efavirenz (e-fav-i-renz)

Sustiva

Classification

Therapeutic: antiretrovirals
Pharmacologic: non-nucleoside reverse transcriptase inhibitors

Pregnancy Category D

Indications

HIV infection in combination with one or more other antiretroviral agents.

Action

Inhibits HIV reverse transcriptase, which results in disruption of DNA synthesis. **Therapeutic Effects:** Slowed progression of HIV infection and decreased occurrence of sequelae. Increased CD4 cell counts and decreased viral load.

Pharmacokinetics

Absorption: 50% absorbed when ingested after a high-fat meal.
Distribution: enters CSF.
Metabolism and Excretion: Mostly metabolized by the liver.
Half-life: *After single dose*—52–76 hr. *After multiple doses*—40–55 hr.

TIME/ACTION PROFILE (blood levels)

	ONSET	PEAK	DURATION
PO	rapid	3–5 hr	unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Concurrent midazolam, triazolam, ergot derivatives or voriconazole.
Use Cautiously in: History of mental illness or substance abuse (↑ risk of psychiatric symptomatology); History of hepatic impairment (including hepatitis B or C infection or concurrent therapy with hepatotoxic agents); Children (increased incidence of rash); Pregnancy or lactation (use in pregnancy only if other options have been exhausted; breastfeeding not recommended in HIV-infected patients).

Adverse Reactions/Side Effects

CNS: abnormal dreams, depression, dizziness, drowsiness, fatigue, headache, impaired concentration, insomnia, nervousness, psychiatric symptomatology. **GI:** nausea, abdominal pain, anorexia, diarrhea, dyspepsia, flatulence. **GU:** hematuria, renal calculi. **Derm:** rash, increased sweating, pruritus. **Neuro:** hypoesthesia.

Interactions

Drug-Drug: Significantly ↓ **voriconazole** levels; concurrent use is contraindicated. ↑ risk of CNS depression with other **CNS depressants**, including **alcohol**, **antidepressants**, **antihistamines**, and **opioid analgesics**. Concurrent use with **ritonavir** ↑ blood levels of both agents and the likelihood of adverse reactions, especially hepatotoxicity. ↑ blood levels of **midazolam**, **triazolam** or **ergot alkaloids** when used concurrently; may result in potentially serious adverse reactions including arrhythmias, CNS, and respiratory depression. May alter the effectiveness of **hormonal contraceptives**. ↓ **indinavir** blood levels (indinavir dosage ↑ recommended). ↓ **saquinavir** blood levels (avoid using saquinavir as the only protease inhibitor with efavirenz). May alter the effects of **warfarin**.
Drug-Natural Products: Use with **St. John's wort** may cause ↓ drug levels and effectiveness, including development of drug resistance.
Drug-Food: Ingestion after a **high-fat meal** ↑ absorption by 50%.

Route/Dosage

PO (Adults and Children >40 kg): 600 mg once daily.
PO (Children 32.5–40 kg): 400 mg once daily.
PO (Children 25–32.5 kg): 350 mg once daily.
PO (Children 20–25 kg): 300 mg once daily.
PO (Children 15–20 kg): 250 mg once daily.
PO (Children 10–15 kg): 200 mg once daily.

emtricitabine (em-tri-si-ti-been)

Emtriva

Classification

Therapeutic: antiretrovirals
Pharmacologic: nucleoside reverse transcriptase inhibitors

Pregnancy Category B

Indications

HIV infection (with other antiretrovirals).

Action

Phosphorylated intracellularly where it inhibits HIV reverse transcriptase, resulting in viral DNA chain termination. **Therapeutic Effects:** Slowed progression of HIV infection and decreased occurrence of sequelae. Increases CD4 cell counts and decreases viral load.

Pharmacokinetics

Absorption: Rapidly and extensively absorbed.
Distribution: Unknown.
Metabolism and Excretion: Some metabolism, 84% renally excreted, 14% fecal excretion.
Half-life: 10 hr.

TIME/ACTION PROFILE (blood levels*)

ROUTE	ONSET	PEAK	DURATION
PO	rapid	1–2 hr	24 hr

*Normal renal function

Contraindications/Precautions

Contraindicated in: Hypersensitivity.
Use Cautiously in: Consider age-related decrease in hepatic, renal, and cardiovascular function as well as other chronic illnesses; Hepatitis B infection (may exacerbate following discontinuation); Renal impairment (↓ dose if CCr <50 ml/min); Pregnancy (use only if clearly needed); Lactation (breast-feeding is not recommended in HIV-infected patients); Children <18 yr (safety not established).

Adverse Reactions/Side Effects

CV: headache. **GI:** diarrhea, nausea. SEVERE HEPATOMEGALY WITH STEATOSIS. **Derm:** rash, skin discoloration. **F and E:** LACTIC ACIDOSIS. **Misc:** fat redistribution.

Interactions

Drug-Drug: None noted.

Route/Dosage

PO (Adults ≥18 yr): 200 mg once daily.

Renal Impairment

PO (Adults ≥18 yr): *CCr 30–49 ml/min*—200 mg every 48 hr; *CCr 15–29 ml/min*—200 mg every 72 hr; *CCr <15 ml/min*—200 mg every 96 hr.

NURSING IMPLICATIONS

Assessment

- Assess patient for change in severity of HIV symptoms and for symptoms of opportunistic infections during therapy.
- Assess patient for signs of hypersensitivity reactions, which may present as fever, rash, fatigue, nausea, vomiting, diarrhea, and abdominal pain or as symptoms of upper respiratory infection (dyspnea, cough pharyngitis). May also cause elevated liver function tests, increased creatine phosphokinase or creatinine, and lymphopenia. Discontinue emtricitabine at the first sign of hypersensitivity reaction. Do not restart emtricitabine after reaction; more severe symptoms may occur within hours and may include life-threatening hypotension and death. Symptoms usually resolve on discontinuation.

NURSING IMPLICATIONS

Assessment

- Assess for change in severity of HIV symptoms and for symptoms of opportunistic infections during therapy.
- Assess patient for rash, especially during 1st mo of therapy. Onset is usually within 2 wk and resolves with continued therapy within 1 mo. May range from mild maculopapular with erythema and pruritus to exfoliative dermatitis and Stevens-Johnson syndrome. Occurs more often and may be more severe in children. If rash is severe or accompanied by blistering, desquamation, mucosal involvement, or fever, therapy must be discontinued immediately. Efavirenz may be reinstated concurrently with antihistamines or corticosteroids in patients discontinuing due to rash.
- Assess patient for CNS and psychiatric symptoms (dizziness, impaired concentration, somnolence, abnormal dreams, insomnia) throughout therapy. Symptoms usually begin during 1st or 2nd day of therapy and resolve after 2–4 wk. Administration at bedtime may minimize symptoms. Concurrent use with alcohol or psychoactive agents may cause additive CNS symptoms.
- ***Lab Test Considerations:*** Monitor viral load and CD4 cell count regularly during therapy.
- Monitor liver function tests in patients with a history of hepatitis B or C. May cause ↑ serum AST, ALT, and GGT concentrations. If moderate to severe liver function test abnormalities occur, efavirenz doses should be held until levels return to normal. Discontinue if liver function abnormalities recur when therapy is resumed.
- May cause ↑ in total cholesterol and serum triglyceride levels.
- May cause false-positive urine cannabinoid results.

Potential Nursing Diagnoses

Risk for infection (Indications)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)
Noncompliance (Patient/Family Teaching)

Implementation

- **PO:** Administer with or without food. Avoid taking with a high-fat meal.

Patient/Family Teaching

- Emphasize the importance of taking efavirenz as directed. It must always be used in combination with other antiretroviral drugs. Do not take more than prescribed amount and do not stop taking without consulting health care professional. Take missed doses as soon as remembered; do not double doses.
- Instruct patient that efavirenz should not be shared with others.
- May cause dizziness, impaired concentration, or drowsiness. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Advise patient to avoid taking other medications, prescription or OTC, or herbal products without consulting health care professional.
- Inform patient that efavirenz does not cure AIDS or prevent associated or opportunistic infections. Efavirenz does not reduce the risk of transmission of HIV to others through sexual contact or blood contamination. Caution patient to use a condom and to avoid sharing needles or donating blood to prevent spreading the AIDS virus to others. Advise patient that the long-term effects of efavirenz are unknown at this time.
- Advise patients taking oral contraceptives to use a nonhormonal method of birth control during efavirenz therapy and to notify health care professional if they become pregnant while taking efavirenz.
- Instruct patient to notify health care professional immediately if rash occurs.
- Emphasize the importance of regular follow-up exams and blood counts to determine progress and monitor for side effects.

Evaluation/Desired Outcomes

- Delayed progression of AIDS and decreased opportunistic infections in patients with HIV.
- Decrease in viral load and increase in CD4 cell counts.

Why was this drug prescribed for your patient?

- May cause lactic acidosis and severe hepatomegaly with steatosis. Monitor patient for signs (increased serum lactate levels, elevated liver enzymes, liver enlargement on palpation). Therapy should be suspended if clinical or laboratory signs occur.
- Test patients for chronic hepatitis B virus (HBV) before initiating therapy. Emtricitabine is not indicated for treatment of HBV. Exacerbations of HBV have occurred upon discontinuation of emtricitabine.
- ***Lab Test Considerations:*** Monitor viral load and CD4 cell count regularly during therapy.
- May cause increased serum glucose and triglyceride levels.
- May cause ↑ AST, ALT, bilirubin, creatine kinase, pancreatic amylase, serum amylase, and serum lipase. May cause ↑ or ↓ serum glucose. May cause ↓ neutrophil count.

Potential Nursing Diagnoses

Risk for infection (Indications)
Noncompliance (Patient/Family Teaching)

Implementation

- **PO:** May be administered with or without food.

Patient/Family Teaching

- Emphasize the importance of taking emtricitabine exactly as directed. It must always be used in combination with other antiretroviral drugs. Do not take more than prescribed amount and do not stop taking without consulting health care professional. If a dose is missed, take as soon as remembered, but not if almost time for next dose; do not double doses.
- Instruct patient that emtricitabine should not be shared with others.
- Inform patient that emtricitabine does not cure AIDS or prevent associated or opportunistic infections. Emtricitabine does not reduce the risk of transmission of HIV to others through sexual contact or blood contamination. Caution patient to use a condom and to avoid sharing needles or donating blood to prevent spreading the AIDS virus to others. Advise patient that the long-term effects of emtricitabine are unknown at this time.
- Instruct patient to notify health care professional immediately if symptoms of lactic acidosis (tiredness or weakness, unusual muscle pain, trouble breathing, stomach pain with nausea and vomiting, cold especially in arms or legs, dizziness, fast or irregular heartbeat) or if signs of hepatotoxicity (yellow skin or whites of eyes, dark urine, light colored stools, lack of appetite for several days or longer, nausea, abdominal pain) occur. These symptoms may occur more frequently in patients that are female, obese, or have been taking medications like emtricitabine for a long time.
- Inform patient that redistribution of body fat (central obesity, dorsocervical fat enlargement or buffalo hump, peripheral and facial wasting, breast enlargement, cushingoid appearance) and skin discoloration (hyperpigmentation on palms and soles) may occur.
- Emphasize the importance of regular follow-up exams and blood counts to determine progress and monitor for side effects.

Evaluation/Desired Outcomes

- Delayed progression of AIDS and decreased opportunistic infections in patients with HIV.
- Decrease in viral load and increase in CD4 cell counts.

Why was this drug prescribed for your patient?

High Alert

epinephrine (e-pi-**nef**-rin)

Adrenalin, Ana-Guard, AsthmaHaler Mist, AsthmaNefrin (racepinephrine), EpiPen, microNefrin, Nephron, Primatene, Sus-Phrine, S-2,

Classification

Therapeutic: antiasthmatics, bronchodilators, vasopressors
Pharmacologic: adrenergics

Pregnancy Category C

Indications

Subcut, IV, Inhaln: Management of reversible airway disease caused by asthma or chronic obstructive pulmonary disease. **Subcut, IV:** Management of severe allergic reactions. **IV, Intracardiac:** Management of cardiac arrest. **Local/Spinal:** Adjunct in the localization/prolongation of anesthesia.

Action

Results in the accumulation of cyclic adenosine monophosphate (cAMP) at beta-adrenergic receptors. Affects both $beta_1$(cardiac)-adrenergic receptors and $beta_2$-adrenergic (pulmonary) receptor sites. Produces bronchodilation. Also has alpha-adrenergic agonist properties, which result in vasoconstriction. Inhibits the release of mediators of immediate hypersensitivity reactions from mast cells. **Therapeutic Effects:** Bronchodilation. Maintenance of heart rate and blood pressure. Localization/prolongation of local/spinal anesthetic.

Pharmacokinetics

Absorption: Well absorbed after subcut administration; some absorption may occur after repeated inhalation of large doses.
Distribution: Does not cross the blood-brain barrier; crosses the placenta and enters breast milk.

Metabolism and Excretion: Action is rapidly terminated by metabolism and uptake by nerve endings.
Half-life: Unknown.

TIME/ACTION PROFILE (bronchodilation)

ROUTE	ONSET	PEAK	DURATION
Inhalation	5–5 min	unknown	1–3 hr
Subcut	6–12 min	20 min	<1–4 hr
IM	6–12 min	unknown	<1–4 hr
IV	rapid	20 min	20–30 min

Contraindications/Precautions

Contraindicated in: Hypersensitivity to adrenergic amines. Some products contain bisulfites or fluorocarbons; avoid in patients with known hypersensitivity/intolerance.
Use Cautiously in: Cardiac disease; Hypertension; Hyperthyroidism; Diabetes; Glaucoma (except for ophthalmic use); Geriatric patients (increased risk of adverse reactions; use lower doses); Excessive use may lead to tolerance and paradoxical bronchospasm (inhaler); Pregnancy (near term), lactation, and children <2 yr (safety not established).

Adverse Reactions/Side Effects

CNS: nervousness, restlessness, tremor, headache, insomnia. **Resp:** PARADOXICAL BRONCHOSPASM (excessive use of inhalers). **CV:** angina, arrhythmias, hypertension, tachycardia. **GI:** nausea, vomiting. **Endo:** hyperglycemia.

Interactions

Drug-Drug: Concurrent use with other **adrenergic agents** will have additive adrenergic side effects. Use with **MAO inhibitors** may lead to hypertensive crisis. **Beta blockers** may negate therapeutic effect.
Drug-Natural Products: Use with **cola nut, guarana, mate** increases stimulant effect.

CONTINUED

epinephrine

perglycemia, hypokalemia, seizures, tachyarrhythmias, persistent trembling, and vomiting. Treatment includes discontinuing adrenergic bronchodilator and other beta-adrenergic agonists and symptomatic, supportive therapy. Cardioselective beta-adrenergic blocking agents are to be used cautiously because they may induce bronchospasm.

Potential Nursing Diagnoses

Ineffective airway clearance (Indications)
Ineffective tissue perfusion (Indications)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- ***High Alert:*** Patient harm or fatalities have occurred from medication errors with epinephrine. Epinephrine is available in various concentrations, strengths, and percentages and is used for different purposes. Packaging labels may be easily confused or the products incorrectly diluted by inexperienced staff. Dilutions should be prepared by a pharmacist. Prior to administration, have second practitioner independently check original order, dosage calculations, concentration, route of administration, and infusion pump settings.
- Administer promptly at the onset of bronchospasm.
- Tolerance may develop with prolonged or excessive use. Effectiveness may be restored by discontinuing for a few days and then readministering.
- Use a tuberculin syringe with a 26-gauge ½-in. needle for subcut injection to ensure that correct amount of medication is administered. Suspension is for subcut use only. Do not use solutions that are pinkish or brownish or that contain a precipitate.
- For anaphylactic shock, volume replacement should be administered concurrently with epinephrine. Antihistamines and corticosteroids may be used in conjunction with epinephrine.
- **IM Subcut:** Medication can cause irritation of tissue. Rotate injection sites to prevent tissue necrosis. Massage injection sites well after administration to enhance absorption and to decrease local vasoconstriction. Avoid IM administration in gluteal muscle. Shake suspension well before administering; inject promptly to prevent settling.
- **IV:** Dilute 1 mg (1 ml) of 1:1000 solution in at least 10 ml of 0.9% NaCl for injection to prepare a 1:10,000 solution. Discard any solution not used within 24 hr of preparation.
- **Direct IV:** Administer each 1 mg 10 ml of 1:10,000 solutionover at least 1 min; more rapid administration may be used during cardiac resuscitation. Follow each dose with 20 ml IV flush.
- **Intermittent Infusion:** In severe anaphylactic shock, 0.1–0.25-mg dose may be repeated every 5–15 min. ***Rate:*** Administer over 5–10 min.
- **Continuous Infusion:** *For cardiac arrest*—Add 30 mg epinephrine (30 ml of 1:1000 solution) to 250 ml of D5W or 0.9% NaCl. *For profound bradycardia or hypotension*—Add 1 mg or 1:1000 solution to 500 ml 0.9% NaCl. Administer through Y-site via infusion pump to ensure accurate dosage. ***Rate:*** *For cardiac arrest*—Administer at a rate of 100 ml/hr. Titrate to response. *For profound bradycardia or hypotension*—Administer at a rate of 1–5 ml/min for a 2–10 mcg/min infusion.
- **Syringe Compatibility:** doxapram, heparin, milrinone.
- **Y-Site Compatibility:** atracurium, calcium chloride, calcium gluconate, cisatracurium, diltiazem, dobutamine, dopamine, famotidine, fentanyl, furosemide, heparin, hydrocortisone sodium succinate, hydromorphone, inamrinone, labetalol, levofloxacin, lorazepam, midazolam, milrinone, morphine, nitroglycerin, norepinephrine, pancuronium, phytonadione, potassium chloride, propofol, ranitidine, remifentanil, vecuronium, vitamin B complex with C, warfarin.

Route/Dosage

Subcut, IM (Adults): *Anaphylactic reactions/asthma*—0.1–0.5 mg (single dose not to exceed 1 mg); may repeat q 10–15 min for anaphylactic shock or q 20 min–4 hr for asthma. *Epinephrine suspension*—0.5 mg subcut initially; may repeat 0.5–1.5 mg q 6 hr.

Subcut: (Children): *Anaphylactic reactions/asthma* —0.01 mg/kg or 0.3 mg/m^2(not to exceed 0.5 mg/dose) q 15 min for 2 doses, then q 4 hr *Epinephrine suspension*—0.025 mg/kg (0.625 mg/m^2) subcut; may be repeated q 6 hr (not to exceed 0.75 mg in children ≤30 kg).

IV (Adults): *Severe anaphylaxis*—0.1–0.25 mg q 5–15 min; may be followed by 1–4 mcg/min continuous infusion. *Cardiopulmonary resuscitation (ACLS guidelines)*—1 mg q 3–5 min; *Bradycardia(ACLS guidelines)*—2–10 mcg/min).

IV (Children): *Severe anaphylaxis*—0.1 mg (less in younger children); may be followed by 0.1 mcg/kg/min continuous infusion (may be increased up to 1.5 mcg/kg/min). *Cardiopulmonary resuscitation(ACLS guidelines)*—0.01 mg/kg, may be repeated q 3–5 min;higher doses (up to 0.1–0.2 mg/kg) may be considered.).

Inhaln (Adults and Children ≥4 yr): *Metered-dose inhaler*—1 inhalation (160–250 mcg), may repeat after 1–2 min; additional doses may be repeated q 3 hr. *Inhalation solution*—1 inhalation of 1% solution; may repeat after 1–2 min; additional doses may be given q 3 hr. *Racepinephrine*—Via hand nebulizer, 2–3 inhalations of 2.25% solution; may repeat in 5 min up to 4–6 times daily.

Intracardiac (Adults): 0.3–0.5 mg.

Endotracheal: (Adults): *Cardiopulmonary resuscitation(ACLS guidelines)*—2.0–2.5 mg.

Topical (Adults and Children ≥6 yr): *Nasal decongestant*—Apply 1% solution as drops, spray, or with a swab.

Intraspinal: (Adults and Children): 0.2–0.4 ml of 1:1000 solution.

With Local Anesthetics: (Adults and Children): Use 1:200,000 solution with local anesthetic.

