscarnet	Foscavir	CMV retinitis
		HSV infections in immunocompromised pts
ganciclovir	Cytovene	CMV retinitis, CMV disease
indinavir	Crixivan	HIV infection
lamivudine	Epivir	HIV infection
nelfinavir	Viracept	HIV infection
nevirapine	Viramune	HIV infection
oseltamivir	Tamiflu	Influenza A and B virus
penciclovir	Denavir	Cold sores
ramantadine	Flumadine	Influenza A virus
ribavirin	Virazole	Lower respiratory infection in infants, children due to respiratory syncytial virus (RSV)
ritonavir	Norvir	HIV infection
saquinavir	Invirase	HIV infection
stavudine	Zerit	HIV infection
valacyclovir	Valtrex	Herpes zoster (shingles)
		Genital herpes (recurrent)
zalcitabine	Hivid	HIV infection
zanamivir	Relenza	Influenza A and B virus
zidovudine	Retrovir	HIV infection

PRECAUTIONS

Contraindications: Hypersensitivity to any component of the product.
NOTE: Because of the diversity of the antivirals, refer to individual monographs for further information on cautions, side effects, adverse/toxic effects, drug interactions, etc.

NURSING IMPLICATIONS

Baseline Assessment: Assess health history (past medical, drug history, lifestyle, type/severity of symptoms). Ask about fatigue, chills, sweating, skin color changes. Note any localized swelling, pain, tenderness in lymph node regions. Assess for pregnancy/lactation. **Intervention/Evaluation:** Monitor renal function, fluid status, I/O, sleep and rest patterns, altered nutrition related to nausea produced by the antivirals. Observe for therapeutic effect, signs/symptoms of improvement. Monitor for undesired clinical response/toxicity associated with antivirals. Review results assessing renal/hepatic function and integrity of hemopoietic system. Inspect intravenous infusion site carefully. **Patient/Family Teaching:** Inform pt of importance of immunization and maintaining immunization against viral infections for small children and adults at high risk of acquiring influenza. Inform pt of importance of adequate fluid intake. Call physician if condition worsens or pt experiences any toxicity with the medication. Inform of ways to control spread/recurrence of viral infections. Drug therapy for AIDS/genital herpes does not prevent transmission to others or prevent opportunistic infections.

Generic Name	Brand Name(s)	Selectivity	Uses	Dosage Range
nadolol	Corgard	Beta$_1$, beta$_2$	HTN, angina	HTN: 40–320 mg/day Angina: 40–240 mg/day
penbutolol	Levotol	Beta$_1$, beta$_2$	HTN	HTN: 10–40 mg/day
pindolol	Visken	Beta$_1$, beta$_2$	HTN	HTN: 10–60 mg/day
propranolol	Inderal	Beta$_1$, beta$_2$	HTN, angina, arrhythmias, MI, migraine, tremors	HTN: 120–640 mg/day Angina: 80–320 mg/day Arrhythmias: 10–30 mg 3–4×/day MI: 180–240 mg/day
sotalol	Betapace	Beta$_1$, beta$_2$	Arrhythmias	Arrhythmias: 160–640 mg/day
timolol	Blocadren Timoptic	Beta$_1$, beta$_2$	HTN, MI, migraine, glaucoma	HTN: 10–60 mg/day MI: 10 mg 2×/day Ophth: 1 drop 1–2×/day

HTN = hypertension; MI = myocardial infarction.

SIDE EFFECTS

Postural hypotension, lightheadedness, fatigue, weakness, reflex tachycardia.

TOXIC EFFECTS/ADVERSE REACTIONS

Severe hypotension, nausea and vomiting, bradycardia, heart block, circulatory failure.