NURSING IMPLICATIONS

Assessment

- **Bronchodilator:** Assess lung sounds, respiratory pattern, pulse, and blood pressure before administration and during peak of medication. Note amount, color, and character of sputum produced and notify physician or other health care professional of abnormal findings.
- Monitor pulmonary function tests before initiating therapy and periodically throughout course to determine effectiveness of medication.
- Observe for paradoxical bronchospasm (wheezing). Withhold medication and notify physician or other health care professional immediately.
- Observe for tolerance and rebound bronchospasm. Patients requiring more than 3 inhalation treatments in 24 hr should be under close supervision. If minimal or no relief is seen after 3–5 inhalation treatments within 6–12 hr, further treatment with aerosol alone is not recommended.
- Assess for hypersensitivity reaction (rash; urticaria; swelling of the face, lips, or eyelids). If condition occurs, withhold medication and notify physician or other health care professional immediately.
- **Vasopressor:** Monitor blood pressure, pulse, ECG, and respiratory rate frequently during IV administration. Perform continuous ECG monitoring, hemodynamic parameters, and urine output.
- Monitor for chest pain, arrhythmias, heart rate >110 bpm, and hypertension. Consult physician for parameters of pulse, BP, and ECG changes for adjusting dosage or discontinuing medication.
- **Shock:** Assess volume status. Hypovolemia should be corrected before administering epinephrine IV.
- **Nasal Decongestant:** Assess patient for nasal and sinus congestion before and periodically during therapy.
- ***Lab Test Considerations:*** May cause transient decrease in serum potassium with nebulization or at higher than recommended doses.
- May cause an increase in blood glucose and serum lactic acid levels.
- ***Toxicity and Overdose:*** Symptoms of overdose include persistent agitation, chest pain or discomfort, decreased blood pressure, dizziness, hy-

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- **Y-Site Incompatibility:** ampicillin, thiopental.
- **Additive Compatibility:** cimetidine, ranitidine.
- **Additive Incompatibility:** aminophylline, sodium bicarbonate. **Inhaln:** When using epinephrine inhalation solution, 10 drops of 1% base solution should be placed in the reservoir of the nebulizer.
- The 2.25% inhalation solution of racepinephrine must be diluted for use in the combination nebulizer/respirator.
- Allow 1–2 min to elapse between inhalations of epinephrine inhalation solution, epinephrine inhalation aerosol, or epinephrine bitartrate inhalation aerosol to make certain the second inhalation is necessary.
- When epinephrine is used concurrently with corticosteroid or ipratropium inhalations, administer bronchodilator first and other medications 5 min apart to prevent toxicity from inhaled fluorocarbon propellants.
- **Endotracheal:** Epinephrine can be injected directly into the bronchial tree via the endotracheal tube if the patient has been intubated. Perform 5 rapid insufflations; forcefully administer 10 ml containing 2.0–2.5 mg epinephrine (1 mg/ml) directly into tube; follow with 5 quick insufflations.

Patient/Family Teaching

- Instruct patient to take medication exactly as directed. If on a scheduled dosing regimen, take missed doses as soon as possible; space remaining doses at regular intervals. Do not double doses. Caution patient not to exceed recommended dose; may cause adverse effects, paradoxical bronchospasm, or loss of effectiveness of medication.
- Instruct patient to contact health care professional immediately if shortness of breath is not relieved by medication or is accompanied by diaphoresis, dizziness, palpitations, or chest pain.
- Advise patient to consult health care professional before taking any OTC medications or alcoholic beverages concurrently with this therapy. Caution patient also to avoid smoking and other respiratory irritants.
- **Inhaln:** Review correct administration technique (aerosolization, IPPB, metered-dose inhaler) with patient. Wait 1–5 min before administering next dose. Mouthpiece should be washed after each use.
- Do not spray inhaler near eyes.
- Instruct patient to save inhaler; refill canisters may be available.
- Advise patients to use bronchodilator first if using other inhalation medications, and allow 5 min to elapse before administering other inhalant medications, unless otherwise directed.
- Advise patient to rinse mouth with water after each inhalation dose to minimize dry mouth.
- Advise patient to maintain adequate fluid intake (2000–3000 ml/day) to help liquefy tenacious secretions.
- Advise patient to consult health care professional if respiratory symptoms are not relieved or worsen after treatment or if chest pain, headache, severe dizziness, palpitations, nervousness, or weakness occurs.
- Instruct patient to notify health care professional if contents of one canister are used up in less than 2 wk.
- **Auto-injector:** Instruct patients using auto-injector for anaphylactic reactions to remove gray safety cap, placing black tip on thigh at right angle to leg. Press hard into thigh until auto-injector functions, hold in place several seconds, remove, and discard properly. Massage injected area for 10 sec.

Evaluation/Desired Outcomes

- Prevention of exercise-induced asthma.
- Reversal of signs and symptoms of anaphylaxis.
- Increase in cardiac rate and output, when used in cardiac resuscitation.
- Increase in blood pressure, when used as a vasopressor.
- Localization of local anesthetic.
- Decrease in sinus and nasal congestion.

Why was this drug prescribed for your patient?

eplerenone (e-ple-re-none)

Inspra

Classification

Therapeutic: antihypertensives
Pharmacologic: aldosterone antagonists

Pregnancy Category B

Indications

Hypertension (alone, or with other agents).

Action

Blocks the effects of aldosterone by attaching to mineralocorticoid receptors. **Therapeutic Effects:** Lowering of blood pressure.

Pharmacokinetics

Absorption: Well absorbed following oral administration.
Distribution: Unknown.
Metabolism and Excretion: Mostly metabolized by the liver (CYP3A4 enzyme system); <5% excreted unchanged by the kidneys.
Half-life: 4–6 hr.

TIME/ACTION PROFILE (antihypertensive effect)

ROUTE	ONSET	PEAK	DURATION
PO	Unknown	4 wk	Unknown

Contraindications/Precautions

Contraindicated in: Serum potassium >5.5 mEq/L. Type 2 diabetes with microalbuminuria (increased risk of hyperkalemia). Serum creatinine >2.0 mg/dL in males or >1.8 mg/dL in females. CCr <50 ml/min. Concurrent use of potassium-sparing diuretics. Concurrent use of strong inhibitors of the CYP3A4 enzyme system (ketoconazole, itraconazole). Lactation.

Use Cautiously in: Severe hepatic impairment; Concurrent use of ACE inhibitors or angiotensin II receptor antagonists (increased risk of hyperkalemia); Pregnancy (use only if clearly needed); Children (safety not established).

Adverse Reactions/Side Effects

CNS: dizziness, fatigue. **GI:** abnormal liver function tests, abdominal pain, diarrhea. **GU:** albuminuria. **Endo:** abnormal vaginal bleeding, gynecomastia. **F and E:** HYPERKALEMIA. **Metab:** hypercholesterolemia, hypertriglyceridemia. **Misc:** flu-like symptoms.

Interactions

Drug-Drug: Concurrent use of strong inhibitors of the CYP3A4 enzyme system (**ketoconazole, itraconazole**) significantly ↑ effects of eplenerone and should be avoided. Concurrent use of weak inhibitors of the CYP3A4 enzyme system (**erythromycin, saquinavir, fluconazole, verapamil**) may ↑ effects of eplerenone; initial dose of eplerenone should be ↓ by 50%. **NSAIDs** may ↓ antihypertensive effects. Concurrent use of **ACE inhibitors** or **Angiotensin II receptor blockers** may ↑ risk of hyperkalemia.

Route/Dosage

PO (Adults): 50 mg once daily initially; may be increased to 50 mg twice daily; *patients receiving concurrent weak CYP3A4 inhibitors (erythromycin, saquinavir, verapamil, fluconazole)*—25 mg once daily initially.

NURSING IMPLICATIONS

Assessment

- Monitor blood pressure periodically during therapy.
- Monitor prescription refills to determine adherence.
- ***Lab Test Considerations:*** May cause hyperkalemia. Monitor serum potassium levels every 2 wk for the first 1–2 mo, then monthly thereafter.
- May cause ↓ serum sodium and ↑ serum triglyceride, cholesterol, ALT, GGT, creatinine, and uric acid levels.

epoetin (ee-poe-e-tin)

EPO, Epogen, ♣Eprex, erythropoietin, Procrit

Classification

Therapeutic: antianemics
Pharmacologic: hormones

Pregnancy Category C

Indications

Anemia due to chronic renal failure. Anemia from zidovudine. Anemia caused by chemotherapy (nonmyeloid malignancies). Reduced need for transfusions after surgery.

Action

Stimulates erythropoiesis. **Therapeutic Effects:** Maintains/elevates red blood cell counts (RBCs), Reduced need for transfusions.

Pharmacokinetics

Absorption: Well absorbed after subcut administration.
Distribution: Unknown.
Metabolism and Excretion: Unknown.
Half-life: 4–13 hr.

TIME/ACTION PROFILE (increase in RBCs)

ROUTE	ONSET†	PEAK	DURATION
IV, subcut	7–10 days	within 2 mos	2 wk‡

†Increase in reticulocytes
‡After discontinuation

Contraindications/Precautions

Contraindicated in: Hypersensitivity to albumin or mammalian cell products. Uncontrolled hypertension. Erythropoietin level >200 mU/ml.
Use Cautiously in: Seizures; porphyria; Pregnancy or lactation (safety not established).

Adverse Reactions/Side Effects

CNS: SEIZURES, headache. **CV:** hypertension, thrombotic events (↑ in hemodialysis patients and hemoglobin ≥ 12 g/dL). **Derm:** transient rashes. **Endo:** resumption of menses, restored fertility.

Interactions

Drug-Drug: May increase the requirement for **heparin** during hemodialysis.

Route/Dosage

Anemia of Chronic Renal Failure

Subcut, IV (Adults): 50 units/kg 3 times weekly initially, then adjusted.
Subcut, IV (Children): 50 units/kg 3 times weekly initially, then adjusted.

Anemia Secondary to Zidovudine (AZT) Therapy

IV, Subcut: (Adults): 100 units/kg 3 times weekly for 8 wk; may increase by 50–100 units/kg every 4–8 wk, up to 300 units/kg 3 times weekly.

Anemia Secondary to Chemotherapy

Subcut: (Adults): 150 units/kg 3 times weekly; may increase after 8 wk up to 300 units/kg 3 times weekly.

Surgery

Subcut: (Adults): 300 units/kg/day for 10 days preop, day of surgery, and 4 days postop *or* 600 units/kg 21, 14, 7 days preop and day of surgery.

NURSING IMPLICATIONS

Assessment

- Monitor BP before and during therapy. Inform health care professional if severe hypertension is present or if BP increases. Additional antihypertensive therapy may be required during initiation of therapy.
- Monitor response for symptoms of anemia (fatigue, dyspnea, pallor).
- Monitor dialysis shunts and status of artificial kidney during hemodialysis. Heparin dose may need to be increased to prevent clotting. Monitor patients with underlying vascular disease for impaired circulation.
- **Lab Test Considerations:** May cause ↑ in WBCs and platelets. May ↓ bleeding times.

Potential Nursing Diagnoses

Decreased cardiac output (Indications)
Noncompliance (Patient/Family Teaching)

Implementation

- **PO:** Administer once daily. May be increased to twice daily if response is inadequate.

Patient/Family Teaching

- Instruct patient to take medication as directed at the same time each day, even if feeling well.
- Encourage patient to comply with additional interventions for hypertension (weight reduction, discontinuation of smoking, moderation of alcohol consumption, regular exercise, stress management). Medication controls, but does not cure, hypertension.
- Instruct patient and family on correct technique for monitoring blood pressure. Advise them to monitor blood pressure at least weekly, and notify health care professional of significant changes.
- Inform patient not to use potassium supplements, salt substitutes containing potassium, or other Rx or OTC medications without consulting health care professional.
- May cause dizziness. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Advise patient to inform health care professional of treatment regimen prior to treatment or surgery.

Evaluation/Desired Outcomes

- Decrease in blood pressure without appearance of side effects.

Why was this drug prescribed for your patient?

- Serum ferritin, transferrin, and iron levels should also be monitored to assess need for concurrent iron therapy. Transferrin saturation should be at least 20% and ferritin should be at least 100 ng/ml.
- **Anemia of Chronic Renal Failure:** Monitor hematocrit before and twice weekly during initial therapy, for 2–6 wk after a change in dose, and regularly after target range (30–36%) has been reached and maintenance dose is determined. Monitor other hematopoietic parameters (CBC with differential and platelet count) before and periodically during therapy. If hemoglobin approaches 12 g/dL orincreases more than 1 g/dL in a 2-wk period, risk of hypertensive reaction and seizures increases. Decrease dose by 25% and monitor hemoglobin twice weekly for 2–6 wk. If increase in hemoglobin continues and exceeds 12 g/dL, dose should be withheld until hemoglobin begins to decrease; epoetin is then re-initiated at a lower dose. If hemoglobin increase of 1 g/dL is not achieved after an 4-wk period and iron stores are adequate, dose may be incrementally increased at 4–wk intervals until desired response is attained.
- Monitor renal function studies and electrolytes closely; resulting increased sense of well-being may lead to decreased compliance with other therapies for renal failure. Increases in BUN, creatinine, uric acid, phosphorus, and potassium may occur.
- **Anemia Secondary to Zidovudine Therapy:** Before initiating therapy, determine serum erythropoietin level before transfusion. Patients receiving zidovudine with endogenous serum erythropoietin levels >500 mU/ml may not respond to therapy. Monitor hematocrit weekly during dosage adjustment. If response does not reduce transfusion requirements or increase hematocrit effectively after 8 wk of therapy, dose may be increased by 50–100 units/kg 3 times weekly. Evaluate response and adjust dose by 50–100 units/kg every 4–8 wk thereafter. If a satisfactory response is not obtained with a dose of 300 units/kg 3 times weekly, it is unlikely that a higher dose will produce a response. Once the desired response is attained, maintenance dose is titrated based on variations of zidovudine dose and intercurrent infections. If hemoglobin exceeds 13 g/dL, discontinue dose until hemoglobin drops to 12 g/dL, then decrease dose by 25%.
- **Anemia from Chemotherapy:** Monitor hemoglobin weekly until stable. Patients with lower baseline serum erythropoietin levels may respond more rapidly; not recommended if levels >200 mU/ml. If response is not adequate after 8 wk of therapy, dose may be increased up to 300 units/kg 3 times weekly. If no response is obtained to this dose, it is unlikely that higher doses will produce a response. If hemoglobin exceeds 12 g/dL or increases >1 g/dL in any 2–wk period decrease dose by 25%. If hemoglobin exceeds 13 g/dL, hold dose until it falls to 12 g/dL, then decrease dose by 25%.
- **Surgery:** Determine that hematocrit is >10 to ≤13 g/dL before therapy.

Implementation

- Transfusions are still required for severe symptomatic anemia. Supplemental iron should be continued throughout therapy.
- Institute seizure precautions in patients who experience a >4-point increase in hematocrit in a 2-wk period or exhibit any neurological change.
- Do not shake vial; inactivation of medication may occur. Discard vial immediately after withdrawing dose from single-use 1-ml vial. Refrigerate multidose 2-ml vial; stable for 21 days after initial entry.
- **Subcut:** Admix in syringe immediately before administration with 0.9 NaCl with benzyl alcohol 0.9% in a 1:1 ratio to prevent injection site discomfort.
- **Direct IV:** Administer undiluted. ***Rate:*** May be administered as direct injection or bolus into IV tubing or via venous line at end of dialysis session.

Patient/Family Teaching

- Stress importance of compliance with dietary restrictions, medications, and dialysis. Foods high in iron include liver, pork, veal, beef, mustard and turnip greens, peas, eggs, broccoli, kale, blackberries, strawberries, apple juice, watermelon, oatmeal, and enriched bread. Epoetin will result in increased sense of well-being, but does not cure renal disease.
- Explain need for iron (increased RBC production requires iron).
- Discuss possible return of menses and fertility in women of childbearing age and contraceptive options with health care professional.
- Discuss ways of preventing self-injury in patients at risk for seizures. Driving and activities requiring continuous alertness should be avoided.

CONTINUED

CONTINUED

epoetin

Evaluation/Desired Outcomes

- Increase in hematocrit with improvement in symptoms of anemia in patients with chronic renal failure, anemia secondary to zidovudine therapy, and anemia caused by chemotherapy.
- Reduction of need for transfusions after surgery.

Why was this drug prescribed for your patient?

High Alert

eptifibatide (ep-ti-**fib**-a-tide)

Integrilin

Classification

Therapeutic: antiplatelet agents
Pharmacologic: glycoprotein IIb/IIIa inhibitors

Pregnancy Category B

Indications

Acute coronary syndrome (unstable angina/non–Q-wave MI), including patients who will be managed medically and those who will undergo percutaneous coronary intervention (PCI) that may consist of percutaneous transluminal angioplasty (PCTA) or atherectomy. Treatment of patients undergoing PCI. Usually used concurrently with aspirin and heparin.

Action

Decreases platelet aggregation by reversibly antagonizing the binding of fibrinogen to the glycoprotein IIb/IIIa binding site on platelet surfaces. **Therapeutic Effects:** Inhibition of platelet aggregation resulting in decreased incidence of new MI, death, or refractory ischemia reducing the need for repeat urgent cardiac intervention.

Pharmacokinetics

Absorption: IV administration results in complete bioavailability.
Distribution: Unknown.
Metabolism and Excretion: 50% excreted by the kidneys.
Half-life: 2.5 hr.

TIME/ACTION PROFILE (effects on platelet function)

ROUTE	ONSET	PEAK	DURATION
IV	immediate	after bolus	brief‡

‡Inhibition is reversible after cessation of infusion

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Active internal bleeding or history of bleeding within previous 30 days. Severe uncontrolled hypertension (systolic BP >200 mm Hg and/or diastolic BP >110 mm Hg). Major surgical procedure within 6 wk. History of hemorrhagic stroke or other stroke within 30 days. Concurrent use of other glycoprotein IIb/IIIa receptor antagonists. Platelet count <100,000/mm³. Severe renal insufficiency (serum creatinine ≥4 mg/dl) or dependency on renal dialysis.
Use Cautiously in: Geriatric patients (increased risk of bleeding); Renal insufficiency (decrease initial dose and infusion rate if infusion serum creatinine ≥2 mg/dl, but <4 mg/dl); Pregnancy, lactation, or children (safety not established; use in pregnancy only if clearly needed).

Adverse Reactions/Side Effects

Noted for patients receiving heparin and aspirin in addition to eptifibatide **CV:** hypotension. **Hemat:** BLEEDING (including GI and intracranial bleeding, hematuria, and hematomas).

Interactions

Drug-Drug: ↑ risk of bleeding with other drugs that affect hemostasis (**heparins**, **warfarin**, **NSAIDs**, **thrombolytic agents**, **dipyridamole**, **ticlopidine**, **clopidogrel**, some **cephalosporins**, **valproates**).
Drug-Natural Products: ↑ bleeding risk with **arnica**, **chamomile**, **clove**, **dong quai**, **feverfew**, **garlic**, **ginger**, **ginkgo**, and **Panax ginseng**.

Route/Dosage

Acute Coronary Syndrome

IV (Adults): 180 mcg/kg as a bolus dose, followed by 2 mcg/kg/min until hospital discharge or surgical intervention (up to 72 hr).

Percutaneous Coronary Intervention

IV (Adults): 180 mcg/kg as a bolus dose, immediately before PCI, followed by 2 mcg/kg/min infusion; a second bolus of 180 mcg/kg is given 10 min after first bolus; infusion should continue for 18–24 or hospital discharge (minimum of 12 hr).

Renal Impairment

(Adults CCr <50 mL/min): 180 mcg/kg bolus followed by 1 mcg.kg.min infusion; second bolus of 180 mcg/kg is given 10 min after first bolus for patients undergoing PCI.

NURSING IMPLICATIONS

Assessment

- **Assess for bleeding. Most common sites are arterial access site for cardiac catheterization or GI or GU tract. Arterial and venous punctures, IM injections, and use of urinary catheters, nasotracheal intubation, and NG tubes should be minimized. Noncompressible sites for IV access should be avoided. If bleeding cannot be controlled with pressure, discontinue eptifibatide and heparin immediately.**
- ***Lab Test Considerations:*** Prior to eptifibatide therapy, assess hemoglobin or hematocrit, platelet count, serum creatinine, and PT/aPTT. Activated clotting time (ACT) should also be measured in patients undergoing PCI.
- Maintain the aPTT between 50 and 70 sec unless PCI is to be performed. Maintain ACT between 300 and 350 sec during PCI.
- Arterial sheath should not be removed unless aPTT <45 sec.
- If platelet count decreases to <100,000 and is confirmed, eptifibatide and heparin should be discontinued and condition monitored and treated.

Potential Nursing Diagnoses

Ineffective tissue perfusion (Indications)

Implementation

- ***High Alert:*** Accidental overdose of antiplatelet medications has resulted in patient harm or death from internal hemorrhage or intracranial bleeding. Have second practitioner independently check original order, dose calculations, and infusion pump settings.
- Most patients receive heparin and aspirin concurrently with eptifibatide.
- After PCI, femoral artery sheath may be removed during eptifibatide treatment only after heparin has been discontinued and its effects mostly reversed.
- Do not administer solutions that are discolored or contain particulate matter. Discard unused portion.
- **Direct IV:** ***High Alert:*** Withdraw appropriate loading dose from bolus vial (20 mg/10ml vial) into a syringe. Administer undiluted. ***Rate:*** Administer via IV push over 1–2 min.
- **Intermittent Infusion:** Administer undiluted directly from the 100-ml vial via an infusion pump. Spike the 100-ml vial in the center of the stopper top with a vented infusion set. ***Rate:*** Rate is based on patient weight. See Route and Dosage section.
- **Y-Site Compatibility:** 0.9% NaCl, D5/0.9% NaCl, up to 60 meq KCl, alteplase, amiodarone, atropine, bivalirudin, dobutamine, heparin, lidocaine, meperidine, metoprolol, midazolam, morphine, nitroglycerin, verapamil.
- **Y-Site Incompatibility:** furosemide.

Patient/Family Teaching

- Inform patient of the purpose of eptifibatide.
- **Instruct patient to notify health care professional immediately if any bleeding is noted.**

Evaluation/Desired Outcomes

- Inhibition of platelet aggregation, resulting in decreased incidence of new MI, death, or refractory ischemia with the need for repeat urgent cardiac intervention.

Why was this drug prescribed for your patient?