NURSING IMPLICATIONS

General: Use cardiac monitor for intravenous administration and preferably for initiation of oral therapy. **Baseline Assessment:** Initial B/P, apical pulse. **Intervention/Evaluation:** Monitor B/P and apical pulse before giving drug; notify physician before administration if B/P or pulse are not within agreed parameters. Assess for CHF (dyspnea, peripheral edema, jugular venous distension, increased weight, rales in lungs, decreased urine output). Assess extremities for peripheral circulation (warmth, color, quality of pulses). **Patient/Family Teaching:** Teach how to take B/P, pulse correctly. Change position slowly to prevent orthostatic hypotension. Do not take OTC cold medications, nasal decongestants. Restrict sodium and alcohol as ordered. Do not stop taking drug suddenly. Report chest pain, fatigue, shortness of breath.

BRONCHODILATORS

ACTION

Asthma (reversible airway obstruction) is the most common breathing disorder.

Methylxanthines: Directly relax smooth muscle of bronchial airway, pulmonary blood vessels (relieve bronchospasm, increase vital capacity). Increase cyclic 3,5-adenosine monophosphate.

Beta$_2$-adrenergic agonists: Stimulate beta receptors in lung, relax bronchial smooth muscle, increase vital capacity, decrease airway resistance.

Anticholinergics: Inhibit cholinergic receptors on bronchial smooth muscle (block acetylcholine action).

Leukotriene receptor antagonist: Blocks effects of leukotriene (bronchoconstriction, inflammation, edema).

Antileukotriene: Inhibits enzyme 5-lipoxygenase, reducing production of leukotriene, a bronchoconstrictor.

USES

Relief of bronchospasm occurring during anesthesia; in bronchial asthma, bronchitis, or emphysema.

PRECAUTIONS

Contraindications: Hypersensitivity to that agent or intolerance to others in the classification, components of preparation. Severe renal or hepatic dysfunction. **Cautions:** Pregnancy, lactation, elderly, hepatic disease, CHF, or other cardiac conditions that would be adversely affected by cardiac stimulation.

INTERACTIONS

Methylxanthines: Glucocorticoids may produce hypernatremia. Phenytoin, primidone, rifampin may increase metabolism. Beta blockers may decrease effects. Cimetidine, ciprofloxacin, erythromycin, norfloxacin may increase concentration, toxicity. Smoking may decrease concentration.

Beta$_2$-adrenergic agonists: General anesthetics may increase risk of arrhythmias. Tricyclic antidepressants, maprotiline may increase cardiovascular effects. May have mutually inhibitory effects with beta-adrenergic blockers. May increase risk of arrhythmias with digoxin.

Anticholinergics: None significant.

BRONCHODILATORS

Generic Name	Brand Name(s)	Route of Administration	Type
albuterol	Proventil	Inhalation	Beta$_2$ agonist
	Ventolin	Oral	
aminophylline	—	Oral	Methylxanthine
		Intravenous	
bitolterol	Tornalate	Inhalation	Beta$_2$ agonist
epinephrine	Adrenalin	SubQ	Beta$_2$ agonist
		Intravenous	
ipratropium	Atrovent	Inhalation	Anticholinergic
isoetharine	Bronkosol	Inhalation	Beta$_2$ agonist
isoproterenol	Isuprel	Inhalation	Beta$_2$ agonist
levalbuterol	Xopenex	Inhalation	Beta$_2$ agonist
metaproterenol	Alupent	Inhalation	Beta$_2$ agonist
montelukast	Singulair	Oral	Leukotriene receptor antagonist
salmeterol	Serevent	Inhalation	Beta$_2$ agonist
terbutaline	Brethine	Inhalation	Beta$_2$ agonist
	Bricanyl	Oral	
		SubQ	
theophylline	Aerolate	Oral	Methylxanthine
	Slo-Bid		
	Slo-Phyllin		
	Theo-24		
	Theo-Dur		
	Theolair		
	Uniphyl		
zafirlukast	Accolate	Oral	Leukotriene receptor antagonist
zileuton	Zyflo	Oral	Antileukotriene

SIDE EFFECTS

Nausea, increased pulse rate, nervousness, weakness, trembling, insomnia.