ERYTHROMYCIN (eh-rith-roe-**mye**-sin)

erythromycin base
♣Apo-Erythro-EC, E-Base, E-Mycin, ♣Erybid, Eryc, Ery-Tab, ♣Erythromid, ♣Novo-rythro, PCE

erythromycin estolate
Ilosone, ♣Novo-rythro

erythromycin ethylsuccinate
♣Apo-Erythro-ES, E.E.S, EryPed

erythromycin gluceptate

erythromycin lactobionate
Erythrocin

erythromycin stearate
Erythrocin, ♣Novo-rythro

Classification
Therapeutic: anti-infectives
Pharmacologic: macrolides

Pregnancy Category B

Indications
PO, IV: Respiratory tract infections, Otitis media (with sulfonamides), Skin/skin structure infections, Pertussis, Diphtheria, Erythrasma, Intestinal amebiasis, Pelvic inflammatory disease, Nongonococcal urethritis, Syphilis, Legionnaires' disease, Rheumatic fever, Lyme disease. Streptococcal infections, syphilis, or gonorrhea in patients with penicillin hypersensitivity.

Action
Suppresses protein synthesis at the level of the 50S ribosome. **Therapeutic Effects:** Bacteriostatic action against susceptible bacteria. **Spectrum:** Active against many gram-positive cocci, including: Streptococci, Staphylococci. Gram-positive bacilli, including: *Clostridium*, *Corynebacterium*. Some gram-negative pathogens: *Neisseria*, *Legionella pneumophila*. *Mycoplasma* and *Chlamydia* are also susceptible.

Pharmacokinetics
Absorption: Well absorbed from the duodenum; absorption of enteric-coated products is delayed.
Distribution: Widely distributed. Crosses placenta; enters breast milk.
Metabolism and Excretion: Partially metabolized by liver, excreted unchanged in bile; small amounts excreted unchanged in the urine.
Half-life: 1.4–2 hr.

TIME/ACTION PROFILE (blood levels)

ROUTE	ONSET	PEAK	DURATION
PO	1 hr	1–4 hr	4–8 hr
IV	rapid	end of infusion	4–6 hr

Contraindications/Precautions
Contraindicated in: Hypersensitivity. Hepatic dysfunction (estolate salt). Concurrent pimozide. Known alcohol intolerance (most topicals). Tartrazine sensitivity (some products contain tartrazine—FDC yellow dye #5). Pregnancy (estolate salt). Products containing benzyl alcohol should be avoided in neonates.
Use Cautiously in: Liver/renal disease; Geriatric patients (↑ risk of ototoxicity if parenteral dose >4 g/day, ↑ risk of QTc prolongation); Salts other than the estolate may be used in pregnancy to treat chlamydial infections or syphilis.

Adverse Reactions/Side Effects
CNS: seizures (rare). **EENT:** ototoxicity. **CV:** QT C PROLONGATION (may result in Torsades de Pointes), VENTRICULAR ARRHYTHMIAS. **GI:** nausea, vomiting, abdominal pain, cramping, diarrhea, drug-induced hepatitis, infantile hypertrophic pyloric stenosis, drug-induced pancreatitis (rare). **Derm:** rashes. **Local:** phlebitis at IV site. **Misc:** allergic reactions, superinfection.

Interactions
Drug-Drug: Concurrent use with **pimozide** ↑ risk of serious arrhythmias (concurrent use contraindicated; similar effects may occur with **dil-**

CONTINUED

ERYTHROMYCIN

Evaluation/Desired Outcomes
- Resolution of the signs and symptoms of infection. Length of time for complete resolution depends on the organism and site of infection.

Why was this drug prescribed for your patient?

tiazem, **verapamil ketoconazole**, **itraconazole**, **nefazodone** and **protease inhibitors**, avoid concurrent use. ↑ blood levels and risk of toxicity from **silfenafil**, **vardenafil** and **tadalafil**; use lower doses. Concurrent **rifabutin** or **rifampin** may ↓ effect of erythromycin and ↑ risk of adverse GI reactions. ↑ levels and risk of toxicity from **alfentanil**, **alprazolam**, **buspirone**, **clozapine**, **bromocriptine**, **theophylline**, **carbamazepine**, **cyclosporine**, **cylostazol** , **diazepam**, **disopyramide**, **ergot alkaloids**, **felodipine**, **warfarin**, **methylprednisolone**, **midazolam**, **quinidine**, **rifabutin**, **tacrolimus**, **triazolam**, or **vinblastine**. Concurrent **HMG-CoA reductase inhibitors** ↑ risk of myopathy/rhabdomyolysis. May ↑ serum **digoxin** levels in a few patients. **Theophylline** may ↓ blood levels. Beneficial effects may be ↓ by **clindamycin** or **lincomycin**.

Route/Dosage

PO (Adults): *Base, estolate, stearate*—250 mg q 6 hr, 333 mg q 8 hr, or 500 mg q 12 hr. *Ethylsuccinate*—400 mg q 6 hr or 800 mg q 12 hr.
PO (Children): 7.5–12.5 mg/kg q 6 hr or 12.5–25 mg/kg q 12 hr (up to 100 mg/kg/day).
IV (Adults): *Gluceptate/lactobionate*—250–500 mg q 6 hr (up to 4 g/day).
IV (Children): *Gluceptate / lactobionate*—3.75–5 mg/kg q 6 hr.

NURSING IMPLICATIONS

Assessment

- Assess patient for infection at beginning of and during therapy.
- Obtain specimens for culture and sensitivity before initiating therapy. First dose may be given before receiving results.

Potential Nursing Diagnoses

Risk for infection (Indications, Side Effects)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)
Noncompliance (Patient/Family Teaching)

Implementation

- Do not confuse erythromycin with azithromycin. Do not confuse Erythrocin (erythromycin) with Ethmozine (morizocine).
- **PO:** Administer around the clock at least 1 hr before or 2 hr after meals. May be taken with food if GI irritation occurs. Take with a full glass of water. Chewable tablets should be crushed or chewed and not swallowed whole. **Do not open, crush, or chew delayed-release capsules or tablets; swallow whole**. Erythromycin base delayed-release capsules may be opened and sprinkled on applesauce, jelly, or ice cream immediately before ingestion. Enteric-coated tablets may be administered regardless of meals.
- **IV:** Add 10 ml of sterile water for injection without preservatives to 250- or 500-mg vials and 20 ml to 1-g vial. Solutions are stable for 7 days after reconstitution if refrigerated.
- **Intermittent Infusion:** Dilute in 100–250 ml of 0.9% NaCl or D5W. ***Rate:*** Administer slowly over 20–60 min to prevent phlebitis. Assess for pain along vein; slow rate if pain occurs. Apply ice and notify physician or other health care professional if unable to relieve pain.
- **Topical:** Available as several topical products for the treatment of acne.
- **Continuous Infusion:** May also be administered as an infusion in a dilution of 1 g/L of 0.9% NaCl, D5W, or lactated Ringer's solution over 4 hr.

Patient/Family Teaching

- Instruct patient to take medication around the clock and to finish the drug completely as directed, even if feeling better. Missed doses should be taken as soon as remembered, with remaining doses evenly spaced throughout day. Advise patient that sharing of this medication may be dangerous.
- May cause nausea, vomiting, diarrhea, or stomach cramps; notify health care professional if these effects persist or if severe abdominal pain, yellow discoloration of the skin or eyes, darkened urine, pale stools, or unusual tiredness develops. May cause infantile hypertrophic pyloric stenosis in infants; notify health care professional if vomiting and irritability occur.
- Advise patient to report signs of superinfection (black, furry overgrowth on the tongue; vaginal itching or discharge; loose or foul-smelling stools).
- Instruct patient to notify health care professional if symptoms do not improve.

CONTINUED

escitalopram (ess-sit-al-o-pram)

Lexapro

Classification

Therapeutic: antidepressants
Pharmacologic: selective serotonin reuptake inhibitors (SSRIs)

Pregnancy Category C

Indications

Treatment of depression, often in conjunction with psychotherapy. Generalized anxiety disorder.

Action

Selectively inhibits the reuptake of serotonin in the CNS. **Therapeutic Effects:** Antidepressant action.

Pharmacokinetics

Absorption: 80% absorbed following oral administration.
Distribution: Enters breast milk.
Metabolism and Excretion: Mostly metabolized by the liver (primarily CYP3A4 and CYP2C19 isoenzymes); 7% excreted unchanged by kidneys.
Half-life: Increased in geriatric patients and patients with hepatic impairment.

TIME/ACTION PROFILE (antidepressant effect)

ROUTE	ONSET	PEAK	DURATION
PO	within 1–4 wk	Unknown	Unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Concurrent MAO inhibitors. Concurrent use of citalopram.

Use Cautiously in: History of mania (may activate mania/hypomania); History of seizures; Patients at risk for suicide; Hepatic impairment (dosage reduction recommended); Pregnancy or children (safety not established); Lactation (may cause adverse effects in infant; risk/benefit should be considered); Hepatic impairment or geriatric patients (↓ doses recommended); Severe renal impairment; May ↑ risk of suicide attempt/ideation especially during early treatment or dose adjustment in children/adolescents (unlabeled for pediatric use); **Pregnancy:** use during third trimester may result in neonatal serotonin syndrome requiring prolonged hospitalization, respiratory and nutritional support; Lactation (escitalpram is present in breast milk and may result in lethargy and ↓ feeding in infants; weigh risks/benefits).

Adverse Reactions/Side Effects

CNS: insomnia, dizziness, drowsiness, fatigue. **GI:** diarrhea, nausea, abdominal pain, constipation, dry mouth, indigestion. **GU:** anorgasmia, decreased libido, ejaculatory delay, impotence. **Derm:** increased sweating. **Endo:** syndrome on inappropriate secretion of antidiuretic hormone (SIADH). **F and E:** hyponatremia. **Metab:** increased appetite.

Interactions

Drug-Drug: May cause serious, potentially fatal reactions when used with **MAO inhibitors** ; allow at least 14 days between escitalopram and **MAO inhibitors**. Use cautiously with other **centrally acting drugs** (including **alcohol, antihistamines, opioid analgesics**, and **sedative/hypnotics**; concurrent use with **alcohol** is not recommended). Concurrent use with **sumatriptan** or other **5–HT$_1$ agonist vascular headache suppressants** may result in weakness, hyperreflexia, and incoordination. **Cimetidine** ↑ blood levels of escitalopram. Serotonergic effects may be potentiated by **lithium** (concurrent use should be carefully monitored). **Carbamazepine** may ↓ blood levels. May ↑ blood levels of **metoprolol**. Concurrent use with **tricyclic antidepressants** should be undertaken with caution because of altered pharmacokinetics.

High Alert

esmolol (es-moe-lole)

Brevibloc

Classification

Therapeutic: antiarrhythmics (class II)
Pharmacologic: beta blockers

Pregnancy Category C

Indications

Management of sinus tachycardia and supraventricular arrhythmias.

Action

Blocks stimulation of beta$_1$ (myocardial)-adrenergic receptors. Does not usually affect beta$_2$ (pulmonary, vascular, or uterine)-receptor sites. **Therapeutic Effects:** Decreased heart rate. Decreased AV conduction.

Pharmacokinetics

Absorption: IV administration results in complete bioavailability.
Distribution: Rapidly and widely distributed.
Metabolism and Excretion: Metabolized by enzymes in RBC and liver.
Half-life: 9 min.

TIME/ACTION PROFILE (antiarrhythmic effect)

ROUTE	ONSET	PEAK	DURATION
IV	within minutes	unknown	1–20 min

Contraindications/Precautions

Contraindicated in: Uncompensated CHF. Pulmonary edema. Cardiogenic shock. Bradycardia or heart block. Known alcohol intolerance.
Use Cautiously in: Geriatric patients (increased sensitivity); Thyrotoxicosis (may mask symptoms); Diabetes mellitus (may mask hypoglycemia); Patients with a history of severe allergic reactions (intensity of reactions may be increased); Pregnancy, lactation, or children (safety not established; neonatal bradycardia, hypotension, hypoglycemia, and respiratory depression may occur rarely).

Adverse Reactions/Side Effects

CNS: fatigue, agitation, confusion, dizziness, drowsiness, weakness. **CV:** hypotension, peripheral ischemia. **GI:** nausea, vomiting. **Derm:** sweating. **Local:** injection site reactions.

Interactions

Drug-Drug: General anesthesia, IV phenytoin, and **verapamil** may cause ↑ myocardial depression. ↑ bradycardia may occur with **digoxin**. ↑ hypotension may occur with other **antihypertensives**, acute ingestion of **alcohol**, or **nitrates**. Concurrent use with **amphetamine, cocaine, ephedrine, epinephrine, norepinephrine, phenylephrine**, or **pseudoephedrine** may result in unopposed alpha-adrenergic stimulation (excessive hypertension, bradycardia). Concurrent **thyroid** administration may ↓ effectiveness. May alter the effectiveness of **insulins** or **oral hypoglycemic agents** . May ↑ the effectiveness of **theophylline**. May ↓ the beneficial beta cardiovascular effects of **dopamine** or **dobutamine**. Use cautiously within 14 days of **MAO inhibitor** therapy (may result in hypertension).

Route/Dosage

IV (Adults): *Antiarrhythmic*—500-mcg/kg loading dose over 1 min, followed by 50-mcg/kg/min infusion for 4 min; if no response within 5 min, give 2nd loading dose of 500 mcg/kg over 1 min, then increase infusion to 100 mcg/kg/min for 4 min. If no response, repeat loading dose of 500 mcg/kg over 1 min and increase infusion rate by 50-mcg/kg/min increments (not to exceed 200 mcg/kg/min for 48 hr). As therapeutic end point is achieved, eliminate loading doses and decrease dosage increments to 25 mg/kg/min. *Intraoperative antihypertensive/antiarrhythmic*—250–500-mcg/kg loading dose over 1 min, followed by 50-mcg/kg/min infusion for 4 min; if no response within 5 min, give 2nd loading dose of 250–500 mcg/kg over 1 min, then increase infusion to 100 mcg/kg/min for 4 min. If no response, repeat loading dose of 250–500 mcg/kg over 1 min and increase infusion rate by 50-mcg/kg/min increments (not to exceed 200 mcg/kg/min for 48 hr).

Drug-Natural Products: ↑ risk of serotonin syndrome with **St. John's wort** and **SAMe.**

Route/Dosage

PO (Adults): 10 mg once daily, may be increased to 20 mg once daily after one week.

Hepatic Impairment

PO (Adults): 10 mg once daily.
PO (Geriatric Patients): 10 mg once daily.

NURSING IMPLICATIONS

Assessment

- Monitor mood changes and level of anxiety during therapy.
- Assess for suicidal tendencies, especially during early therapy. Restrict amount of drug available to patient. Risk may be increased for children or adolescents. After starting therapy, children and adolescents should be seen by health care professional at least weekly for 4 wks, every 2 wks for next 4 wks, and on advice of health care professional thereafter.

Potential Nursing Diagnoses

Ineffective coping (Indications)
Risk for injury (Side Effects)

Implementation

- Do not administer escitalopram and citalopram concomitantly.
- **PO:** Administer as a single dose in the morning or evening without regard to meals.

Patient/Family Teaching

- Instruct patient to take escitalopram as directed. Take missed doses on the same day as soon as remembered and consult health care professional. Resume regular dosing schedule next day. Do not double doses. Do not stop abruptly, should be discontinued gradually.
- May cause dizziness. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Advise patient to avoid alcohol and other CNS-depressant drugs during therapy and to consult a health care professional before taking other Rx or OTC medications or herbal products.
- Instruct female patients to notify health care professional if pregnancy is planned or suspected or if they plan to breastfeed an infant.
- Caution patients that escitalopram should not be used for at least 14 days after discontinuing MAO inhibitors, and at least 14 days should be allowed after stopping escitalopram before starting an MAO inhibitor.

Evaluation/Desired Outcomes

- Increased sense of well-being
- Renewed interest in surroundings. May require 1–4 wk of therapy to obtain antidepressant effects. Full antidepressant effects occur in 4–6 wks.
- Decrease in anxiety.

Why was this drug prescribed for your patient?

IV (Children): *Antiarrhythmic*—50 mcg/kg/min, may be increased q 10 min up to 300 mcg/kg/min.

NURSING IMPLICATIONS

Assessment

- Monitor blood pressure, ECG, and pulse frequently during dosage adjustment period and periodically throughout therapy. The risk of hypotension is greatest within the first 30 min of initiating esmolol infusion.
- Monitor intake and output ratios and daily weights. Assess routinely for signs and symptoms of CHF (dyspnea, rales/crackles, weight gain, peripheral edema, jugular venous distention).
- Assess infusion site frequently throughout therapy. Concentrations >10 mg/ml may cause redness, swelling, skin discoloration, and burning at the injection site. Do not use butterfly needles for administration. If venous irritation occurs, stop the infusion and resume at another site.
- ***Toxicity and Overdose:*** Monitor patients receiving esmolol for signs of overdose (bradycardia, severe dizziness or fainting, severe drowsiness, dyspnea, bluish fingernails or palms, seizures). Notify physician immediately if these signs occur: IV glucagon and symptomatic care are used in the treatment of esmolol overdose. Because of the short action of esmolol, discontinuation of therapy may relieve acute toxicity.

Potential Nursing Diagnoses

Decreased cardiac output (Side Effects)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- ***High Alert:*** IV vasoactive medications are inherently dangerous. Esmolol is available in different concentrations; fatalities have occurred when loading dose vial is confused with concentrated solution for injection, which contains 2,500mg in a 10 ml vial (250 mg/ml) and must be diluted. Before administering, have second practitioner independently check original order, dosage calculations, and infusion pump settings. Do not confuse Brevibloc (esmolol) with Brevital (methohexital). If both are available as floor stock, store in separate areas.
- To convert to other antiarrhythmics, administer the 1st dose of the antiarrhythmic agent and decrease the esmolol dose by 50% after 30 min. If an adequate response is maintained for 1 hr after the 2nd dose of the antiarrhythmic agent, discontinue esmolol.
- **Direct IV:** The 10 mg/ml strength, but not the 250 g/ml strength, may be administered undiluted.
- **Intermittent Infusion:** To dilute for infusion, remove 20 ml from a 500-ml bottle of D5W, D5/LR, D5/0.45% NaCl, D5/0.9% NaCl, 0.45% NaCl, 0.9% NaCl, or LR. Add 5 g of esmolol to the bottle for a concentration of 10 mg/ml. Solution is clear, colorless to light yellow; stable for 24 hr at room temperature. ***Rate:*** The loading dose of esmolol is administered over 1 min, followed by a maintenance dose via IV infusion over 4 min. If the response is not adequate, procedure is repeated every 5 min with an increase in the maintenance dose. Dose titration is based on desired heart rate or undesired decrease in BP. Do not discontinue infusions abruptly; eliminate loading doses and decrease dosage by 25 mcg/kg/min.

Patient/Family Teaching

- May cause drowsiness. Caution patients receiving esmolol to call for assistance during ambulation or transfer.
- Advise patients to change positions slowly to minimize orthostatic hypotension.

Evaluation/Desired Outcomes

- Control of arrhythmias without appearance of detrimental side effects.

Why was this drug prescribed for your patient?

esomeprazole (es-o-**mep**-ra-zole)

Nexium

Classification

Therapeutic: antiulcer agents
Pharmacologic: proton-pump inhibitors

Pregnancy Category B

Indications

GERD including erosive esophagitis. With amoxicillin and clarithromycin to eradicate *Helicobacter pylori* in duodenal ulcer disease or history of duodenal ulcer disease. Decrease risk of gastric ulcer during continuous NSAID therapy.

Action

Binds to an enzyme on gastric parietal cells in the presence of acidic gastric pH, preventing the final transport of hydrogen ions into the gastric lumen. **Therapeutic Effects:** Diminished accumulation of acid in the gastric lumen with lessened gastroesophageal reflux. Healing of duodenal ulcers. Decreased incidence of gastric ulcer during continuous NSAID therapy.

Pharmacokinetics

Absorption: Well absorbed (90%) following oral administration; food decreases absorption.
Distribution: Unknown.
Protein Binding: 97%.
Metabolism and Excretion: Extensively metabolized by the liver (cytochrome P450 [CY P450] system, primarily CY P2 C19 isoenzyme); <1% excreted unchanged in urine.
Half-life: 1.0–1.5 hr.

TIME/ACTION PROFILE (blood levels*)

	ONSET	PEAK	DURATION
PO	rapid	1.6 hr	24 hr
IV	rapid	end of infusion	24 hr

*Resolution of symptoms takes 5–8 days

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Lactation (not recommended).
Use Cautiously in: Severe hepatic impairment (daily dose should not exceed 20 mg); Pregnancy (use only if clearly needed); Children <18 yr (safety not established).

Adverse Reactions/Side Effects

CNS: headache. **GI:** abdominal pain, constipation, diarrhea, dry mouth, flatulence, nausea.

Interactions

Drug-Drug: May ↓ absorption and effects of drugs where gastric pH is a determinant of bioavailability, including **digoxin ketoconazole** and **iron salts**. May ↑ risk of bleeding with **warfarin** (monitor INR and PT).

Route/Dosage

Gastroesophageal reflux disease

PO (Adults): *Healing of erosive esophagitis*—20 mg or 40 mg once daily for 4–8 wks; *maintenance of healing of erosive esophagitis*—20 mg once daily; *symptomatic GERD*—20 mg once daily for 4 wks (additional 4 wks may be considered for nonresponders).
IV (Adults): 20 or 40 mg once daily.

H. pylori eradication to reduce the risk of duodenal ulcer recurrence (triple therapy)

PO (Adults): 40 mg once daily for 10 days with amoxicillin 1000 mg twice daily for 10 days and clarithromycin 500 mg twice daily for 10 days.

eszopiclone (es-**zop**-i-klone)

Lunesta

Classification

Therapeutic: sedative/hypnotics
Pharmacologic: cyclopyrrolones

Schedule IV

Pregnancy Category C

Indications

Insomnia.

Action

Interacts with GABA-receptor complexes; not a benzodiazepine. **Therapeutic Effects:** Improved sleep with decreased latency and increased maintenance of sleep.

Pharmacokinetics

Absorption: Rapidly absorbed after oral administration.
Distribution: Unknown.
Metabolism and Excretion: Extensively metabolized by the liver (CYP3A4 and CYP2E1 enzyme systems); metabolites are renally excreted, <10% excreted unchanged in urine.
Half-life: 6 hr.

TIME/ACTION PROFILE (blood levels)

ROUTE	ONSET	PEAK	DURATION
PO	rapid	1 hr	6 hr

Contraindications/Precautions

Contraindicated in: No known contraindications.

Use Cautiously in: Geriatric/debilitated patients (may have decreased metabolism or increased sensitivity; use lower initial dose); Conditions that may alter metabolic or hemodynamic function; Severe hepatic impairment (use lower initial dose); Lactation and children <18 yr (safety not established); Pregnancy (safety not established; use only if maternal benefit justifies fetal risk).

Adverse Reactions/Side Effects

CNS: depression, hallucinations, headache. **CV:** chest pain, peripheral edema. **GI:** dry mouth, unpleasant taste. **Derm:** rash.

Interactions

Drug-Drug: ↑ risk of CNS depression with other **CNS depressants** including **antihistamines**, **antidepressants**, **opioids**, **sedative/hypnotics** and **antipsychotics**. ↑ levels and risk of CNS depression with **drugs that inhibit the CYP3A4 enzyme system**, including **ketoconazole**, **itraconazole**, **clarithromycin**, **nefazodone**, **ritonavir** and **nelfinavir**. Levels and effectiveness may be ↓ by **drugs that induce the CYP3A4 enzyme system**, including **rifampicin**.

Route/Dosage

PO (Adults): 2 mg immediately before bedtime, may be raised to 3 mg if needed (3 mg dose is more effective for sleep maintenance); *geriatric patients*—1 mg immediately before bedtime for patients with difficulty falling asleep, 2 mg for patients who difficulty staying asleep

Hepatic Impairment

PO (Adults): *Severe hepatic impairment*—1 mg immediately before bedtime.
PO (Adults receiving concurrent CYP3A4 inhibitors): 1 mg immediately before bedtime, may be raised to 2 mg if needed.

Decrease gastric ulcer during continuous NSAID therapy

PO (Adults): 20 or 40 mg once daily for up to 6 mo.

NURSING IMPLICATIONS

Assessment

- Assess patient routinely for epigastric or abdominal pain and frank or occult blood in the stool, emesis, or gastric aspirate.
- ***Lab Test Considerations:*** May cause ↑ serum creatinine, uric acid, total bilirubin, alkaline phosphatase, AST, and ALT.
- May alter hemoglobin, WBC, platelets, serum sodium, potassium, and thyroxine levels.

Potential Nursing Diagnoses

Acute pain (Indications)

Implementation

- Antacids may be used while taking esomeprazole.
- **PO:** Administer at least 1 hr before meals. Capsules should be swallowed whole.
- For patients with difficulty swallowing, place 1 tbsp of applesauce in an empty bowl. Open capsule and carefully empty the pellets inside onto applesauce. Mix pellets with applesauce and swallow immediately. Applesauce should not be hot and should be soft enough to swallow without chewing. Do not store applesauce mixture for future use. Tap water, orange juice, apple juice, and yogurt have also been used. **Do not crush or chew pellets.**
- For patients with an NG tube, delayed-release capsules can be opened and intact granules emptied into a 60 ml syringe and mixed with 50 ml of water. Replace plunger and shake syringe vigorously for 15 seconds. Hold syringe with tip up and check for granules in tip. Attach syringe to NG tube and administer solution. After administering, flush syringe with additional water. Do not administer if granules have dissolved or disintegrated. Administer immediately after mixing.
- Antacids may be used concurrently.
- **Direct IV:** Reconstitute each vial with 5 mL of 0.9% NaCl, LR, or D5W. Do not administer solutions that are discolored or contain a precipitate. Stable at room temperature for up to 12 hrs. ***Rate:*** Administer over at least 3 min.
- **Intermittent Infusion:** Dilute reconstituted solution to a volume of 50 mL. Solutions diluted with 0.9% NaCl or LR are stable for 12 hr and those diluted with D5W are stable for 6 hr at room temperature. ***Rate:*** Administer over 10–30 min.
- **Y-Site Incompatibility:** Do not administer with other medications or solutions. Flush line with 0.9% NaCl, LR, or D5W before and after administration.

Patient/Family Teaching

- Instruct patient to take medication as directed for the full course of therapy, even if feeling better. Take missed doses as soon as remembered but not if almost time for next dose. Do not double doses.
- Advise patient to avoid alcohol, products containing aspirin or NSAIDs, and foods that may cause an increase in GI irritation.
- Advise patient to report onset of black, tarry stools; diarrhea; abdominal pain; or persistent headache to health care professional promptly.

Evaluation/Desired Outcomes

- Decrease in abdominal pain or prevention of gastric irritation and bleeding. Healing of duodenal ulcers can be seen on x-ray examination or endoscopy.
- Decrease in symptoms of GERD. Sustained resolution of symptoms usually occurs in 5–8 days. Therapy is continued for 4–8 wk after initial episode.

Why was this drug prescribed for your patient?

NURSING IMPLICATIONS

Assessment

- Assess sleep patterns prior to and during administration. Continued insomnia after 7–10 days of therapy may indicate primary psychiatric or mental illness.
- Assess mental status and potential for abuse prior to administration. Prolonged use of >7–10 days may lead to physical and psychological dependence. Limit amount of drug available to the patient.

Potential Nursing Diagnoses

Disturbed sleep pattern (Indications)

Implementation

- **PO:** Onset is rapid. Administer immediately before going to bed or after patient has gone to bed and has experienced difficulty falling asleep, only on nights when patient is able to get 8 or more hours of sleep before being active again.
- Swallow tablet whole; **do not break, crush, or chew.**
- Eszopiclone is more effective if not taken with or before a high-fat, heavy meal.

Patient/Family Teaching

- Instruct patient to take eszopiclone immediately before going to bed, as directed. Taking prior to going to bed may result in short-term memory impairment, hallucinations, impaired coordination, and dizziness. Do not increase dose or discontinue without notifying health care professional. Dose may need to be decreased gradually to minimize withdrawal symptoms. Rebound insomnia may occur upon discontinuation and usually resolves within 1–2 nights.
- May cause daytime drowsiness. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Advise patient to notify health care professional before taking any Rx, OTC, or herbal products with eszopiclone.
- Caution patient to avoid concurrent use of alcohol or other CNS depressants.
- Advise patient to notify health care professional if pregnancy is planned or suspected.

Evaluation/Desired Outcomes

- Decreased sleep latency and improved sleep maintenance.

Why was this drug prescribed for your patient?

etodolac (ee-toe-doe-lak)

Lodine, Lodine XL

Classification

Therapeutic: nonopioid analgesics
Pharmacologic: pyranocarboxylic acid

Pregnancy Category C

Indications

Osteoarthritis. Rheumatoid arthritis. Mild/moderate pain (not Lodine XL).

Action

Inhibits prostaglandin synthesis. Also has uricosuric action. **Therapeutic Effects:** Suppression of inflammation. Decreased severity of pain.

Pharmacokinetics

Absorption: Well absorbed following oral administration.
Distribution: Widely distributed.
Metabolism and Excretion: Mostly metabolized by the liver; <1% excreted unchanged in urine.
Half-life: 6–7 hr (single dose); 7.3 hr (chronic dosing).

TIME/ACTION PROFILE (analgesic effect)

ROUTE	ONSET	PEAK	DURATION
PO (analgesic)	0.5 hr	1–2 hr	4–12 hr
PO (anti-inflammatory)	days–wks	unknown	6–12 hr†

†Up to 24 hr as Lodine XL (extended-release) tablet

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Active GI bleeding or ulcer disease. Cross-sensitivity may exist with other NSAIDs, including aspirin.

Use Cautiously in: Severe cardiovascular, renal, or hepatic disease; History of ulcer disease; Pregnancy (not recommended for use during second half of pregnancy); Lactation or children (safety not established).

Adverse Reactions/Side Effects

CNS: depression, dizziness, drowsiness, insomnia, malaise, nervousness, syncope, weakness. **EENT:** blurred vision, photophobia, tinnitus. **Resp:** asthma. **CV:** CHF, edema, hypertension, palpitations. **GI:** GI BLEEDING, dyspepsia, abdominal pain, constipation, diarrhea, dry mouth, flatulence, gastritis, hepatitis (drug-induced), nausea, thirst, stomatitis, vomiting. **GU:** dysuria, renal failure, urinary frequency. **Derm:** EXFOLIATIVE DERMATITIS, STEVENS-JOHNSON SYNDROME, TOXIC EPIDERMAL NECROLYSIS, ecchymoses, flushing, hyperpigmentation, pruritus, rashes, sweating. **Hemat:** anemia, prolonged bleeding time, thrombocytopenia. **Misc:** allergic reactions including , ANAPHYLAXIS, ANGIOEDEMA, chills, fever.

Interactions

Drug-Drug: Concurrent use with **aspirin** may ↓ effectiveness. ↑ adverse GI effects with **aspirin**, other **NSAIDs, potassium supplements, corticosteroids**, or **alcohol.** Chronic use with **acetaminophen** may ↑ the risk of adverse renal reactions. May ↓ the effectiveness of **diuretic** or **antihypertensive** therapy. May ↑ serum **lithium** levels and ↑ the risk of toxicity. ↑ the risk of toxicity from **methotrexate**. ↑ risk of bleeding with **cefotetan, cefoperazone, valproic acid, thrombolytic agents**, or **anticoagulants.** ↑ risk of adverse hematologic reactions with **antineoplastics** or **radiation therapy.** May increase the risk of nephrotoxicity from **cyclosporine**.
Drug-Natural Products: ↑ risk of bleeding with **arnica, chamomile, clove, dong quai, fever few, garlic, ginko**, and **Panax ginseng.**

Route/Dosage

PO (Adults): *Analgesia*—200–400 mg q 6–8 hr (not to exceed 1200 mg/day). *Osteoarthritis/rheumatoid arthritis*—300 mg 2–3 times daily, 400–500 mg twice daily or 400–1200 mg once daily as Lodine XL tablets.

exenatide (ex-en-a-tide)

Byetta

Classification

Therapeutic: antidiabetics
Pharmacologic: incretrin mimetic agents

Pregnancy Category C

Indications

Type 2 diabetes uncontrolled by metformin and/or a sulfonylurea.

Action

Mimics the action of incretin which promotes endogenous insulin secretion and promotes other mechanisms of glucose-lowering. **Therapeutic Effects:** Improved control of blood glucose.

Pharmacokinetics

Absorption: Well absorbed following subcutaneous administration.
Distribution: Unknown.
Metabolism and Excretion: Excreted mostly by glomerular filtration followed by degradation.
Half-life: 2.4 hr.

TIME/ACTION PROFILE (effects on post-prandial blood glucose)

ROUTE	ONSET	PEAK	DURATION
subcut	within 30 min	2.1 hr	8 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Type 1 diabetes or diabetic ketoacidosis. End-stage renal disease (CCr <30 mL/min). Severe gastrointestinal disease. Lactation.

Use Cautiously in: (dose adjustment may be necessary); Use in pregnancy only if potential maternal benefit outweighs fetal risk); safety not established.

Adverse Reactions/Side Effects

CV: dizziness, headache, jitteryness, weakness. **GI:** diarrhea, nausea, vomiting, dyspepsia, gastroinestinal reflux. **Derm:** hyperhydrosis. **Metab:** ↓ appetite, weight loss.

Interactions

Drug-Drug: Concurrent use with **sulfonlyureas** may ↑ risk of hypoglycemia (↓ dose of sulfonylurea if hypoglycemia occurs). Due to slowed gastric emptying, may decrease absorption of **orally administered medications**, especially those requiring rapid GI absorption or require a specific level for efficacy (anti-infectives, oral contraceptives).

Route/Dosage

Subcut: (Adults): 5 mcg within 60 min before morning and evening meal; after one month, dose may be increased to 10 mcg depending on response.

NURSING IMPLICATIONS

Assessment

- Observe for signs and symptoms of hypoglycemic reactions (abdominal pain, sweating, hunger, weakness, dizziness, headache, drowsiness, tremor, tachycardia, anxiety, confusion, irritability, jitteryness), especially when combined with oral sulfonylureas.
- ***Lab Test Considerations:*** Monitor serum glucose and glycolysated hemoglobin periodically during therapy to evaluate effectiveness of therapy.

Potential Nursing Diagnoses

Imbalanced nutrition: more than body requirements (Indications)
Noncompliance (Patient/Family Teaching)

Implementation

- Some medications may need to be taken 1 hr before exenatide.

NURSING IMPLICATIONS

Assessment

- Patients who have asthma, aspirin-induced allergy, and nasal polyps are at increased risk for developing hypersensitivity reactions. Monitor for rhinitis, asthma, and urticaria.
- **Osteoarthritis/RheumatoidArthritis:** Assess pain and range of movement before and 1–2 hr after administration.
- **Pain:** Assess location, duration, and intensity of the pain before and 60 min after administration.
- ***Lab Test Considerations:*** May cause decreased hemoglobin, hematocrit, leukocyte, and platelet counts.
- Monitor liver function tests within 8 wk of initiating etodolac therapy and periodically during therapy. May cause elevated serum alkaline phosphatase, LDH, AST, and ALT concentrations.
- Monitor BUN, serum creatinine, and electrolytes periodically during therapy. May cause increased BUN, serum creatinine, and electrolyte concentrations and decreased urine electrolyte concentrations.
- May cause decreased serum and increased urine uric acid concentrations.

Potential Nursing Diagnoses

Acute pain (Indications)
Impaired physical mobility (Indications)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- Administration in higher-than-recommended doses does not provide increased effectiveness but may cause increased side effects.
- Use lowest effective dose for shortest period of time.
- **PO:** For rapid initial effect, administer 30 min before or 2 hr after meals. May be administered with food, milk, or antacids containing aluminum or magnesium to decrease GI irritation.
- **Do not crush, break, or chew extended-release tablets.**

Patient/Family Teaching

- Advise patient to take etodolac with a full glass of water and to remain in an upright position for 15–30 min after administration.
- Instruct patient to take medication exactly as directed. If a dose is missed, take as soon as possible within 1–2 hr if taking twice/day, or unless it is almost time for next dose if taking more than twice/day. Do not double doses.
- Etodolac may occasionally cause drowsiness or dizziness. Advise patient to avoid driving or other activities requiring alertness until response to the medication is known.
- Caution patient to avoid concurrent use of alcohol, aspirin, acetaminophen, NSAIDs, or other OTC medications without consultation with health care professional.
- Advise patient to inform health care professional of medication regimen before treatment or surgery.
- Advise patient to consult health care professional if rash, itching, visual disturbances, tinnitus, weight gain, edema, black stools, persistent headache, or influenza-like syndrome (chills, fever, muscle aches, pain) occur.

Evaluation/Desired Outcomes

- Decreased severity of pain.
- Improved joint mobility. Patients who do not respond to one NSAID may respond to another. May require 2 wk or more for maximum anti-inflammatory effects.

Why was this drug prescribed for your patient?

- Patients stabilized on a diabetic regimen who are exposed to stress, fever, trauma, infection, or surgery may require administration of insulin.
- **Subcut:** Follow directions for *New Pen Setup* in *Information for Patient* prior to use of each new pen. Administer exenatide in thigh, abdomen, or upper arm at any time within the 60–min period **before** the morning and evening meals. Do not administer after a meal. Solution should be clear and colorless; do not administer solutions that are discolored or contain particulate matter. Refrigerate; discard pen 30 days after 1st use, even if some drug remains in pen. Do not freeze. Do not store pen with needle attached; medication may leak from pen or air bubbles may form in the cartridge.

Patient/Family Teaching

- Instruct patient to take exenatide as directed within 60 min before a meal. Do not take after a meal. If a dose is missed, skip the dose and take the next dose at the prescribed time. Do not take an extra dose or increase the amount of the next dose to make up for missed dose.
- Instruct patient in proper technique for administration, timing of dose and concurrent oral medications, storage of medication and disposal of used needles. Patients should read the "Information for Patient" insert prior to initiation of therapy and with each Rx refill. Advise patient that New Pen Setup should be done only with each new pen, not with each dose.
- Inform patient that pen needles are not includes with pen and must be purchased separately. Advise patient which needle length and gauge should be used. Caution patient not to share pen and needles.
- Explain to patient that exenatide helps control hyperglycemia but does not cure diabetes. Therapy is usually long term.
- Encourage patient to follow prescribed diet, medication, and exercise regimen to prevent hyperglycemic or hypoglycemic episodes.
- Review signs of hypoglycemia and hyperglycemia with patient. If hypoglycemia occurs, advise patient to take a glass of orange juice or 2–3 tsp of sugar, honey, or corn syrup dissolved in water, and notify health care professional. Risk of hypoglycemia is increased if sulfonureas are taken concurrently with exenatide.
- Inform patient that therapy may result in reduction of appetite, food intake, and/or body weight. Dose modification is not necessary. Nausea is more common at initiation of therapy and usually decreases over time.
- Advise patient to notify health care professional before taking any Rx, OTC, and herbal products. Exenatide delays stomach emptying. Some medications (such as anti-infectives and oral contraceptives) may need to be taken 1 hr before exenatide injection.
- Instruct patient in proper testing of blood glucose and urine ketones. These tests should be monitored closely during periods of stress or illness and health care professional notified if significant changes occur.
- Advise patient to notify health care professional if pregnancy is suspected or planned.
- Advise patient to inform health care professional of medication regimen before treatment or surgery.
- Advise patient to carry a form of sugar (sugar packets, candy) and identification describing disease process and medication regimen at all times.
- Emphasize the importance of routine follow-up exams and regular testing of blood glucose and glycosylated hemoglobin.

Evaluation/Desired Outcomes

- Control of blood glucose levels without the appearance of hypoglycemic or hyperglycemic episodes.

Why was this drug prescribed for your patient?

ezetimibe (e-zet-i-mibe)

Zetia

Classification

Therapeutic: lipid-lowering agents
Pharmacologic: cholesterol absorption inhibitors

Pregnancy Category C

Indications

Alone or with other agents (HMG-CoA reductase inhibitors) in the management of dyslipidemias including primary hypercholesterolemia, homozygous familial hypercholesterolemia and homozygous sitosterolemia.

Action

Inhibits absorption of cholesterol in the small intestine. **Therapeutic Effects:** Lowering of cholesterol, a known risk factor for atherosclerosis.

Pharmacokinetics

Absorption: Following absorption, rapidly converted to ezetimibe-glucaronide, which is active. Bioavailability is variable.
Distribution: Unknown.
Metabolism and Excretion: Undergoes enterhepatic recycling, mostly eliminated in feces, minimal renal excretion.
Half-life: 22 hr.

TIME/ACTION PROFILE

ROUTE	ONSET	PEAK	DURATION
PO	unknown	unknown	unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Acute liver disease or unexplained laboratory evidence of liver disease (when used with HMG-CoA reductase inhibitor). Moderate or severe hepatic insufficiency. Concurrent use of fibrates.
Use Cautiously in: Lactation (use only if benefit to mother outweighs possible risks to infant); Pregnancy or children < 10 yr (safety not established).

Adverse Reactions/Side Effects

GI: cholecystitis, cholelithiasis, ↑ hepatic transaminases (with HMG-CoA reductase inhibitors), nausea, pancreatitis. **Derm:** rash. **Misc:** ANGIOEDEMA.

Interactions

Drug-Drug: Effects may be ↓ by **cholestyramine** or other **bile acid sequestrants**. Concurrent use of **fibrates** may ↑ blood levels of ezetimibe and also ↑ the risk of cholelithiasis. **Cyclosporine** may ↑ ezetimibe levels. May ↑ risk of rhabdomyolysis when used with **HMG CoA-reductase inhibitors**.

Route/Dosage

PO (Adults): 10 mg once daily.

NURSING IMPLICATIONS

Assessment

- Obtain a diet history, especially with regard to fat consumption.
- ***Lab Test Considerations:*** Serum cholesterol and triglyceride levels should be evaluated before initiating, after 2–4 wk of therapy, and periodically thereafter.
- May cause elevated liver transaminases when administered with HMG-CoA reductase inhibitors. Monitor liver enzymes prior to initiation and throughout therapy according to recommendations of HMG-CoA reductase inhibitor. Elevations are usually asymptomatic and return to baseline with continued therapy.

Potential Nursing Diagnoses

Noncompliance, related to diet and medication regimen (Patient/Family Teaching)

fentanyl (transdermal) (fen-ta-nil)

Duragesic

Classification

Therapeutic: opioid analgesics, anesthetic adjuncts
Pharmacologic: opioid agonists

Schedule II

Pregnancy Category C

Indications

Moderate to severe chronic pain requiring continuous opioid analgesic therapy for an extended time at a dosage of 25 mcg/hr or more of the transdermal system. Transdermal fentanyl is not recommended for the control of postoperative, mild, or intermittent pain.

Action

Binds to opiate receptors in the CNS, altering the response to and the perception of pain. **Therapeutic Effects:** Decrease in severity of chronic pain.