TOXIC EFFECTS/ADVERSE REACTIONS

Tachycardia, irregular heartbeat, headache, nausea and vomiting, severe weakness, increased B/P.

NURSING IMPLICATIONS

General: Administer oral agents on regular schedule. Assist pt in identifying what triggered an acute bronchospasm attack. **Intervention/Evaluation:** Monitor arterial blood gases, serum levels for aminophylline, theophylline. Assess lung sounds, B/P, pulse, respirations. Encourage fluid intake to decrease viscosity of secretions. **Patient/Family Teaching:** Demonstrate

correct use of inhalers. Drink 8 or more glasses of fluid/day. Avoid caffeine-containing products, e.g., coffee, tea, colas, chocolate (cause further CNS stimulation). Do not smoke. Use other medications only after consulting physician. Teach effective deep breathing and coughing. Notify physician if symptoms are not relieved or worsen. Report adverse reactions.

CALCIUM CHANNEL BLOCKERS

ACTION

Calcium channel blockers inhibit the flow of extracellular Ca^{+2} ions across cell membrane of cardiac cells, vascular tissue. Calcium channel blockers relax arterial smooth muscle, depress the rate of sinus node pacemaker, slow AV conduction, decrease heart rate, produce negative inotropic effect (rarely seen clinically due to reflex response). All calcium channel blockers decrease coronary vascular resistance, increase coronary blood flow, reduce myocardial oxygen demand. Degree of action varies with individual agent.

CALCIUM CHANNEL BLOCKERS

Generic Name	Brand Name(s)	Onset Action	Uses	Rte Admin	Dosage Range
amlodipine	Norvasc	—	Angina Hypertension	Oral	2.5–10 mg/day
bepridil	Vascor	1 hr	Angina	Oral	200–400 mg/day
diltiazem	Cardizem Cardizem CD	30–60 min	Angina Hypertension Arrhythmias	Oral, IV	Oral: 120–360 mg/day IV: 20–25 mg IV bolus; 5–15 mg/hr IV infusion
felodipine	Plendil	2–5 hrs	Hypertension	Oral	5–10 mg/day
isradipine	DynaCirc	2 hrs	Hypertension	Oral	5–20 mg/day
nicardipine	Cardene	20 min	Angina Hypertension	Oral	60–120 mg/day
nifedipine	Adalat Procardia	20 min	Angina Hypertension	SL, Oral	Oral: 30–120 mg/day XL: 30–60 mg/day
nimodipine	Nimotop	—	Subarachnoid hemorrhage	Oral	60 mg q4h × 21 days
nisoldipine	Sular	—	Hypertension	Oral	20–60 mg/day
verapamil	Calan Isoptin Verelan	30 min	Angina Hypertension Arrhythmias	Oral, IV	Oral: 120–480 mg/day IV: 5–10 mg, max: 10 mg/dose

SL: Sublingual. XL: Sustained-release. IV: Intravenous.

USES

Treatment of essential hypertension, treatment and prophylaxis of angina pectoris (including vasospastic, chronic stable, unstable), prevent/control supraventricular tachyarrhythmias, prevent neurologic damage due to subarachnoid hemorrhage.

PRECAUTIONS

Contraindications: Renal or hepatic dysfunction, heart block, hypotension, extreme bradycardia, aortic stenosis, sick-sinus syndrome, severe left ventricular dysfunction, pregnancy, lactation. **Cautions:** Administer cautiously to elderly because half-life may be increased. Liver enzymes should be monitored periodically.

INTERACTIONS

Beta-adrenergic blockers may have additive effect. May increase digoxin concentration. Procainamide, quinidine may increase risk of QT interval prolongation. Carbamazepine, quinidine, theophylline may increase concentration, toxicity.