Pharmacokinetics

Absorption: Well absorbed (92% of dose) through skin surface under transdermal patch, creating a depot in the upper skin layers. Release from transdermal system into systemic circulation increases gradually to a constant rate, providing continuous delivery for 72 hr.
Distribution: Crosses the placenta and enters breast milk.
Metabolism and Excretion: Mostly metabolized by the liver; 10–25% excreted unchanged by the kidneys.
Half-life: 17 hr following removal of single application of patch (due to continuous release from deposition of drug in skin layers); up to 21 hr following multiple application of patch.

ROUTE	ONSET	PEAK	DURATION
Transdermal	6 hr†	12–24 hr	~2 hr‡

†Achievement of blood levels associated with analgesia. Maximal response and dose titration may take up to 6 days
‡While patch is worn

Contraindications/Precautions

Contraindicated in: Hypersensitivity to fentanyl or adhesives. Known intolerance. Acute pain (onset not rapid enough). Not recommeded during labor and delivery, avoid during lactation. Alcohol intolerance (small amounts of alcohol released into skin).
Use Cautiously in: Patients >60 yr; cachectic or debilitated patients (dosage reduction suggested because of altered drug disposition); Diabetics; Patients with severe pulmonary or hepatic disease; CNS tumors; Increased intracranial pressure; Head trauma; Adrenal insufficiency; Undiagnosed abdominal pain; Hypothyroidism; Alcoholism; Cardiac disease, particularly bradyarrhythmias; Fever or situation which increase body temperature (increases release of fentanyl from delivery system); Titration period (additional analgesics may be required); Children (safety not established for children <2 yr; pediatric patients initiating therapy at 25 mcg/hr should be opioid tolerant and receiving at least 60 mg oral morphine equivalents per day.

Adverse Reactions/Side Effects

CNS: confusion, sedation, weakness, dizziness, restlessness. **Resp:** APNEA, bronchoconstriction, laryngospasm, respiratory depression. **CV:** bradycardia. **GI:** anorexia, constipation, dry mouth, nausea, vomiting. **Derm:** sweating, erythema. **Local:** application site reactions. **MS:** skeletal and thoracic muscle rigidity. **Misc:** physical dependence, psychological dependence.

Interactions

Drug-Drug: Avoid use in patients who have received MAO inhibitors within the previous 14 days (may produce unpredictable, po-

Implementation

- **PO:** Administer without regard to meals. May be taken at the same time as HMG-CoA reductase inhibitors.

Patient/Family Teaching

- Instruct patient to take medication exactly as directed, at the same time each day, even if feeling well. Take missed doses as soon as remembered, but do not take more than 1 dose/day. Medication helps control but does not cure elevated serum cholesterol levels.
- Advise patient that this medication should be used in conjunction with diet restrictions (fat, cholesterol, carbohydrates, alcohol), exercise, and cessation of smoking. Ezetimibe does not assist with weight loss.
- Instruct female patients to notify health care professional promptly if pregnancy is planned or suspected or if breast feeding. If regimen includes HMG-CoA reductase inhibitors, they are contraindicated in pregnancy.
- Instruct patient to notify health care professional if unexplained muscle pain, tenderness, or weakness occur. Risk may increase when used with HMG CoA reductase inhibitors.
- Advise patient to avoid taking OTC medications or natural/herbal products without consulting health care professional.
- Advise patient to notify health care professional of medication regimen prior to treatment or surgery.
- Emphasize the importance of follow-up exams to determine effectiveness and to monitor for side effects.

Evaluation/Desired Outcomes

- Decrease in serum LDL and total cholesterol levels
- Increase in HDL cholesterol levels.

Why was this drug prescribed for your patient?

...reactions): Concomitant use **drugs that inhibit the CYP3A4 enzyme** system including **ritonavir ketoconazole itraconazole clarithromycin nelfinavir nefazodone diltiazem** and **erythromycin** may result in ↑ levels and risk of CNS and respiratory depression. Levels and effectiveness may be ↓ by **drugs that induce the CYP3A4 enzyme**. Additive CNS and respiratory depression with other **CNS depressants**, including **alcohol, antihistamines, antidepressants, sedative/hypnotics,** and other **opioids.**

Drug-Natural Products: Concomitant use of **kava, valerian, chamomile,** or can increase CNS depression.

Route/Dosage

Transdermal (Adults): 25 mcg/hr is the initial dose; patients who have not been receiving opioids should receive not more that 25 mcg/hr. To calculate the dosage of transdermal fentanyl required in patients who are already receiving opioid analgesics, assess the 24-hr requirement of currently used opioid. Using the equianalgesic table in Appendix B, convert this to an equivalent amount of morphine/24 hr. Conversion to fentanyl transdermal may be accomplished by using the fentanyl conversion table in Appendix B. During dosage titration, additional short-acting opioids should be available for any breakthrough pain that may occur. Morphine 10 mg IM or 60 mg PO q 4 hr (60 mg/24 hr IM or 360 mg/24 hr PO) is considered to be approximately equivalent to transdermal fentanyl 100 mcg/hr. Transdermal patch lasts 72 hr in most patients. Some patients require a new patch every 48 hr.

Transdermal (Adults >60 yr, Debilitated or Cachectic Patients): Initial dose should be 25 mcg/hr unless previous opioid use was >135 mg morphine PO per day (or other opioid equivalent).

NURSING IMPLICATIONS

Assessment

- Assess type, location, and intensity of pain before and 24 hr after application and periodically during therapy. Monitor pain frequently during initiation of therapy and dose changes to assess need for supplementary analgesics for breakthrough pain.
- Assess blood pressure, pulse, and respirations before and periodically during administration. If respiratory rate is <10/min, assess level of sedation. Physical stimulation may be sufficient to prevent significant hypoventilation. Dose may need to be decreased by 25–50%. Initial drowsiness will diminish with continued use.
- Prolonged use may lead to physical and psychological dependence and tolerance. This should not prevent patient from receiving adequate analgesia. Most patients who receive opioid analgesics for pain do not develop psychological dependence.
- Progressively higher doses may be required to relieve pain with long-term therapy. It may take up to 6 days after increasing doses to reach equilibrium, so patients should wear higher dose through 2 applications before increasing dose again.
- Assess bowel function routinely. Prevent constipation with increased intake of fluids and bulk, and laxatives to minimize constipating effects. Administer stimulant laxatives routinely if opioid use exceeds 2–3 days, unless contraindicated.
- ***Lab Test Considerations:*** May ↑ plasma amylase and lipase levels.
- ***Toxicity and Overdose:*** If an opioid antagonist is required to reverse respiratory depression or coma, naloxone (Narcan) is the antidote. Dilute the 0.4-mg ampule of naloxone in 10 ml of 0.9% NaCl and administer 0.5 ml (0.02 mg) by direct IV push every 2 min. For patients weighing <40 kg, dilute 0.1 mg of naloxone in 10 ml of 0.9% NaCl for a concentration of 10 mcg/ml and administer 0.5 mcg/kg every 2 min. Titrate dose to avoid withdrawal, seizures, and severe pain. Monitor patient closely; dose may need to be repeated or may need to be administered as an infusion because of long duration of action despite removal of patch.

Potential Nursing Diagnoses

Acute pain (Indications)
Risk for injury (Side Effects)

CONTINUED

CONTINUED

fentanyl (transdermal)

Implementation

- ***High Alert:*** Accidental overdose of opioid analgesics has resulted in fatalities. Before administering, clarify ambiguous orders; have second practitioner independently check original order and dose calculations.
- Duragesic-12 delivers 12.5 mcg/hr of fentanyl. Use supplemental doses of short-acting opioid analgesics to manage pain until relief is obtained with the transdermal system. Patients may continue to require supplemental opioids for breakthrough pain. If >100 mcg/hr is required, use multiple transdermal systems.
- Dose is titrated based on the patient's report of pain until adequate analgesia (50% reduction in patient's pain rating on numerical or visual analogue scale or patient reports satisfactory relief) is attained. Dose is determined by calculating the previous 24-hr analgesic requirement and converting to the equianalgesic morphine dose using Appendix B. The conversion ratio from morphine to transdermal fentanyl is conservative; 50% of patients may require a dose increase after initial application. Increase after 3 days based on required daily doses of supplemental analgesics. Increases should be based on ratio of 45 mg/24 hr of oral morphine to 12.5 mcg/hr increase in transdermal fentanyl dose.
- Coadministration with nonopioid analgesics may have additive analgesic effects and permit lower opioid doses.
- To convert to another opioid analgesic, remove transdermal fentanyl system and begin treatment with half the equianalgesic dose of the new analgesic in 12–18 hr.
- Medication should be discontinued gradually after long-term use to prevent withdrawal symptoms.
- **Transdermal:** Apply system to flat, nonirritated, and nonirradiated site such as chest, back, flank, or upper arm. If skin preparation is necessary, use clear water and clip, do not shave, hair. Allow skin to dry completely before application. Apply immediately after removing from package. Do not alter the system (i.e., cut) in any way before application. Remove liner from adhesive layer and press firmly in place with palm of hand for 30 sec, especially around the edges, to make sure contact is complete. For continued use, remove used system and fold so that adhesive edges are together. Flush system down toilet immediately on removal. Apply new system to a different site. Discard unused systems by removing from pouch and flushing down toilet.

Patient/Family Teaching

- Instruct patient in how and when to ask for pain medication.
- Instruct patient in correct method for application and disposal of transdermal system. **Fatalities have occurred from children having access to improperly discarded patches.** May be worn while bathing, showering, or swimming.
- May cause drowsiness or dizziness. Caution patient to call for assistance when ambulating or smoking and to avoid driving or other activities requiring alertness until response to medication is known.
- Advise patient to change positions slowly to minimize dizziness.
- Caution patient to avoid concurrent use of alcohol or other CNS depressants with this medication.
- Advise patient that fever, electric blankets, heating pads, saunas, hot tubs, and heated water beds increase the release of fentanyl from the patch.
- Advise patient that good oral hygiene, frequent mouth rinses, and sugarless gum or candy may decrease dry mouth.

filgrastim (fil-**gra**-stim)

G-CSF, Granulocyte Colony-Stimulating Factor, Neupogen

Classification

Therapeutic: colony-stimulating factors

Pregnancy Category C

Indications

Prevention of febrile neutropenia/infection in patients who have received bone marrow depressants for the treatment of nonmyeloid malignancies. Reduction of time for neutrophil recovery and duration of fever in patients undergoing induction consolidation chemotherapy for acute myelogenous leukemia. Reduction of time to neutrophil recovery and sequelae of neutropenia in patients with nonmyeloid malignancies undergoing myeloablative chemotherapy followed by bone marrow transplantation. Mobilization of hematopoietic progenitor cells into peripheral blood for collection by leukapheresis. Management of severe chronic neutropenia.

Action

Binds to and stimulates immature neutrophils to divide and differentiate. Activates mature neutrophils. **Therapeutic Effects:** Decreased incidence of infection in neutropenic patients. Improved harvest of progenitor cells for bone marrow transplantation.

Pharmacokinetics

Absorption: Well absorbed following subcut administration.
Distribution: Unknown.
Metabolism and Excretion: Unknown.
Half-life: 3.5 hr.

TIME/ACTION PROFILE

ROUTE	ONSET	PEAK	DURATION
IV, subcut	unknown	unknown	4 days†

†Return of neutrophil count to baseline

Contraindications/Precautions

Contraindicated in: Hypersensitivity to filgrastim or *Escherichia coli*–derived proteins.
Use Cautiously in: Cardiac disease; Pregnancy, lactation, and children (safety not established).

Adverse Reactions/Side Effects

Hemat: excess leukocytosis. **Local:** pain, redness at subcut site. **MS:** medullary bone pain.

Interactions

Drug-Drug: Antineoplastics may have adverse effects on rapidly proliferating neutrophils—avoid use for 24 hr before and after chemotherapy.

Route/Dosage

Following Myelosuppressive Chemotherapy

IV, Subcut: (Adults): 5 mcg/kg/day for up to 2 wk. Dosage may be increased by 5 mcg/kg during each cycle of chemotherapy depending on blood counts.

Following Bone Marrow Transplantation

IV, Subcut: (Adults): 10 mcg/kg/day as a 4- or 24-hr IV infusion or continuous subcut infusion; initiate at least 24 hr after chemotherapy and at least 24 hr following bone marrow transplant. Adjust dose according to blood counts.

Peripheral Blood Progenitor Cell Collection and Therapy

Subcut: (Adults): 10 mcg/kg/day as a bolus or continuous infusion for at least 4 days prior to first leukapheresis and continued until last leukapheresis; dosage modification suggested if WBC >100,000 cells/mm³.

Severe Chronic Neutropenia

Subcut: (Adults): *Congenital neutropenia*—6 mcg/kg twice daily. *Idiopathic/cyclical neutropenia*—5 mcg/kg daily (decrease if absolute neutrophil count [ANC] remains >10,000/mm³).

NURSING IMPLICATIONS

Assessment

- Monitor heart rate, blood pressure, and respiratory status prior to and periodically during therapy.

Evaluation/Desired Outcomes

- Decrease in severity of pain without a significant alteration in level of consciousness, respiratory status, or blood pressure.

Why was this drug prescribed for your patient?

filgrastim (fil-gra-stim)

G-CSF, Granulocyte Colony-Stimulating Factor, Neupogen

Classification

Therapeutic: colony-stimulating factors

Pregnancy Category C

Indications

Prevention of febrile neutropenia/infection in patients who have received bone marrow depressants for the treatment of nonmyeloid malignancies. Reduction of time for neutrophil recovery and duration of fever in patients undergoing induction consolidation chemotherapy for acute myelogenous leukemia. Reduction of time to neutrophil recovery and sequelae of neutropenia in patients with nonmyeloid malignancies undergoing myeloablative chemotherapy followed by bone marrow transplantation. Mobilization of hematopoietic progenitor cells into peripheral blood for collection by leukapheresis. Management of severe chronic neutropenia.

Action

Binds to and stimulates immature neutrophils to divide and differentiate. Activates mature neutrophils. **Therapeutic Effects:** Decreased incidence of infection in neutropenic patients. Improved harvest of progenitor cells for bone marrow transplantation.

Pharmacokinetics

Absorption: Well absorbed following subcut administration.
Distribution: Unknown.
Metabolism and Excretion: Unknown.
Half-life: 3.5 hr.

TIME/ACTION PROFILE

ROUTE	ONSET	PEAK	DURATION
IV, subcut	unknown	unknown	4 days†

†Return of neutrophil count to baseline

Contraindicated in: Hypersensitivity to filgrastim or *Escherichia coli*–derived proteins.
Use Cautiously in: Cardiac disease; Pregnancy, lactation, and children (safety not established).

Adverse Reactions/Side Effects

Hemat: excess leukocytosis. **Local:** pain, redness at subcut site. **MS:** medullary bone pain.

Interactions

Drug-Drug: Antineoplastics may have adverse effects on rapidly proliferating neutrophils—avoid use for 24 hr before and after chemotherapy.

Route/Dosage

Following Myelosuppressive Chemotherapy

IV, Subcut: (Adults): 5 mcg/kg/day for up to 2 wk. Dosage may be increased by 5 mcg/kg during each cycle of chemotherapy depending on blood counts.

Following Bone Marrow Transplantation

IV, Subcut: (Adults): 10 mcg/kg/day as a 4- or 24-hr IV infusion or continuous subcut infusion; initiate at least 24 hr after chemotherapy and at least 24 hr following bone marrow transplant. Adjust dose according to blood counts.

Peripheral Blood Progenitor Cell Collection and Therapy

Subcut: (Adults): 10 mcg/kg/day as a bolus or continuous infusion for at least 4 days prior to first leukapheresis and continued until last leukapheresis; dosage modification suggested if WBC >100,000 cells/mm^3.

Severe Chronic Neutropenia

Subcut: (Adults): *Congenital neutropenia*—6 mcg/kg twice daily. *Idiopathic/cyclical neutropenia*—5 mcg/kg daily (decrease if absolute neutrophil count [ANC] remains >10,000/mm^3).

NURSING IMPLICATIONS

Assessment

- Monitor heart rate, blood pressure, and respiratory status prior to and periodically during therapy.

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finasteride (fi-nas-teer-ide)

Propecia, Proscar

Classification

Therapeutic: hair regrowth stimulants
Pharmacologic: androgen inhibitors

Pregnancy Category X

Indications

Management of benign prostatic hyperplasia (BPH); can be used with doxazosin. Treatment of androgenetic alopecia (male pattern hair loss) in men only.

Action

Inhibits the enzyme 5alpha-reductase, which is responsible for converting testosterone to its potent metabolite 5alpha-dihydrotestosterone in prostate, liver, and skin; 5alpha-dihydrotestosterone is partially responsible for prostatic hyperplasia and male pattern hair loss. **Therapeutic Effects:** Reduced prostate size with associated decrease in urinary symptoms. Decreased hair loss with some hair regrowth.

Pharmacokinetics

Absorption: Well absorbed after oral administration (63%).
Distribution: Enters prostatic tissue and crosses the blood-brain barrier. Remainder of distribution not known.
Metabolism and Excretion: Mostly metabolized; 39% excreted in urine as metabolites; 57% excreted in feces.
Half-life: 6 hr (range 6–15 hr; slightly increased in patients >70 yr).

TIME/ACTION PROFILE (reduction in dihydrotestosterone levels†)

ROUTE	ONSET	PEAK	DURATION
PO	rapid	8 hr	2 wk

†Clinical effects as noted by urinary tract symptoms and hair regrowth may not be evident for several months and remain for 4 mo after discontinuation

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Women.
Use Cautiously in: Patients with hepatic impairment or obstructive uropathy.

Adverse Reactions/Side Effects

GU: decreased libido, decreased volume of ejaculate, impotence.

Interactions

Drug-Drug: None noted.

Route/Dosage

PO (Adults, Males): *BPH*—5 mg once daily. *Androgenetic alopecia*—1 mg/day.

NURSING IMPLICATIONS

Assessment

- Assess for symptoms of prostatic hypertrophy (urinary hesitancy, feeling of incomplete bladder emptying, interruption of urinary stream, impairment of size and force of urinary stream, terminal urinary dribbling, straining to start flow, dysuria, urgency) before and periodically during therapy.
- Digital rectal examinations should be performed before and periodically during therapy for BPH.
- ***Lab Test Considerations:*** Serum prostate-specific antigen (PSA) concentrations, which are used to screen for prostate cancer, may be evaluated before and periodically during therapy. Finasteride may cause a ↓ in serum PSA levels.

Potential Nursing Diagnoses

Impaired urinary elimination (Indications)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- **PO:** Administer once daily with or without meals.

Patient/Family Teaching

- Instruct patient to take finasteride as directed, even if symptoms improve or are unchanged. At least 6–12 mo of therapy may be necessary to determine whether an individual will respond to finasteride.

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fluconazole (floo-kon-a-zole)

Diflucan

Classification

Therapeutic: antifungals (systemic)

Pregnancy Category C

Indications

PO, IV: Oropharyngeal or esophageal candidiasis, Serious systemic candidal infections, Urinary tract infections, Peritonitis, Cryptococcal meningitis. Prevention of candidiasis in patients who have undergone bone marrow transplantation. **PO:** Single-dose oral treatment of vaginal candidiasis.

Action

Inhibits synthesis of fungal sterols, a necessary component of the cell membrane. **Therapeutic Effects:** Fungistatic action against susceptible organisms. May be fungicidal in higher concentrations. **Spectrum:** Active against: *Candida* spp, *Cryptococcus neoformans*.

Pharmacokinetics

Absorption: Well absorbed following oral administration.
Distribution: Widely distributed; penetrates cerebrospinal fluid, eye, peritoneum.
Metabolism and Excretion: >80% excreted unchanged by the kidneys; <10% metabolized by the liver.
Half-life: 30 hr (increased in renal impairment).

TIME/ACTION PROFILE (blood levels)

ROUTE	ONSET	PEAK	DURATION
PO	unknown	1–2 hr	24 hr
IV	rapid	end of infusion	24 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity to fluconazole or other azoles.
Use Cautiously in: Renal impairment (dosage reduction required if CCr <50 ml/min); Geriatric patients (increased risk of adverse reactions); Liver disease; Pregnancy, lactation, or children (safety not established).

Adverse Reactions/Side Effects

Incidence of adverse reactions is increased in HIV patients **CNS:** headache, dizziness, seizures. **GI:** HEPATOTOXICITY, abdominal discomfort, diarrhea, nausea, vomiting. **Derm:** exfoliative skin disorders including STEVENS-JOHNSON SYNDROME. **Endo:** hypokalemia, hypertriglyceridemia. **Misc:** allergic reactions, including ANAPHYLAXIS.

Interactions

Drug-Drug: ↑ activity of **warfarin**. **Rifampin**, **rifabutin**, and **isoniazid** ↓ levels. Fluconazole at doses >200 mg/day may inhibit the CYP3A4 enzyme system and effect the activity of drugs metabolized by this system. ↑ hypoglycemic effects of **tolbutamide**, **glyburide**, or **glipizide**. ↑ levels and risk of toxicity from **cyclosporine**, **rifabutin**, **tacrolimus**, **theophylline**, **zidovudine**, **alfentanil**, and **phenytoin**. ↑ levels and effects of **benzodiazepines**, **zolpidem**, **bispirone**, **nisoldipine**, **tricyclic antidepressants**, and **losartan**. May ↑ risk of bleeding with **warfarin**.

Route/Dosage

Oropharyngeal Candidiasis

PO, IV (Adults): 200 mg initially, then 100 mg daily for at least 2 wk.
PO, IV (Children >6 mos): 3 mg/kg/day for at least 2 wk.

Esophageal Candidiasis

PO, IV (Adults): 200 mg initially, then 100 mg once daily for at least 3 wk or 2 wk following symptomatic improvement (up to 400 mg/day).
PO, IV (Children >6 mos): 3 mg/kg/day for at least 3 wk or 2 wk after symptomatic improvement.