SYMPATHOMIMETICS

ACTION

Sympathetic nervous system (SNS) is involved in maintaining homeostasis (involved in regulation of heart rate, force of cardiac contractions, B/P, bronchial airway tone, carbohydrate, fatty acid metabolism). The SNS is mediated by neurotransmitters (primarily norepinephrine, epinephrine, and dopamine), which act on adrenergic receptors. These receptors include $beta_1$, $beta_2$, $alpha_1$, $alpha_2$, and dopaminergic. Sympathomimetics differ widely in their actions based on their specificity to affect these receptors. Actions expected by stimulating these receptors include the following:

$Alpha_1$: Mydriasis, constriction of arterioles, veins.
$Alpha_2$: Inhibits transmitter release.
$Beta_1$: Increases rate, force of contraction, conduction velocity of heart, releases renin from kidney.
$Beta_2$: Dilates arterioles, bronchi, relaxes uterus.
Dopamine: Dilates kidney vasculature.

USES

Stimulation of $alpha_1$-receptors: Induces vasoconstriction primarily in skin and mucous membranes; nasal decongestion; combines with local anesthetics to delay anesthetic absorption; increases B/P in certain hypotensive states; produces mydriasis, facilitating eye exams, ocular surgery.

Stimulation of $alpha_2$-receptors: No therapeutic use.

Stimulation of $beta_1$-receptors: Treatment of cardiac arrest (not primary); treatment of heart failure, shock, AV block (temporary only).

Stimulation of $beta_2$-receptors: Treatment of asthma; delays premature labor.

Stimulation of dopamine receptors: Treatment of shock.

PRECAUTIONS

Contraindications: Hyperthyroidism, hypertension, cardiovascular disease, narrow-angle glaucoma, Parkinson's disease, psychoneuroses, hypersensitivity. **Cautions:** Diabetes mellitus, urinary tract obstructions, elderly, debilitated, infants and children. See individual monograph for pregnancy, lactation precautions.

SYMPATHOMIMETICS

Generic Name	Brand Name(s)	Receptor Specificity	Primary Clinical Use
albuterol	Proventil Ventolin	$Beta_2$	Bronchodilator
bitolterol	Tornalate	$Beta_2$	Bronchodilator
dobutamine	Dobutrex	$Beta_1$ $Beta_2$ $Alpha_1$	Inotropic support in pts with cardiac decompensation
dopamine	Intropin	$Beta_1$ $Alpha_1$ Dopaminergic	Cardiogenic, septic shock Pressor agent
epinephrine	Adrenalin Sus-phrine	$Beta_1$ $Beta_2$ $Alpha_1$	Allergic reaction Bronchodilator Local vasoconstriction (with anesthetics)
isoetharine	Bronkosol	$Beta_2$	Bronchodilator
isoproterenol	Isuprel	$Beta_1$ $Beta_2$	Heart rate stimulator in bradycardia, heart block Vasopressor in shock Bronchodilator
metaproterenol	Alupent	$Beta_2$	Bronchodilator

continued

Generic Name	Brand Name(s)	Receptor Specificity	Primary Clinical Use
metaraminol	Aramine	$Beta_1$ $Alpha_1$	Pressor in acute hypotensive states
norepinephrine	Levophed	$Beta_1$ $Alpha_1$	Pressor in acute hypotensive states
phenylephrine	Neo-synephrine	$Alpha_1$	Arterial vasoconstrictor Nasal decongestant Mydriatic
ritodrine	Yutopar	$Beta_2$	Arrest premature labor
terbutaline	Brethine Bricanyl	$Beta_2$	Bronchodilator

INTERACTIONS

Monoamine oxidase (MAO) inhibitors are contraindicated; in combination with adrenergics, potentiated effects can cause hypertensive crisis, intracranial hemorrhage, and death. Effects of MAO inhibitors may last 3 wks after discontinuation. General anesthetics may increase risk of arrhythmias. Tricyclic antidepressants, maprotiline may increase cardiovascular effects. Norepinephrine may decrease effect of methyldopa. May have mutually inhibitory effects with beta-adrenergic blockers. May increase risk of arrhythmias with digoxin. Ergonovine, oxytocin may increase vasoconstriction. Numerous agents interact with adrenergics; review each monograph individually.

SIDE EFFECTS

Palpitations, nervousness, restlessness, sweating, difficulty urinating, headache.

TOXIC EFFECTS/ADVERSE REACTIONS

Nausea and vomiting, tachycardia, pale/cold skin, difficulty breathing, significant increase or decrease in B/P. *Rare:* Chest pain and irregular heartbeat.

NURSING IMPLICATIONS

General: Immediately obtain intravenous access in cardiac arrest or other emergency. When infusions indicated, pt should be in intensive care unit with cardiac monitor. Infuse titrate carefully; use infusion pumps for accurate delivery.
Intervention/Evaluation: Monitor vital signs frequently, blood gases, electrolytes, renal and hepatic function results. Assess multiorgan response. **Patient/Family Teaching:** Measures to prevent recurrence when given for asthma, COPD such as avoidance of respiratory infection, prevention of allergen exposure, increased hydration.

THYROID

ACTION

Thyroid hormone (T_4 [thyroxine] and T_3 [triiodothyroxine]) are essential for normal growth, development, and energy metabolism. *Promotes growth/development:* Controls DNA transcription and protein synthesis. Necessary in development of nervous system. *Stimulates energy use:* Increases basal metabolic rate (increases O_2 consumption, heat production). *Cardiovascular:* Stimulates heart by increased rate, force of contraction, cardiac output.

USES

Treatment of primary or secondary hypothyroidism, myxedema, cretinism, or simple goiter.

chronic lung conditions. **Patient/Family Teaching:** Mouthwash, cold drinks, hard candy or gum (if permitted) may be used for dry mouth. Take safety precautions with drowsiness, blurred vision, or lightheadedness; do not drive or perform activities requiring mental acuity. Increased fluid intake to decrease viscosity of secretions, aid in bowel elimination. *Ophthalmic:* Protect eyes from light; wear sunglasses.

ANTICOAGULANTS/ANTIPLATELETS/THROMBOLYTICS

ACTION

Anticoagulants: Inhibit blood coagulation by preventing the formation of new clots and extension of existing ones. *Do not dissolve formed clots.* Anticoagulants are subdivided into two common classes: *Heparin:* Directly interferes with blood coagulation by blocking the conversion of prothrombin to thrombin and fibrinogen to fibrin. *Coumarin:* Acts indirectly to prevent synthesis in the liver of vitamin K–dependent clotting factors.

Antiplatelets: Interfere with platelet aggregation. Effects are irreversible for life of platelet.

Thrombolytics: Act directly or indirectly on fibrinolytic system to dissolve clots (converting plasminogen to plasmin, an enzyme that digests fibrin clot).

USES

Anticoagulants: Primarily decrease risk of venous thromboembolism.

Antiplatelets: Primarily decrease risk of arterial thromboembolism.

Thrombolytics: Lyse existing clots.

Treatment and prevention of venous thromboembolism, acute myocardial infarction, acute cerebral embolism; reduces risk of acute myocardial infarction, total mortality in pts with unstable angina; occlusion of saphenous grafts following open heart surgery; embolism in select pts with atrial fibrillation, prosthetic heart valves, valvular heart disease, cardiomyopathy. Heparin also used for acute/chronic consumption coagulopathies (disseminated intravascular coagulation).

PRECAUTIONS

Contraindications: Hypersensitivity, active bleeding, blood dyscrasias and bleeding tendencies, pregnancy. **Cautions:** Renal, hepatic dysfunction; alcoholism; history of allergy.