Other Candidiasis

PO, IV (Adults): 50–400 mg/day.

Cryptococcal Meningitis

PO, IV (Adults): *Treatment*—400 mg once daily until favorable clinical response, then 200–400 mg once daily for at least 10–12 wk following

- Inform patient that the volume of ejaculate may be decreased during therapy, but that this will not interfere with normal sexual function. Sexual dysfunction side effects will diminish over time.
- Caution patient that finasteride poses a potential risk to a male fetus. Women who are pregnant or may become pregnant should avoid exposure to semen of a partner taking finasteride and should not handle crushed finasteride because of the potential for absorption.
- Emphasize the importance of periodic follow-up exams to determine whether a clinical response has occurred.

Evaluation/Desired Outcomes

- Decrease in urinary symptoms of benign prostatic hyperplasia.
- Hair regrowth in androgenetic alopecia. Evidence of hair growth usually requires 3 mo or longer. Continued use is recommended to sustain benefit. Withdrawal leads to reversal of effect within 12 mo.

Why was this drug prescribed for your patient?

Suppressive therapy—200 mg once daily.
PO, IV (Children >6 mos): 6—12 mg/kg/day for at least 10—12 wk after clearing of CSF; change to oral therapy as soon as possible. *Suppressive therapy*—6 mg/kg/day.

Prevention of Candidiasis Following Bone Marrow Transplant

PO, IV (Adults): 400 mg once daily; begin several days before procedure, continue for 7 days after absolute neutrophil count (ANC) >1000/mm^3.

Vaginal Candidiasis

PO (Adults): 150 mg single dose.

NURSING IMPLICATIONS

Assessment

- Assess infected area and monitor CSF cultures before and periodically during therapy.
- Specimens for culture should be taken before instituting therapy. Therapy may be started before results are obtained.
- ***Lab Test Considerations:*** Monitor BUN and serum creatinine before and periodically during therapy; patients with renal dysfunction will require dose adjustment.
- Monitor liver function tests before and periodically during therapy. May cause ↑ AST, ALT, serum alkaline phosphate, and bilirubin concentrations.

Potential Nursing Diagnoses

Risk for infection (Indications)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- Do not confuse Diflucan (fluconazole) with Diprivan (propofol).
- **PO:** Shake oral suspension well prior to administration.
- **Intermittent Infusion:** Open overwrap immediately before infusion. Inner bag may have slight opacity that will diminish gradually. Do not administer solution that is cloudy or has a precipitate. Check for leaks by squeezing inner bag. If found, discard container as unsterile.
- Do not set tubing as part of a series of connections because this may cause air embolism. ***Rate:*** Infuse at a maximum rate of 200 mg/hr.

Patient/Family Teaching

- Instruct patient to take medication as directed, even if feeling better. Doses should be taken at the same time each day. Take missed doses as soon as remembered, but not if almost time for next dose. Do not double doses.
- Instruct patient to notify health care professional if abdominal pain, fever, or diarrhea becomes pronounced, if signs and symptoms of liver dysfunction (unusual fatigue, anorexia, nausea, vomiting, jaundice, dark urine, or pale stools) occur, or if no improvement is seen within a few days of therapy.

Evaluation/Desired Outcomes

- Resolution of clinical and laboratory indications of fungal infections. Full course of therapy may require weeks or months of treatment following resolution of symptoms.
- Prevention of candidiasis in patients who have undergone bone marrow transplantation.
- Decrease in skin irritation and vaginal discomfort in patients with vaginal candidiasis. Diagnosis should be reconfirmed with smears or cultures prior to a second course of therapy to rule out other pathogens associated with vulvovaginitis. Recurrent vaginal infections may be a sign of systemic illness.

Why was this drug prescribed for your patient?

FLUOROQUINOLONES (floor-oh-**kwin**-oh-lones)

ciprofloxacin
(sip-roe-**flox**-a-sin)
Cipro Cipro XR

gatifloxacin
(ga-ti-**flox**-a-sin)
Tequin

gemifloxacin
(gem-i-**flox**-a-sin)
Factive

levofloxacin
(le-voe-**flox**-a-sin)
Levaquin

lomefloxacin
(loe-me-**flox**-a-sin)
Maxaquin

moxifloxacin
(mox-i-**flox**-a-sin)
Avelox

norfloxacin
(nor-**flox**-a-sin)
Noroxin

ofloxacin
(oh-**flox**-a-sin)
Floxin

sparfloxacin
(spar-**flox**-a-sin)

Classification
Therapeutic: anti-infectives
Pregnancy Category C

Indications

PO, IV: Treatment of Urinary tract and gynecologic infections (not sparfloxacin), Gonorrhea (some agents), Prostatitis (ciprofloxacin, levofloxacin, ofloxacin), Respiratory tract infections including sinusitis (not norfloxacin), Skin and skin structure infections (ciprofloxacin, gatifloxacin, levofloxacin, moxifloxacin, ofloxacin), Bone and joint infections (ciprofloxacin), Infectious diarrhea (ciprofloxacin), Intra-abdominal infections (ciprofloxacin with metronidazole). Perioperative prophylaxis before transurethral procedures (lomefloxacin). Febrile neutropenia (ciprofloxacin). Post-exposure treatment of inhalational or cutaneous anthrax (ciprofloxacin, levofloxacin).

Action

Inhibit bacterial DNA synthesis by inhibiting DNA gyrase. **Therapeutic Effects:** Death of susceptible bacteria. **Spectrum:** Broad activity includes many gram-positive pathogens: Staphylococci including methicillin-resistant *Staphylococcus aureus* and *Staphylococcus epidermidis*, *Streptococcus pneumoniae*, *Bacillus anthracis*. Gram-negative spectrum notable for activity against: *Escherichia coli*, *Klebsiella* spp, *Enterobacter*, *Salmonella*, *Shigella*, *Proteus vulgaris*, *Providencia stuartii*, *Providencia rettgeri*, *Morganella morganii*, *Pseudomonas aeruginosa*, *Serratia*, *Haemophilus* spp, *Acinetobacter*, *Neisseria gonorrhoeae* and *Neisseria meningitidis*, *Moraxella catarrhalis*, *Yersinia*, *Vibrio*, *Brucella*, *Campylobacter*, *Aeromonas* spp. Active against the following anaerobic pathogens: *Bacteroides fragilis* and *Bacteroides intermedius* (sparfloxacin). *Clostridium perfringens* and *Clostridium welchii*, *Gardnerella vaginalis*, *Peptococcus niger*, *Peptostreptococcus* spp. Additional spectrum includes: *Chlamydia pneumoniae* and *Chlamydia trachomatis*, *Legionella pneumoniae*, *Mycobacterium tuberculosis*, *Mycoplasma pneumoniae*, *Urea urealyticum*.

Pharmacokinetics

Absorption: Well absorbed after oral administration (*Ciprofloxacin*—70%; *moxifloxacin*—90%; *gatifloxacin*—96%; *gemifloxacin*—71%; *levofloxacin*—99%; *lomefloxacin*—95–98%; *norfloxacin*—30–40%; *ofloxacin*—89%; *sparfloxacin*—92%.

CONTINUED

FLUOROQUINOLONES

Interactions

Drug-Drug: ↑ risk of serious adverse cardiovascular reactions with concurrent use of gatifloxacin, gemifloxacin, moxifloxacin or sparfloxacin and amiodarone, disopyramide, erythromycin, pentamidine, phenothiazines, pimozide, procainamide, quinidine, sotalol, tricyclic antidepressants. ↑ serum **theophylline** levels and may lead to toxicity. Administration with **antacids, iron salts, bismuth subsalicylate, sucralfate,** and **zinc salts** decreases absorption of fluoroquinolones. May alter the effects of **warfarin.** Serum levels of fluoroquinolones may be decreased by **antineoplastics. Cimetidine** may interfere with elimination of fluoroquinolones. Beneficial effects of ciprofloxacin may be antagonized by **nitrofurantoin. Probenecid** ↓ renal elimination of fluoroquinolones. Fluoroquinolones may ↑ risk of nephrotoxicity from **cyclosporine.** Concurrent use of ciprofloxacin with **foscarnet** may ↑ risk of seizures. Concurrent therapy with **corticosteroids** may ↑ the risk of tendon rupture. May ↑ effects of some **oral antidiabetic agents.**

Drug-Natural Products: Fennel ↓ the absorption of ciprofloxacin. Gatifloxacin may exaggerate hypoglycemia when used with **oral hypoglycemic agents.**

Drug-Food: Absorption is impaired by **concurrent tube feeding** (because of metal cations). Ciprofloxacin should not be taken with **milk** or **yogurt** alone, but may be taken with other dietary calcium. Absorption of norfloxacin is decreased by **food** and/or **dairy products** (take 1 hr before or 2 hr after).

Route/Dosage

Ciprofloxacin

PO (Adults): *Most infections*—500–750 mg q 12 hr. *Urinary tract infections*—250–500 mg q 12 hr. *Uncomplicated urinary tract infections*—100 mg q 12 hr for 3 days *or* 1000 mg q 24 hr for 10–14 days as extended-release tablets. *or* 500 mg q 24 hr for 3 days as extended-release tablets. *Gonorrhea*—250-mg single dose. *Inhalational anthrax (post exposure or cutaneous)*—500 mg q 12 hr for 60 days.
PO (Children): *Inhalational anthrax (post exposure or cutaneous)*—15 mg/kg q 12 hr for 60 days (not to exceed 500 mg/dose).
IV (Adults): *Most infections*—400 mg q 12 hr. *Urinary tract infections*—200 mg q 12 hr. *Inhalational anthrax (post exposure or cutaneous)*—400 mg q 12 hr for 60 days.
IV (Children): *Inhalational anthrax (post exposure or cutaneous)*—10 mg/kg q 12 hr for 60 days (not to exceed 400 mg/dose).

Gatifloxacin

PO, IV (Adults): *Acute bacterial exacerbation of chronic bronchitis, skin/skin structure infections, complicated urinary tract infections, acute pyelonephritis*—400 mg q 24 hr for 7–10 days. *Acute sinusitis*—400 mg q 24 hr for 10 days. *Community-acquired pneumonia*—400 mg q 24 hr for 7–14 days. *Uncomplicated urinary tract infections (cystitis)*—400-mg single dose or 200 mg q 24 hr for 3 days. *Uncomplicated urethral gonorrhea in men or endocervical/rectal gonorrhea in women*—400-mg single dose.

Gemifloxacin

PO (Adults): *Acute bacterial exacerbation of chronic bronchitis*—320 mg once daily for 5 days; *Community-acquired pneumonia (CAP)*—320 mg once daily for 7 days.

Levofloxacin

PO, IV (Adults): 250–750 mg q 24 hr; *inhalational anthrax (post-exposure)*—500 mg daily for 60 days.

Distribution: Widely distributed. High tissue and urinary levels are achieved. All agents appear to cross the placenta. *Ciprofloxacin, ofloxacin,* and *sparfloxacin* enter breast milk.

Metabolism and Excretion: *Ciprofloxacin*—15% metabolized by the liver, 40–50% excreted unchanged by the kidneys; *gatifloxacin*—>70% excreted unchanged in urine; *gemifloxacin*—Minimal metabolism, 61% excreted unchanged in feces, 36% excreted unchanged in urine; *levofloxacin*—87% excreted unchanged in urine, small amounts metabolized; *lomefloxacin*—65% excreted unchanged by the kidneys, 10% excreted unchanged in feces; *moxifloxacin*—mostly metabolized by the liver, 20% excreted unchanged in urine, 25% excreted unchanged in feces; *norfloxacin*—10% metabolized by the liver, 30% excreted unchanged by the kidneys, 30% excreted unchanged in feces; *ofloxacin*—70–80% excreted unchanged by the kidneys; *sparfloxacin*—partially metabolized by the liver, 10% excreted unchanged in urine.

Half-life: *Ciprofloxacin*—4 hr, *gatifloxacin*—7.1–7.8 hr, *gemifloxacin*—7 hr (range 4–12 hr); *levofloxacin*—6–8 hr, *lomefloxacin*—8 hr, *moxifloxacin*—12 hr, *norfloxacin*—6.5 hr, *ofloxacin*—5–7 hr (all are increased in renal impairment), *sparfloxacin*—20 hr.

TIME/ACTION PROFILE (blood levels)

ROUTE	ONSET	PEAK	DURATION
Ciprofloxacin—PO	rapid	1–2 hr	12 hr
Ciprofloxacin—PO-ER	rapid	1–4 hr	24 hr
Ciprofloxacin—IV	rapid	end of infusion	12 hr
Gatifloxacin—PO	rapid	1–2 hr	24 hr
Gatifloxacin—IV	rapid	end of infusion	24 hr
Gemifloxacin—PO	rapid	0.5—2 hr	24 hr
Levofloxacin—PO	rapid	1–2 hr	24 hr
Levofloxacin—IV	rapid	end of infusion	24 hr
Lomefloxacin—PO	rapid	unknown	24 hr
Moxifloxacin—PO	within 1 hr	1–3 hr	24 hr
Moxifloxacin—IV	rapid	end of infusion	24 hr
Norfloxacin—PO	rapid	2–3 hr	12 hr
Ofloxacin—PO	rapid	1–2 hr	12 hr
Ofloxacin—IV	rapid	end of infusion	12 hr
Sparfloxacin—PO	rapid	3–6 hr	24 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Cross-sensitivity among agents may occur (including cinoxacin and nalidixic acid). Pregnancy or Children <18 yr except for post-exposure inhalational or skin anthrax). Pregnancy. **Sparfloxacin only.** History of photosensitivity to other agents; unavoidable exposure to sun, bright natural light, or UV rays, *gatifloxacin, gemifloxacin, moxifloxacin, sparfloxacin*—Concurrent use of amiodarone, disopyramide, erythromycin, pentamidine, phenothiazines, procainamide, quinidine, pimozide, sotalol, or tricyclic antidepressants, Known QT_c prolongation or concurrent use of agents causing prolongation

Use Cautiously in: Underlying CNS pathology; Renal impairment (dosage reduction if CCr ≤50 ml/min for ciprofloxacin, levofloxacin, ofloxacin, sparfloxacin; ≤30 ml/min for norfloxacin; <40 ml/min for gatifloxacin, gemifloxacin and lomefloxacin); Cirrhosis; Geriatric patients, dialysis patients (increased risk of adverse reactions); Lactation (safety not established except for inhalational/skin anthrax).

Adverse Reactions/Side Effects

CNS: SEIZURES, dizziness, drowsiness, headache, insomnia, acute psychoses, agitation, confusion, hallucinations, increased intracranial pressure, tremors. **CV:** *moxifloxacin, norfloxacin sparfloxacin*—ARRHYTHMIAS, QT_c prolongation, vasodilation. **GI:** PSEUDOMEMBRANOUS COLITIS, abdominal pain, diarrhea, nausea, altered taste. **GU:** interstitial cystitis, vaginitis. **Derm:** photosensitivity (↑ with lomefloxacin), phototoxicity (sparfloxacin), rash. **Endo:** hyperglycemia, hypoglycemia. **Local:** phlebitis at IV site. **MS:** tendinitis, tendon rupture. **Neuro:** peripheral neuropathy (gemifloxacin, lomefloxacin, levofloxacin, norfloxacin, ofloxacin). **Misc:** hypersensitivity reactions including STEVENS-JOHNSON SYNDROME, lymphadenopathy.

CONTINUED

Lomefloxacin

PO (Adults): *Bronchitis/urinary tract infections*—400 mg once daily. *Perioperative prophylaxis (transurethral surgery)*—400 mg 2–6 hr before surgery.

Moxifloxacin

PO (Adults): *Community-acquired pneumonia/bacterial sinusitis*—400 mg once daily for 10 days. *Acute bacterial exacerbation of chronic bronchitis*—400 mg once daily for 5 days. *skin/skin structure infections*—400 mg/day for 7–21 days.

Norfloxacin

PO (Adults): *Urinary tract infections*—400 mg q 12 hr. *Gonorrhea*—800-mg single dose.

Ofloxacin

PO, IV (Adults): *Most infections*—400 mg q 12 hr. *Prostatitis/chlamydial infections*—300 mg q 12 hr. *Urinary tract infections*—200 mg q 12 hr. *Gonorrhea*—400-mg single dose.

Sparfloxacin

PO (Adults): 400 mg initially, then 200 mg q 24 hr for 10 days.

NURSING IMPLICATIONS

Assessment

- Assess for infection (vital signs; appearance of wound, sputum, urine, and stool; WBC; urinalysis; frequency and urgency of urination; cloudy or foul-smelling urine) prior to and during therapy.
- Obtain specimens for culture and sensitivity before initiating therapy. First dose may be given before receiving results. To prevent development of resistant bacteria, therapy should only be used to treat infections that are proven or strongly suspected to be caused by susceptible bacteria.
- Observe for signs and symptoms of anaphylaxis (rash, pruritus, laryngeal edema, wheezing). Discontinue drug and notify physician or other healthcare professional immediately if these problems occur. Keep epinephrine, an antihistamine, and resuscitation equipment close by in case of an anaphylactic reaction. Patients taking *gemifloxacin* who are at greater risk for rash are those receiving gemifloxacin for >7 days, <40 yrs of age, females, and postmenopausal females receiving hormone replacement therapy.
- ***Lab Test Considerations:*** Fluoroquinolones may cause ↑ serum AST, ALT, LDH, bilirubin, and alkaline phosphatase.
- May also cause ↓ WBC; ↑ or ↓ serum glucose; and glucosuria, hematuria, proteinuria, and albuminuria.
- Ciprofloxacin and norfloxacin may also cause crystalluria and ↑ BUN and serum creatinine concentrations.
- Moxifloxacin may cause hyperglycemia, hyperlipidemia, and altered prothrombin time. It may also cause ↑ WBC; ↑ serum calcium, chloride, albumin, and globulin; and ↓ glucose, hemoglobin, RBCs, neutrophils, eosinophils, and basophils.
- Monitor prothrombin time closely in patients receiving fluoroquinolones and warfarin; may enhance the anticoagulant effects of warfarin.

Potential Nursing Diagnoses

Risk for infection (Patient/Family Teaching)

Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- **Do not confuse norfloxacin with Norflex (orphenadrine).**
- **PO:** Administer *norfloxacin and ofloxacin* on an empty stomach 1 hr before or 2 hr after meals, with a full glass of water. *Moxifloxacin* may be administered without regard to meals. Antacids containing magnesium or aluminum, iron, or zinc preparations should not be taken within 4 hr before and 2 hr (8 hr for *moxifloxacin*) after administration.
- If gastric irritation occurs, *ciprofloxacin* and *lomefloxacin* may be administered with meals. Food slows and may slightly decrease absorption.
- Milk and yogurt decrease the absorption of *ciprofloxacin*. Do not administer concurrently.

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FLUOROQUINOLONES

- *Ciprofloxacin* 5% and 10% oral suspension should not be administered through a feeding tube due to unusual physical characteristics. Shake solution for 15 min prior to administration. Do not chew microcapsules in solution.
- *Gemifloxacin* and *ciprofloxacin extended-release tablets* should be swallowed whole; **do not crush, break, or chew.**

Ciprofloxacin

- **Intermittent Infusion:** Dilute to a concentration of 1–2 mg/ml with 0.9% NaCl or D5W. Stable for 14 days at refrigerated or room temperature. ***Rate:*** Administer over 60 min into a large vein to minimize venous irritation.
- **Y-Site Incompatibility:** Temporarily discontinue other solutions when administering ciprofloxacin.

Gatifloxacin

- **Intermittent Infusion:** Dilute to a concentration of 2 mg/ml with D5W, 0.9% NaCl, D5LR, or D5/0.9% NaCl. Solution is stable for 14 days if refrigerated or at room temperature. ***Rate:*** Administer over 60 min. Avoid rapid or bolus IV infusion.
- **Y-Site Incompatibility:** Do not mix or administer with other medications. Temporarily discontinue other solutions when administering gatifloxacin. Flush IV line before and after administration.

Levofloxacin

- **Intermittent Infusion:** Dilute to a concentration of 5 mg/ml with 0.9% NaCl, D5W, D5/0.9% NaCl, D5/0.45% NaCl, D5/LR, 5% sodium bicarbonate, D5, Plasmalyte 56, or sodium lactate. Also available in premixed bottles and flexible containers with D5W, which need no further dilution. Discard unused solution. Diluted solution is stable for 72 hr at room temperature and 14 days if refrigerated. ***Rate:*** Administer by infusion over at least 60 min for 250 mg or 500 mg doses and over 90 min for 750 mg dose. Avoid rapid bolus injection to prevent hypotension.
- **Y-Site Incompatibility:** Manufacturer recommends that no other drugs be added to or administered with levofloxacin.

Moxifloxacin

- **Intermittent Infusion:** Premix bags should not be further diluted. Use transfer set whose piercing pin does not require excessive force; insert with a gentle twisting motion until pin is firmly seated. ***Rate:*** Administer over 60 min. Avoid rapid or bolus infusion.
- **Solution Compatibility:** 0.9% NaCl, D5W, D10W, LR.
- **Y-Site Incompatibility:** Temporarily discontinue administration of other solutions during moxifloxacin.