ANTICOAGULANTS/ANTIPLATELETS/THROMBOLYTICS

Generic Name	Brand Name(s)	Class	Dosage Range
abciximab	ReoPro	Antiplatelet	Adults: IV bolus: 0.25 mg/kg; IV infusion: 10 mcg/min
alteplase	Activase	Thrombolytic	Adults: IV infusion: 100 mg over 3 hrs (2 hrs for pulmonary embolism)
anagrelide	Agrylin	Antiplatelet	Adults: Oral: 2–10 mg/day
anistreplase	Eminase	Thrombolytic	Adults: IV push: 30 units over 2–5 min
ardeparin	Normiflo	Anticoagulant	Adults: SubQ: 50 U/kg q12 h
aspirin	—	Antiplatelet	Adults: 81–325 mg/day
clopidrogel	Plavix	Antiplatelet	Adults: Oral: 75 mg once daily
dalteparin	Fragmin	Anticoagulant	Adults: SubQ: 200 IU/kg once daily or 100 IU/kg q12h
danaparoid	Organan	Anticoagulant	Adults: SubQ: 750 units q12h
dipyridamole	Persantine	Antiplatelet	Adults: 75–100 mg 4 times/day
enoxaparin	Lovenox	Anticoagulant	Adults: 30 mg q12h
heparin	—	Anticoagulant	Adults: IV bolus: 5,000 units then IV infusion of 20,000–40,000 units/day Children: IV bolus: 50 units/kg then IV infusion of 20,000 units/m^2/24 hrs
reteplase	Retavase	Thrombolytic	Adults: IV: 10 units q30min × 2 doses
streptokinase	Kabikinase Streptase	Thrombolytic	Adults: (AMI) 1.5 million units over 60 min

Generic Name	Brand Name(s)	Class	Dosage Range
ticlopidine	Ticlid	Antiplatelet	Adults: 250 mg 2 times/day
urokinase	Abbokinase	Thrombolytic	Adults: IV: 4,400 IU/kg over 10 min, then 4,400 IU/kg/min for 12–24 hrs
warfarin	Coumadin	Anticoagulant	Adults: Initially, 5–10 mg/day, then 2–10 mg/day

INTERACTIONS

Anticoagulants interact with many drugs and foods. Pts should be cautioned against smoking, alcohol consumption, and use of OTC drugs. Aspirin, many NSAIDs, antihistamines, diuretics, antibiotics, estrogen contraceptives are among the drugs that affect anticoagulant action. Any medication taken with an anticoagulant should be checked for interaction. Prothrombin time (PT) may be shortened by high-fat diet or sudden increase in foods rich in vitamin K. Antidote for heparin: protamine sulfate; for coumarins: vitamin K.

SIDE EFFECTS

Not common. Local reactions with parenteral administration. Nausea, vomiting, anorexia, and diarrhea with oral administration.

TOXIC EFFECTS/ADVERSE REACTIONS

Minor bleeding to major hemorrhage. Thrombocytopenia and alopecia are transient and reversible. Jaundice, hepatitis, increased serum transaminase levels with coumarin therapy. Hypersensitivity reactions are rare: fever, chills, urticaria.

NURSING IMPLICATIONS

General: Do not discontinue abruptly. Monitor coagulation test results before administration: for heparin therapy, the activated partial thromboplastin time (APTT); for coumarin therapy, the PT. Consult physician for targeted coagulation range for individual pt (generally, dosage is adjusted to keep results about 1.5–2 times control value for APTT, 1.5 times control value for PT). **Intervention/Evaluation:** Assess for bleeding: vital signs, bruises, overt bleeding, and blood in sputum, urine, and feces. Check for headache, abdominal or back pain. **Patient/Family Teaching:** Importance of taking drug as directed and periodic lab tests to determine response to medication. Explain how to check for bleeding signs. Carry identification indicating anticoagulant therapy. Avoid large quantities of vitamin K–rich food, such as green leafy vegetables, liver, fish, bananas, cauliflower, tomatoes (decrease effects of oral anticoagulants). Consult physician before taking other medications (including aspirin). Avoid alcohol. Avoid activities with high risk of injury. Inform physician, dentist of anticoagulant therapy before surgical/dental procedures.

ANTICONVULSANTS

INTRODUCTION

Epilepsy is a condition having a tendency to seizures. Epilepsy is a chronic neurologic disorder that may be the result of brain injury from difficulties at birth, stroke, head trauma, or brain tumor. However, the majority of cases have no identifiable cause. The common feature is enhanced susceptibility to recurring seizures caused by abrupt onset of abnormal electrical hyperactivity in the brain.

Seizures are classified as either partial (beginning in a limited area on one side of the brain) or generalized (beginning on both sides of the brain). The most common seizure is partial at onset and may become generalized.

ACTION

Anticonvulsants can prevent or reduce excessive discharge of neurons with seizure foci or decrease the spread of excitation from seizure foci to normal neurons. Exact mechanism unknown but may be due to suppressing sodium influx, suppressing calcium influx, or increasing the action of GABA, which inhibits neurotransmitters throughout the brain. Anticonvulsants include the hydantoins, barbiturates, succinimides, oxazolidinediones, benzodiazepines, and several miscellaneous agents (see table).

attacks). Do not take alcohol (can cause hypotensive, shocklike state) or other drugs without physician approval. Identify precipitating factors. Take sublingual tablets sitting or lying down for anginal relief; may repeat every 5 min, up to 3 tablets in 15 min. If no relief, have ambulance transport to hospital. Do not change brands; discard expired drugs. Notify physician of severe or persistent headache.

NONSTEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDs)

ACTION

Exact mechanism for anti-inflammatory, analgesic, antipyretic effects unknown. Inhibition of enzyme cyclooxygenase, the enzyme responsible for prostaglandin synthesis, appears to be a major mechanism of action. May inhibit other mediators of inflammation (e.g., leukotrienes). Direct action on hypothalamus heat-regulating center may contribute to antipyretic effect.

NSAIDS

Generic Name	Brand Name(s)	Use: Dosage Range
aspirin	many	Aches/pains: 325–650 mg q4h prn Arthritis: 3.2–6 g/day Juvenile rheumatoid arthritis: 60–110 mg/kg/day Acute rheumatic fever: Adults: 5–8 g/day; Children: 100 mg/kg/day x14 days; then, 75 mg/kg/day ×4–6 wks Transient ischemic attacks: 1,300 mg/day Myocardial infarction prophylaxis: 81–325 mg/day Analgesic/antipyretic (children): up to 60–80 mg/kg/day or 10–15 mg/kg/dose q4h
bromfenac	Duract	Pain: 25 mg q6–8h prn
choline salicylate	Arthropan	Arthritis/pain/fever: 870 mg (5 ml) q3–4h up to 6×/day
diclofenac	Voltaren	Arthritis: 100–200 mg/day
diflunisal	Dolobid	Arthritis: 0.5–1 g/day Pain: 1 g, then 0.5 g q8–12h
etodolac	Lodine	Arthritis: 600–800 mg/day Pain: 200–400 mg q6–8h; max: 1200 mg/day
fenoprofen	Nalfon	Arthritis: 300–600 mg 3–4×/day Pain: 200 mg q4–6h prn
flurbiprofen	Ansaid	Arthritis: 200–300 mg/day
ibuprofen	Motrin	Arthritis: 1.2–3.2 g/day Pain: 400 mg q4–6h prn Fever: 200 mg q4–6h prn Primary dysmenorrhea: 400 mg q4h prn Juvenile arthritis: 30–40 mg/kg/day
indomethacin	Indocin	Arthritis: 50–200 mg/day Bursitis/tendonitis: 75–150 mg/day Gouty arthritis: 150 mg/day
ketoprofen	Orudis	Arthritis: 150–300 mg/day Pain/primary dysmenorrhea: 25–50 mg q6–8h as needed
ketorolac	Toradol	Pain: Oral: 10 mg q4–6h prn; max: 40 mg/day; IM/IV: 60–120 mg/day
magnesium salicylate	Magan	Arthritis/pain/fever: 3.6–4.8 g/day in 3–4 divided doses
meclofenamate	Meclomen	Arthritis: 200–400 mg/day Pain: 50 mg q4–6h prn Primary dysmenorrhea: 100 mg 3×/day
nabumetone	Relafen	Arthritis: 1–2 g/day