Ofloxacin

- **Intermittent Infusion:** Dilute to a concentration of 4 mg/ml with 0.9% NaCl, D5W, D5/0.9% NaCl, D5/LR, 5% sodium bicarbonate, D5, Plasmalyte 56, or sodium lactate. Also available in premixed bottles and flexible containers with D5W that need no further dilution. Discard unused solution. ***Rate:*** Administer by infusion only over at least 60 min.
- **Y-Site Compatibility:** ampicillin, cisatracurium, docetaxel, etoposide, gemcitabine, granisetron, propofol, remifentanil, thiotepa.
- **Y-Site Incompatibility:** amphotericin B cholesteryl sulfate, cefepime, doxorubicin liposome.

Patient/Family Teaching

- Instruct patient to take medication as directed at evenly spaced times and to finish drug completely, even if feeling better. Take missed doses as soon as possible, unless almost time for next dose. Do not double doses. Advise patient that sharing of this medication may be dangerous. Caution patients that fluoroquinolones should only be used to treat bacterial in-

High Alert

fluorouracil (flure-oh-**yoor**-a-sill)

Adrucil, 5-FU

Classification

Therapeutic: antineoplastics
Pharmacologic: antimetabolites

Pregnancy Category D

Indications

Alone/with other modalities (surgery, radiation therapy, other antineoplastics) for colon, breast, rectal, gastric, and pancreatic carcinoma.

Action

Inhibits DNA and RNA synthesis by preventing thymidine production (cell-cycle S-phase–specific). **Therapeutic Effects:** Death of rapidly replicating cells, particularly malignant ones.

Pharmacokinetics

Absorption: IV administration results in complete bioavailability.
Distribution: Widely distributed; concentrates and persists in tumors.
Metabolism and Excretion: Converted to an active metabolite; undergoes hepatic metabolism with small amounts excreted unchanged in urine.
Half-life: 20 hr.

TIME/ACTION PROFILE (IV = effects on blood counts)

ROUTE	ONSET	PEAK	DURATION
IV	1–9 days	9–21 days (nadir)	30 days

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Pregnancy or lactation.

Use cautiously in: Infections, depressed bone marrow reserve, [illegible] debilitating illnesses; Obese or edematous patients (base dose on ideal weight); Patients with childbearing potential.

Adverse Reactions/Side Effects

More likely to occur with systemic use than topical use. **CNS:** acute cerebellar dysfunction. **GI:** diarrhea, nausea, stomatitis, vomiting. **Derm:** alopecia, maculopapular rash, melanosis of nails, nail loss, palmar-plantar dysesthesia, phototoxicity. **Endo:** gonadal suppression. **Hemat:** anemia, leukopenia, thrombocytopenia. **Local:** thrombophlebitis. **Misc:** fever.

Interactions

Drug-Drug: Combination chemotherapy with **irinotecan** may produce unacceptable toxicity. Additive bone marrow depression with other **bone marrow depressants** (other **antineoplastics** and **radiation therapy**).

Route/Dosage

Doses may vary greatly, depends on tumor, patient condition, and protocol use.

Advanced Colorectal Cancer

IV (Adults): 370 mg/m² preceded by leucovorin or 425 mg/m² preceded by leucovorin daily for 5 days. May be repeated q 4–5 wk.

Other Tumors

IV (Adults): *Initial dose*—12 mg/kg/day for 4 days, then 1 day of rest, then 6 mg/kg every other day for 4–5 doses; or 7–12 mg/kg/day for 4 days followed by 3-day rest, then 7–10 mg/kg q 3–4 days for 3 doses. *Maintenance*—7–12 mg/kg q 7–10 days or 300–500 mg/m²/day for 4–5 days, repeated monthly (no single dose should >800 mg/day). *Poor-Risk Patients:* 3–6 mg/kg/day on days 1–3, 3 mg/kg/day on days 5, 7, 9 (not to exceed 400 mg/dose). Doses of 370–425 mg/m²/day for 5 days have been used with leucovorin.

fections; they are not effective against viral infections, such as the common cold.
- Advise patients to notify health care professional immediately if they are taking theophylline.
- Encourage patient to maintain a fluid intake of at least 1500–2000 ml/day to prevent crystalluria.
- Advise patient that antacids or medications containing iron or zinc will decrease absorption and should not be taken within 2 hr before *norfloxacin* or *ofloxacin*; 3 hr before *gemifloxacin*; 4 hr before *moxifloxacin*; 6 hr before *ciprofloxacin* or *lomefloxacin*; and 2 hr (*moxifloxacin*—8 hr) after taking this medication.
- May cause dizziness and drowsiness. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Advise patient to notify health care professional of any personal or family history of QTc prolongation or proarrhythmic conditions such as recent hypokalemia, significant bradycardia, or recent myocardial ischemia. Patients with this history should not receive fluoroquinolones.
- Caution patient to use sunscreen and protective clothing to prevent phototoxicity reactions during and for 5 days after therapy. Notify health care professional if a sunburn-like reaction or skin eruption occurs.
- Instruct patients being treated for gonorrhea that partners also must be treated.
- Instruct patient to consult health care professional before taking any other Rx, OTC, or herbal products.
- Advise patient to report signs of superinfection (furry overgrowth on the tongue, vaginal itching or discharge, loose or foul-smelling stools).
- Instruct patient to notify health care professional if fever and diarrhea develop, especially if stool contains blood, pus, or mucus. Advise patient not to treat diarrhea without consulting health care professional.
- Instruct patient to notify health care professional immediately if rash or tendon pain or inflammation occur. Therapy should be discontinued.

Evaluation/Desired Outcomes
- Resolution of the signs and symptoms of infection. Time for complete resolution depends on organism and site of infection.
- Resolution of the signs and symptoms of urinary tract infection
- Negative urine culture.
- Post exposure treatment of inhalational anthrax or cutaneous anthrax.

Why was this drug prescribed for your patient?

NURSING IMPLICATIONS

Assessment
- Monitor vital signs frequently throughout therapy.
- Assess mucous membranes, number and consistency of stools, and frequency of vomiting. Assess for bleeding. Avoid IM injections and taking rectal temperatures. Apply pressure to venipuncture sites for 10 min. Notify physician if symptoms of toxicity (stomatitis or esophagopharyngitis, uncontrollable vomiting, diarrhea, GI bleeding, leukocyte count of $<3500/mm^3$, platelet count $<100,000/mm^3$, or hemorrhage from any site) occur, because drug will need to be discontinued.
- Assess IV site frequently for infiltration. If extravasation occurs, stop infusion and restart in another vein. Notify physician or other health care professional immediately regarding application of ice compresses.
- Monitor intake and output, appetite, and nutritional intake.
- Assess skin for palmar-plantar erythrodysesthesia (tingling of hands and feet followed by pain, erythema, and swelling) throughout therapy.
- Monitor patient for cerebellar dysfunction (weakness, ataxia, dizziness). Dysfunction may persist after discontinuation of therapy.
- ***Lab Test Considerations:*** Monitor hepatic (AST, ALT, LDH, and serum bilirubin), renal, and hematologic (hematocrit, hemoglobin, leukocyte, platelet count) functions before and periodically throughout therapy. Monitor CBC daily during IV therapy. Report WBC of $<3500/mm^3$ or platelets $<100,000/mm^3$ immediately; they are criteria for discontinuation. Nadir of leukopenia occurs in 9–14 days, with recovery by day 30. May also cause thrombocytopenia.

Implementation
- ***High Alert:*** Fatalities have occurred with incorrect administration of chemotherapeutic agents. Before administering, clarify all ambiguous orders; double check single, daily, and course-of-therapy dose limits; have second practitioner independently double check original order, calculations and infusion pump settings. The "5" in 5-fluorouracil is part of a drug name and not the dosage.
- Solution for IV administration should be prepared in a biologic cabinet. Wear gloves, gown, and mask while handling IV medication. Discard IV equipment in specially designated containers.
- **Direct IV:** Rapid IV push administration (over 1–2 min) is most effective but causes a more rapid onset of toxicity.
- **Intermittent Infusion:** May be diluted with D5W or 0.9% NaCl.
- Use plastic IV tubing and IV bags. Solution is stable for 24 hr at room temperature. Do not refrigerate. Solution is colorless to faint yellow. Discard discolored or cloudy solutions. If crystals form, dissolve by warming solution, shaking it vigorously, and cooling it to body temperature. ***Rate:*** Onset of toxicity is delayed by administering by infusion over 2–8 hr.

Patient/Family Teaching
- Instruct patient to notify health care professional if fever, chills; sore throat; infection; bleeding gums; bruising; petechiae; or blood in urine, stool, or emesis occurs. Caution patient to avoid crowds and persons with infections. Instruct patient to use soft toothbrush and electric razor. Caution patient to avoid alcohol or products containing aspirin or NSAIDs.
- Advise patient to rinse mouth after eating and avoid flossing to minimize stomatitis. Consult health care professional if pain interferes with eating.
- Discuss with patient the possibility of hair loss. Explore methods of coping.
- Review with patient the need for contraception throughout therapy.
- Caution patient to use sunscreen and protective clothing to prevent phototoxicity reactions.
- Instruct patient not to receive any vaccinations without advice of health care professional.
- Emphasize the importance of routine follow-up lab tests.

Evaluation/Desired Outcomes
- Tumor regression.

Why was this drug prescribed for your patient?

fluoxetine (floo-ox-uh-teen)

Prozac, Prozac Weekly, Sarafem

Classification

Therapeutic: antidepressants
Pharmacologic: selective serotonin reuptake inhibitors (SSRIs)

Pregnancy Category B

Indications

Various forms of depression, often in conjunction with psychotherapy (including depression in geriatric patients). Obsessive-compulsive disorder (OCD). Bulimia nervosa. Panic disorder. **Sarafem:** Management of premenstrual dysphoric disorder (PMDD).

Action

Selectively inhibits the reuptake of serotonin in the CNS. **Therapeutic Effects:** Antidepressant action. Decreased behaviors associated with panic disorder, bulimia. Decreased mood alterations from PMDD.

Pharmacokinetics

Absorption: Well absorbed following oral administration.
Distribution: Crosses the blood-brain barrier.
Metabolism and Excretion: Converted by the liver to norfluoxetine, an antidepressant compound; both are mostly metabolized by the liver.
Half-life: 2–3 days (norfluoxetine 5–7 days).

TIME/ACTION PROFILE (antidepressant effect)

ROUTE	ONSET	PEAK	DURATION
PO	1–4 wk	unknown	2 wk

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Concurrent use or use within 14 days of discontinuing MAO inhibitors (fluoxetine should be discontinued 5 wks before MAO therapy is initiated).

Use Cautiously in: Severe hepatic or renal impairment (lower/less frequent dose may be necessary); History of seizures; Debilitated patients (↑ risk of seizures); Diabetes mellitus; Patients with concurrent chronic illness, or multiple drug therapy (dosage adjustments may be necessary); Patients with impaired hepatic function (lower doses/increased dosing interval may be necessary); May ↑ risk of suicide attempt/ideation especially during dose early treatment or dose adjustment; risk may be greater in children or adolescents (safe use in children <8 yr not established); Use during third trimester may result in neonatal serotonin syndrome requiring prolonged hospitalization, respiratory, and nutritional support; Lactation (may cause sedation in infant).

Adverse Reactions/Side Effects

CNS: SEIZURES, anxiety, drowsiness, headache, insomnia, nervousness, abnormal dreams, dizziness, fatigue, hypomania, mania, weakness. **EENT:** stuffy nose, visual disturbances. **Resp:** cough. **CV:** chest pain, palpitations. **GI:** diarrhea, abdominal pain, abnormal taste, anorexia, constipation, dry mouth, dyspepsia, nausea, vomiting, weight loss. **GU:** sexual dysfunction, urinary frequency. **Derm:** excessive sweating, pruritus, erythema nodosum, flushing, rashes. **Endo:** dysmenorrhea. **MS:** arthralgia, back pain, myalgia. **Neuro:** tremor. **Misc:** allergic reactions, fever, flu-like syndrome, hot flashes, sensitivity reaction.

Interactions

Drug-Drug: Discontinue use of **MAO inhibitors** for 14 days before fluoxetine therapy; combined therapy may result in confusion, agitation, seizures, hypertension, and hyperpyrexia (serotonin syndrome). Fluoxetine should be discontinued for at least 5 wk before MAO inhibitor therapy is initiated. Inhibits the activity of cytochrome P450 2D6 enzyme in the liver and increases the effects of drugs metabolized by this enzyme system. **Medica-**

CONTINUED

fluoxetine

Potential Nursing Diagnoses

Ineffective coping (Indications)
Risk for injury (Side Effects)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- Do not confuse Sarafem (fluoxetine) with Serophene (clomiphene).
- **PO:** Administer as a single dose in the morning. Some patients may require increased amounts, in divided doses, with a second dose at noon.
- May be administered with food to minimize GI irritation.

Patient/Family Teaching

- Instruct patient to take fluoxetine exactly as directed. If a dose is missed, omit dose and return to regular dosing schedule. Do not double doses.
- May cause drowsiness, dizziness, impaired judgment, and blurred vision. Caution patient to avoid driving and other activities requiring alertness until response to the drug is known.
- Advise patient to avoid alcohol or other CNS depressant drugs during therapy and to consult health care professional before taking other medications or natural/herbal products.
- Caution patient to change position slowly to minimize dizziness.
- Inform patient that frequent mouth rinses, good oral hygiene, and sugarless gum or candy may minimize dry mouth. If dry mouth persists for >2 wk, consult health care professional regarding use of saliva substitute.
- Instruct female patient to inform health care professional if pregnancy is planned or suspected.
- Advise patient to notify health care professional if sensitivity reaction occurs or if headache, nausea, anorexia, anxiety, or insomnia persists.
- Emphasize the importance of follow-up exams to monitor progress. Encourage patient participation in psychotherapy.

Evaluation/Desired Outcomes

- Increased sense of well-being
- Renewed interest in surroundings. Requires 1–4 wk of therapy for antidepressant effects.
- Decrease in obsessive-compulsive behaviors.
- Decrease in binge eating and vomiting in patients with bulimia nervosa.
- Decreased incidence frequency of panic attacks.
- Decreased mood alterations associated with PMDD.

Why was this drug prescribed for your patient?

tions that inhibit the P450 enzyme system, including **ritonavir**, **saquinavir**, and **efavirenz** may increase the risk of developing the serotonin syndrome (for concurrent use with **ritonavir**, decrease fluoxetine dose by 70%; if initiating fluoxetine, start with 10 mg/day dose). Decreases metabolism and increases effects of **alprazolam** (decrease alprazolam dose by 50%). Additive CNS depression with **alcohol, antihistamines**, other **antidepressants, opioid analgesics**, or **sedative/hypnotics.** Increased risk of side effects and adverse reactions with other **antidepressants, tryptophan**, or **phenothiazines.** May increase effectiveness/risk of toxicity from **carbamazepine**, **clozapine**, **digoxin**, **haloperidol**, **phenytoin**, **lithium**, or **warfarin**. May decrease the effects of **buspirone**. **Cyproheptadine** may decrease or reverse effects of fluoxetine. May increase sensitivity to **adrenergics** and increase the risk of serotonin syndrome. May alter the activity of other **drugs that are highly bound to plasma proteins.**
Drug-Natural Products: Increased risk of serotonin syndrome with **St. John's wort** and **SAMe.**

Route/Dosage

PO (Adults): *Depression, OCD*—20 mg/day in the morning. After several weeks, may increase by 20 mg/day at weekly intervals. Doses greater than 20 mg/day should be given in 2 divided doses, in the morning and at noon (not to exceed 80 mg/day). Patients who have been stabilized on the 20 mg/day dose may be switched over to delayed-release capsules (Prozac Weekly) at at dose of 90 mg weekly, initiated 7 days after the last 20 mg dose. *Panic disorder*—10 mg/day initially, may increase after one week to 20 mg/day (usual dose is 20 mg, but may be increased as needed/tolerated up to 60 mg/day). *Bulimia nervosa*—60 mg/day (may need to titrate up to dosage over several days). *PMDD*—20 mg/day (not to exceed 80 mg/day) *or* 20 mg/day starting 14 days prior to expected onset on menses, continued through first full day of menstruation, repeated with each cycle.
PO (Geriatric Patients): *Depression*—10 mg/day in the morning initially, may be increased (not to exceed 60 mg/day).
PO (Children 7–17 yr): *adolescents and higher weight children*— 10 mg/day may be increased after 2 wk to 20 mg/day; additional increases may be made after several more weeks (range 20–60 mg/day); *lower weight children*— 10 mg/day initially, may be increased after several more weeks (range 20–30 mg/day).

NURSING IMPLICATIONS

Assessment

- Monitor mood changes. Inform physician if patient demonstrates significant increase in anxiety, nervousness, or insomnia.
- Assess for suicidal tendencies, especially during early therapy. Restrict amount of drug available to patient.
- Monitor appetite and nutritional intake. Weigh weekly. Notify physician of continued weight loss. Adjust diet as tolerated to support nutritional status.
- Assess patient for sensitivity reaction (urticaria, fever, arthralgia, edema, carpal tunnel syndrome, rash, hives, lymphadenopathy, respiratory distress) and notify health care professional if present; symptoms usually resolve by stopping fluoxetine but may require administration of antihistamines or corticosteroids.
- **Obsessive-Compulsive Disorder:** Assess patient for frequency of obsessive-compulsive behaviors. Note degree to which these thoughts and behaviors interfere with daily functioning.
- **Bulimia Nervosa:** Assess frequency of binge-eating and vomiting.
- ***Lab Test Considerations:*** Monitor CBC and differential periodically during therapy. Notify physician if leukopenia, anemia, thrombocytopenia, or increased bleeding time occurs.
- Proteinuria and mild increase in AST may occur during sensitivity reactions.
- May cause increase in serum alkaline phosphatase, ALT (SGPT), BUN, creatine phosphokinase, hypouricemia, hypocalcemia, hypoglycemia or hyperglycemia, and hyponatremia.

CONTINUED

gabapentin (ga-ba-**pen**-tin)

Gabarone, Neurontin

Classification

Therapeutic: analgesic adjuncts, anticonvulsants

Pregnancy Category C

Indications

Partial seizures with and without secondary generalization (adjunct treatment). Postherpetic neuralgia. **Unlabeled uses:** Chronic pain. Prevention of migraine headache.

Action

Mechanism of action is not known. May affect transport of amino acids across and stabilize neuronal membranes. **Therapeutic Effects:** Decreased incidence of seizures. Decreased postherpetic pain.

Pharmacokinetics

Absorption: Well absorbed after oral administration by active transport. At larger doses, transport becomes saturated and absorption decreases (bioavailability ranges from 60% for a 300-mg dose to 35% for a 1600-mg dose).
Distribution: Crosses blood-brain barrier; enters breast milk.
Metabolism and Excretion: Eliminated mostly by renal excretion of unchanged drug.
Half-life: 5–7 hr (normal renal function); up to 132 hr in anuria.

TIME/ACTION PROFILE (blood levels)

ROUTE	ONSET	PEAK	DURATION
PO	rapid	2–4 hr	8 hr

🍁 = Canadian drug name.

Contraindications/Precautions

Contraindicated in: Hypersensitivity.
Use Cautiously in: Renal insufficiency (↓ dose and/or ↑ dosing interval if CCr ≤60 ml/min); Geriatric patients (because of age-related ↓ in renal function); Pregnancy, lactation, or children <3 yr (safety not established).

Adverse Reactions/Side Effects

CNS: confusion,, depression, drowsiness, anxiety, concentration difficulties (children), dizziness, emotional lability (children), hostility, hyperkinesia (children), malaise, vertigo, weakness. **EENT:** abnormal vision, nystagmus. **CV:** hypertension. **GI:** anorexia, flatulence, gingivitis. **MS:** arthralgia. **Neuro:** ataxia, altered reflexes, hyperkinesia, paresthesia. **Misc:** facial edema.

Interactions

Drug-Drug: Antacids may ↓ absorption of gabapentin. ↑ risk of CNS depression with other **CNS depressants**, including **alchohol, antihistamines, opioids**, and **sedative/hypnotics**. **Morphine** ↑ gabapentin levels and may ↑ risk of toxicity, dosage adjustments may be required.
Drug-Natural Products: Kava, valerian, chamomile, or **hops** can ↑ CNS depression.

Route/Dosage

Epilepsy

PO (Adults and Children >12 yr): 300 mg 3 times daily initially. Titration may be continued until desired (range is 900–1800 mg/day in 3 divided doses; doses should not be more than 12 hr apart). Doses up to 2400–3600 mg/day have been well tolerated.
PO (Children ≥5–12 yr): 10–15 mg/kg/day in 3 divided doses initially titrated upward over 3 days to 25–35 mg/kg/day in 3 divided doses; dosage interval should not exceed 12 hr (doses up to 50 mg/kg/day have been used).
PO (Children 3–4 yrs): 10–15 mg/kg/day in 3 divided doses initially titrated upward over 3 days to 40 mg/kg/day in 3 divided doses; dosage interval should not exceed 12 hr (doses up to 50 mg/kg/day have been used).

* CAPITALS indicates life-threatening, underlines indicate most frequent.

High Alert

gemcitabine (jem-**site**-a-been)

Gemzar

Classification

Therapeutic: antineoplastics
Pharmacologic: antimetabolites, nucleoside analogues

Pregnancy Category D

Indications

Pancreatic cancer (locally advanced or metastatic). Inoperable locally advanced/metastatic non–small-cell lung cancer (with cisplatin). Metastatic breast cancer (with paclitaxel).

Action

Interferes with DNA synthesis (cell-cycle phase–specific). **Therapeutic Effects:** Death of rapidly replicating cells, particularly malignant ones.

Pharmacokinetics

Absorption: IV administration results in complete bioavailability.
Distribution: Unknown.
Metabolism and Excretion: Converted in cells to active diphosphate and triphosphate metabolites; these are excreted primarily by the kidneys.
Half-life: 32–94 min.