Generic Name	Brand Name(s)	Use: Dosage Range
naproxen	Anaprox Naprosyn	Arthritis: 250–550 mg/day Pain/1° dysmenorrhea/bursitis/tendonitis: 500 mg, then 250 mg q6–8h Juvenile arthritis: 10 mg/kg in 2 divided doses Gouty arthritis: 750 mg, then 250 mg q8h
oxaprozin	Daypro	Arthritis: 600–1,800 mg/day
piroxicam	Feldene	Arthritis: 20 mg/day
sodium salicylate	Sodium Salicylate	Arthritis/pain/fever: 325–650 mg q4h prn
sulindac	Clinoril	Arthritis: 300 mg/day Acute gouty arthritis/painful shoulder: 400 mg/day
tolmetin	Tolectin	Arthritis: 600–1,800 mg/day Juvenile arthritis: 15–30 mg/kg/day

1° = primary; prn= as circumstances may require.

USES

Provides symptomatic relief from *pain/inflammation* in the treatment of musculoskeletal disorders (e.g., rheumatoid arthritis, osteoarthritis, ankylosing spondylitis); *analgesic* for low to moderate pain; *reduces fever* (many agents not suited for routine/prolonged therapy due to toxicity). By virtue of its action on platelet function, aspirin is used in treatment or prophylaxis of diseases associated with hypercoagulability (reduces risk of stroke/heart attack).

PRECAUTIONS

Contraindications: Aspirin sensitivity or allergy to other components; pregnancy; lactation; children <14 yrs of age, gastrointestinal disorders. **Cautions:** Renal or hepatic dysfunctions, cardiac or hypertensive disorders, severe infections, elderly, coagulation defects, otic disease.

INTERACTIONS

Salicylates: Antacids, NSAIDs may increase risk of GI effects (e.g., ulceration). Urinary alkalinizers, antacids increase excretion. Anticoagulants, heparin, thrombolytics increase risk of bleeding. Large doses may increase insulin, oral hypoglycemic effects. Valproic acid, platelet aggregation inhibitors may increase risk of bleeding. May increase toxicity of methotrexate, zidovudine. Ototoxic medications, vancomycin may increase ototoxicity. May decrease effect of probenecid, sulfinpyrazone.

NSAIDs: May increase effects of oral anticoagulants, heparin, thrombolytics. May decrease effect of antihypertensives, diuretics. Salicylates, aspirin may increase risk of GI side effects, bleeding. Bone marrow depressants may increase risk of hematologic reactions. May increase methotrexate toxicity. Probenecid may increase concentration.

SIDE EFFECTS

Gastrointestinal upset, dizziness, headache, constipation or diarrhea. *Ophthalmic:* Burning, stinging on instillation, keratitis, elevated intraocular pressure.

TOXIC EFFECTS/ADVERSE REACTIONS

Hypersensitivity reactions, including skin rash or urticaria. Renal or hepatic toxicity, bone marrow suppression, bleeding, esp. of gastrointestinal tract. Tinnitus and hearing disturbances. Reactions vary by individual drug.

NURSING IMPLICATIONS

General: Check for aspirin sensitivity (cross-sensitivity). Administer on schedule to maintain blood levels. Provide rest, positioning, and other comfort measures for pain relief. **Baseline Assessment:** Assess pain (type, location, intensity). Check temperature, pulse, respirations. **Intervention/Evaluation:** Assess pain, therapeutic response (decreased temperature, pain relief, improved mobility). **Patient/Family Teaching:** Take with meals or on empty stomach, as indicated by individual drug; however, all drugs may be taken with food, if necessary, to reduce GI side effects. Avoid alcohol and consult physician about other medications. Refrain from driving or other activities requiring motor response until certain no dizziness present. Inform other physicians or dentist of drug therapy.