TIME/ACTION PROFILE (effect on blood counts)

ROUTE	ONSET	PEAK	DURATION
IV	unknown	unknown	unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Pregnancy or lactation.
Use Cautiously in: Hepatic/renal impairment (increased risk of toxicity); History of cardiovascular disease; Chronic debilitating illness; Patients with childbearing potential.

Adverse Reactions/Side Effects

Resp: PULMONARY TOXICITY, dyspnea, bronchospasm. **CV:** ARRHYTHMIAS, CEREBROVASCULAR ACCIDENT, MI, edema, hypertension. **GI:** HEPATOTOXICITY, diarrhea, nausea, stomatitis, transient elevation of hepatic transaminases, vomiting. **GU:** HEMOLYTIC UREMIC SYNDROME, hematuria, proteinuria. **Derm:** alopecia, rash. **Hemat:** anemia, leukopenia, thrombocytopenia. **Local:** injection site reactions. **Neuro:** paresthesias. **Misc:** flu-like symptoms, fever, anaphylactoid reactions.

Interactions

Drug-Drug: ↑ bone marrow depression with other **antineoplastics** or **radiation therapy.** May ↓ antibody response to **live-virus vaccines** and ↑ risk of adverse reactions.

Route/Dosage

Other regimens are used.

Pancreatic Cancer

IV (Adults): 1000 mg/m² once weekly for 7 wk, followed by a week of rest. May be followed by cycles of once-weekly administration for 3 wk followed by a week of rest.

Non–Small-Cell Lung Cancer (with Cisplatin)

IV (Adults): 1000 mg/m² on days 1, 8, and 15 of each 28-day cycle (cisplatin is also given on day 1) *or* 1250 mg/m² on days 1 and 8 of each 21-day cycle (cisplatin is also given on day 1).

Breast Cancer

IV (Adults): 1250 mg/m² days 1 and 8 of each 21-day cycle (paclitaxel is also given on day 1).

NURSING IMPLICATIONS

Assessment

- Monitor vital signs before and frequently during therapy.
- Monitor injection site during administration. Although gemcitabine is not considered a vesicant, local reactions may occur.
- Monitor for bone marrow depression. Assess for bleeding (bleeding gums, bruising, petechiae; guaiac stools, urine, and emesis) and avoid IM

🍁 = Canadian drug name.

* CAPITALS indicates life-threatening, underlines indicate most frequent.

Post-herpetic neuralgia

PO (Adults): 300 mg once daily on first day, 300 mg twice daily on second day, then 300 mg three times/day on day 3, may then be titrated upward as needed up to 600 mg three times/day.

NURSING IMPLICATIONS

Assessment

- **Seizures:** Assess location, duration, and characteristics of seizure activity.
- **Post-herpetic Neuralgia & Chronic Pain:** Assess location, characteristics, and intensity of pain periodically during therapy.
- ***Lab Test Considerations:*** May cause false-positive readings when testing for urinary protein with *Ames N-Multistix SG* dipstick test; use sulfosalicylic acid precipitation procedure.
- May cause leukopenia.

Potential Nursing Diagnoses

Risk for injury (Side Effects)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- **PO:** May be administered without regard to meals.
- 600 mg and 800 mg tablets are scored and can be broken to administer a half—tablet. If half—tablet is used, administer other half at the next dose. Discard half—tablets not used within several days.
- Gabapentin should be discontinued gradually over at least 1 wk. Abrupt discontinuation may cause increase in seizure frequency.

Patient/Family Teaching

- Instruct patient to take medication exactly as directed. Patients on tid dosing should not exceed 12 hr between doses. Take missed doses as soon as possible; if less than 2 hr until next dose, take dose immediately and take next dose 1–2 hr later, then resume regular dosing schedule. Do not double doses. Do not discontinue abruptly; may cause increase in frequency of seizures.
- Advise patient not to take gabapentin within 2 hr of an antacid.
- Gabapentin may cause dizziness and drowsiness. Caution patient to avoid driving or activities requiring alertness until response to medication is known. Seizure patients should not resume driving until physician gives clearance based on control of seizure disorder.
- Advise female patient to notify health care professional if pregnancy is planned or suspected or if she intends to breastfeed or is breastfeeding an infant.
- Instruct patient to notify health care professional of medication regimen before treatment or surgery.
- Advise patient to carry identification describing disease process and medication regimen at all times.

Evaluation/Desired Outcomes

- Decrease in the frequency or cessation of seizures.
- Decrease in postherpetic neuralgia pain.
- Decrease in intensity of chronic pain.

Why was this drug prescribed for your patient?

injections and taking rectal temperatures if platelet count is low. Apply pressure to venipuncture sites for 10 min. Assess for infection during neutropenia. Monitor for anemia (increased fatigue, dyspnea, orthostatic hypotension).

- Monitor intake and output, appetite, and nutritional intake. Nausea and vomiting occur frequently. Antiemetics may be used prophylactically.
- ***Lab Test Considerations:*** Monitor CBC, including differential and platelet count, before each dose. Dose guidelines are based on the CBC. If the absolute granulocyte count is >1000 and platelet count is >100,000, the full dose may be administered. If the absolute granulocyte count is 500–999 or platelet count is 50,000–99,000, 75% of the dose may be given. If the absolute granulocyte count is <500 or the platelet count is <50,000, withhold further doses.
- Monitor hepatic and renal function before and periodically during therapy. May cause transient ↑ in serum AST, ALT, alkaline phosphatase, and bilirubin concentrations.
- May also cause ↑ BUN and serum creatinine concentrations, proteinuria, and hematuria.

Implementation

- ***High Alert:*** Fatalities have occurred with incorrect administration of chemotherapeutic agents. Before administering, clarify all ambiguous orders; double check single, daily, and course-of-therapy dose limits; have second practitioner independently double check original order, calculations and infusion pump settings.
- Solution should be prepared in a biologic cabinet. Wear gloves, gown, and mask while handling IV medication. Discard IV equipment in specially designated containers.
- **Intermittent Infusion:** To reconstitute, add 5 ml of 0.9% NaCl without preservatives to 200-mg vial or 25 ml of 0.9% NaCl to the 1-g vial of gemcitabine for a concentration of 40 mg/ml. Incomplete dissolution may result in concentrations greater than 40 mg/ml. May be further diluted with 0.9% NaCl for concentrations as low as 0.1 mg/ml. Solution is colorless to light straw color. Do not administer solutions that are discolored or contain particulate matter. Solution is stable for 24 hr at room temperature. Discard unused portions. Do not refrigerate; crystallization may occur. ***Rate:*** Administer dose over 30 min. Infusions longer than 60 min have a greater incidence of toxicity.

Patient/Family Teaching

- Instruct patient to notify health care professional if fever; chills; sore throat; signs of infection; bleeding gums; bruising; petechiae; or blood in urine, stool, or emesis occurs. Caution patient to avoid crowds and persons with known infections. Instruct patient to use soft toothbrush and electric razor. Patient should be cautioned not to drink alcoholic beverages or take products containing aspirin or NSAIDs.
- Instruct patient to inspect oral mucosa for erythema and ulceration. If ulceration occurs, advise patient to use sponge brush and rinse mouth with water after eating and drinking. Stomatitis pain may require management with opioid analgesics.
- Instruct patient to notify health care professional if flu-like symptoms (fever, anorexia, headache, cough, chills, myalgia), swelling of the feet or legs, or shortness of breath occurs.
- Discuss with patient the possibility of hair loss. Explore methods of coping.
- Advise patient that this medication may have teratogenic effects. Contraception should be used during therapy.
- Instruct patient not to receive any vaccinations without advice of health care professional.
- Emphasize the need for periodic lab tests to monitor for side effects.

Evaluation/Desired Outcomes

- Palliative, symptomatic improvement in patients with pancreatic cancer.
- Decrease in size and spread of malignancy in lung and breast cancer.

Why was this drug prescribed for your patient?

gemfibrozil (gem-fye-broe-zil)

Lopid

Classification

Therapeutic: lipid-lowering agents
Pharmacologic: fibric acid derivatives

Pregnancy Category C

Indications

Management of type II-b hyperlipidemia (decreased high-density lipoproteins, increased low-density lipoproteins, increased triglycerides) in patients who do not yet have clinical coronary artery disease and have failed therapy with diet, exercise, weight loss, or other agents (niacin, bile acid sequestrants).

Action

Inhibits peripheral lipolysis. Decreases triglyceride production by the liver. Decreases production of the triglyceride carrier protein. Increases high-density lipoproteins (HDL). **Therapeutic Effects:** Decreased plasma triglycerides and increased HDL.

Pharmacokinetics

Absorption: Well absorbed after oral administration.
Distribution: Unknown.
Metabolism and Excretion: Some metabolism by the liver, 70% excreted by the kidneys (mostly unchanged), 6% excreted in feces.
Half-life: 1.3–1.5 hr.

TIME/ACTION PROFILE (triglyceride-VLDL–lowering effect)

	ONSET	PEAK	DURATION
PO	2–5 days	4 wk	several mo

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Primary biliary cirrhosis.
Use Cautiously in: Gallbladder disease; Liver disease; Severe renal impairment; Pregnancy, lactation, or children (safety not established).

Adverse Reactions/Side Effects

CNS: dizziness, headache. **EENT:** blurred vision. **GI:** abdominal pain, diarrhea, epigastric pain, flatulence, gallstones, heartburn, nausea, vomiting. **Derm:** alopecia, rashes, urticaria. **Hemat:** anemia, leukopenia. **MS:** myositis.

Interactions

Drug-Drug: May increase the effects of **warfarin** or **sulfonylurea oral hypoglycemic agents**. Concurrent use with **HMG-CoA reductase inhibitors** may increase the risk of rhabdomyolysis (avoid concurrent use). May decrease the effect of **cyclosporine**.

Route/Dosage

PO (Adults): 600 mg twice daily 30 min before breakfast and dinner.

NURSING IMPLICATIONS

Assessment

- Obtain patient's diet history, especially regarding fat and alcohol consumption.
- ***Lab Test Considerations:*** Serum triglyceride and cholesterol levels should be monitored before and periodically throughout therapy. LDL and VLDL levels should be assessed before and periodically throughout therapy. Medication should be discontinued if paradoxical increase in lipid levels occurs.
- Liver function tests should be assessed before and periodically throughout therapy. May cause an increase in serum bilirubin, alkaline phosphatase, CK, LDH, AST, and ALT. If hepatic function tests rise significantly, therapy should be discontinued and not resumed.

granisetron (gra-nees-e-tron)

Kytril

Classification

Therapeutic: antiemetics
Pharmacologic: 5 HT_3 antagonists

Pregnancy Category B

Indications

Prevention of nausea and vomiting due to emetogenic chemotherapy, radiation therapy. Prevention and treatment of postoperative nausea and vomiting.

Action

Blocks the effects of serotonin at receptor sites (selective antagonist) located in vagal nerve terminals and in the chemoreceptor trigger zone in the CNS. **Therapeutic Effects:** Decreased incidence and severity of nausea and vomiting following emetogenic chemotherapy or radiation therapy.

Pharmacokinetics

Absorption: 50% absorbed following oral administration.
Distribution: Distributes into erythrocytes; remainder of distribution is unknown.
Metabolism and Excretion: Mostly metabolized by the liver; 12% excreted unchanged in urine.
Half-life: *Patients with cancer*—8–9 hr (range 0.9–31.1 hr); *healthy volunteers*—4.9 hr (range 0.9–15.2 hr); *geriatric patients*—7.7 hr (range 2.6–17.7 hr).

TIME/ACTION PROFILE

ROUTE	ONSET	PEAK	DURATION
PO	rapid	60 min	up to 24 hr
IV	rapid	30 min	up to 24 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity.
Use Cautiously in: Pregnancy or lactation (safety not established); Children <2 yr (safe use of IV route not established); Children <18 yr (safe use of PO route not established).

Adverse Reactions/Side Effects

CNS: headache, agitation, anxiety, CNS stimulation, drowsiness, weakness. **CV:** hypertension. **GI:** constipation, diarrhea, elevated liver enzymes, taste disorder. **Misc:** anaphylactoid reactions, fever.

Interactions

Drug-Drug: ↑ risk of extrapyramidal reactions with other **agents causing extrapyramidal reactions.**

Route/Dosage

Prevention of Nausea and Vomiting Due to Emetogenic Chemotherapy

PO (Adults): 1 mg twice daily; 1st dose given at least 60 min prior to chemotherapy and 2nd dose 12 hr later only on days when chemotherapy is administered; may also be given as 2 mg once daily at least 60 min prior to chemotherapy.
IV (Adults and Children 2–16 yr): 10 mcg/kg within 30 min prior to chemotherapy.

Prevention of Nausea and Vomiting Associated with Radiation Therapy

PO (Adults): 2 mg taken once daily within 1 h of radiation therapy.

Prevention and Treatment of Postoperative Nausea and Vomiting

IV (Adults): *Prevention*—1 mg prior to induction or anesthesia or just prior to reversal of anesthesia; *Treatment*—1 mg.

- CBC and electrolytes should be evaluated every 3–6 mo and then yearly throughout course of therapy. May cause mild decrease in hemoglobin, hematocrit, and leukocyte counts. May cause a decrease in serum potassium concentrations.
- May cause slight increase in serum glucose.

Potential Nursing Diagnoses

Deficient knowledge, related to medication regimen (Patient/Family Teaching)
Noncompliance (Patient/Family Teaching)

Implementation

- **PO:** Administer 30 min before breakfast or dinner.

Patient/Family Teaching

- Instruct patient to take medication exactly as directed, not to skip doses or double up on missed doses. If a dose is missed, take as soon as remembered unless almost time for next dose.
- Advise patient that this medication should be used in conjunction with dietary restrictions (fat, cholesterol, carbohydrates, alcohol), exercise, and cessation of smoking.
- Instruct patient to notify health care professional promptly if any of the following symptoms occur: severe stomach pains with nausea and vomiting, fever, chills, sore throat, rash, diarrhea, muscle cramping, general abdominal discomfort, or persistent flatulence.

Evaluation/Desired Outcomes

- Decrease in serum triglyceride and cholesterol levels and improved HDL to total cholesterol ratios. If response is not seen within 3 mo, medication is usually discontinued.

Why was this drug prescribed for your patient?

NURSING IMPLICATIONS

Assessment

- Assess patient for nausea, vomiting, abdominal distention, and bowel sounds prior to and following administration.
- Assess for extrapyramidal symptoms (involuntary movements, facial grimacing, rigidity, shuffling walk, trembling of hands) during therapy. This occurs rarely and is usually associated with concurrent use of other drugs known to cause this effect.
- ***Lab Test Considerations:*** May cause ↑ AST and ALT levels.

Potential Nursing Diagnoses

Imbalanced nutrition: less than body requirements (Indications)

Implementation

- For chemotherapy or radiation, granisetron is administered only on the day(s) chemotherapy or radiation is given. Continued treatment when not on chemotherapy or radiation therapy has not been found to be useful.
- **PO:** Administer 1st dose up to 1 hr before chemotherapy or radiation therapy and 2nd dose 12 hr after the first.
- 2 tsp oral solution are equal to 2 mg granisetron.
- **Direct IV:** May be administered undiluted or diluted in 20–50 ml of 0.9% NaCl or D5W. Solution should be prepared at time of administration but is stable for 24 hr at room temperature. ***Rate:*** Administer undiluted granisetron over 30 sec or as a diluted solution over 5 min.
- **Syringe Compatibility:** dexamethasone, methylprednisolone.
- **Y-Site Compatibility:** acyclovir, allopurinol, amifostine, amikacin, aminophylline, amphotericin B cholesteryl sulfate, ampicillin, ampicillin-sulbactam, aztreonam, bleomycin, bumetanide, buprenorphine, butorphanol, calcium gluconate, carboplatin, carmustine, cefepime, cefoperazone, cefotaxime, cefotetan, cefoxitin, ceftazidime, ceftizoxime, ceftriaxone, cefuroxime, chlorpromazine, cimetidine, ciprofloxacin, cisplatin, cladribine, clindamycin, cyclophosphamide, cytarabine, dacarbazine, dactinomycin, daunorubicin, dexamethasone, dexmedetomidine, diphenhydramine, dobutamine, docetaxel, dopamine, doxorubicin, doxorubicin liposome, doxycycline, droperidol, enalaprilat, etoposide, etoposide phosphate, famotidine, fenoldopam, filgrastim, floxuridine, fluconazole, fludarabine, fluorouracil, furosemide, ganciclovir, gatifloxacin, gemcitabine, gentamicin, haloperidol, heparin, hydrocortisone, hydromorphone, idarubicin, ifosfamide, imipenem/cilastatin, leucovorin, linezolid, lorazepam, magnesium sulfate, mechlorethamine, melphalan, meperidine, mesna, methotrexate, methylprednisolone, metoclopramide, metronidazole, miconazole, minocycline, mitomycin, mitoxantrone, morphine, nalbuphine, ofloxacin, paclitaxel, piperacillin, piperacillin-tazobactam, potassium chloride, prochlorperazine, promethazine, propofol, ranitidine, sargramostim, sodium bicarbonate, streptozocin, teniposide, thiotepa, ticarcillin, ticarcillin/clavulanate, tobramycin, topotecan, trimethoprim-sulfamethoxazole, vancomycin, vinblastine, vincristine, vinorelbine, zidovudine.
- **Y-Site Incompatibility:** amphotericin B.
- **Additive Incompatibility:** Granisetron should not be admixed with other medications.

Patient/Family Teaching

- Advise patient to notify health care professional immediately if involuntary movement of eyes, face, or limbs occurs.

Evaluation/Desired Outcomes

- Prevention of nausea and vomiting associated with emetogenic cancer chemotherapy or radiation therapy.
- Prevention and treatment of postoperative nausea and vomiting.

Why was this drug prescribed for your patient?

haloperidol (ha-loe-**per**-i-dole)

♣Apo-Haloperidol, Haldol, Haldol Decanoate, ♣Haldol L.A, ♣Novo-Peridol, ♣Peridol

Classification

Therapeutic: antipsychotics
Pharmacologic: butyrophenones

Pregnancy Category C

Indications

Acute and chronic psychotic disorders including schizophrenia, manic states, drug-induced psychoses. Also useful in managing aggressive or agitated patients. Tourette's syndrome. Severe behavioral problems in children which may be accompanied by unprovoked, combative, explosive hyperexcitability, hyperactivity accompanied by conduct disorders (short-term use when other modalities have failed). **Unlabeled uses:** Nausea and vomiting from surgery or chemotherapy.

Action

Alters the effects of dopamine in the CNS. Has anticholinergic and alpha-adrenergic blocking activity. **Therapeutic Effects:** Diminished signs/symptoms of psychoses. Improved behavior.

Pharmacokinetics

Absorption: Well absorbed after oral and IM administration.
Distribution: Concentrates in liver; crosses placenta and enters breast milk.
Metabolism and Excretion: Mostly metabolized by the liver.
Half-life: 21–24 hr.

TIME/ACTION PROFILE (antipsychotic activity)

ROUTE	ONSET	PEAK	DURATION
PO	2 hr	2–6 hr	8–12 hr
IM	20–30 min	30–45 min	4–8 days
IM (decanoate)	3–9 days	unknown	1 mo

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Narrow-angle glaucoma. Bone marrow depression. CNS depression. Severe hepatic or cardiovascular disease. Some products contain tartrazine, sesame oil, or benzyl alcohol and should be avoided in patients with known intolerance or hypersensitivity.
Use Cautiously in: Geriatric or debilitated patients (dosage reduction required); Cardiac disease; Diabetes; Respiratory insufficiency; Prostatic hypertrophy; CNS tumors; Intestinal obstruction; Seizures; Pregnancy and lactation (safety not established).

Adverse Reactions/Side Effects

CNS: SEIZURES, extrapyramidal reactions, confusion, drowsiness, restlessness, tardive dyskinesia. **EENT:** blurred vision, dry eyes. **Resp:** respiratory depression. **CV:** hypotension, tachycardia. **GI:** constipation, dry mouth, anorexia, drug-induced hepatitis, ileus. **GU:** urinary retention. **Derm:** diaphoresis, photosensitivity, rashes. **Endo:** galactorrhea. **Hemat:** anemia, leukopenia. **Metab:** hyperpyrexia. **Misc:** NEUROLEPTIC MALIGNANT SYNDROME, hypersensitivity reactions.

Interactions

Drug-Drug: ↑ hypotension with **antihypertensives, nitrates,** or acute ingestion of **alcohol.** ↑ anticholinergic effects with **drugs having anticholinergic properties,** including **antihistamines, antidepressants, atropine, phenothiazines, quinidine,** and **disopyramide.** ↑ CNS depression with other **CNS depressants,** including **alcohol, antihistamines, opioid analgesics,** and **sedative/hypnotics.** Concurrent use with **epinephrine** may result in severe hypotension and tachycardia. May ↓

♣ = Canadian drug name.

* CAPITALS indicates life-threatening, underlines indicate most frequent.

CONTINUED

haloperidol

- Use calibrated measuring device for accurate dosage. Do not dilute concentrate with coffee or tea; may cause precipitation. Should be given undiluted, but if necessary may dilute in at least 60 ml of liquid.
- **IM:** Inject slowly, using 2-in., 21-gauge needle into well-developed muscle via Z-track technique. Do not exceed 3 ml per injection site. Slight yellow color does not indicate altered potency. Keep patient recumbent for at least 30 min following injection to minimize hypotensive effects.
- **Direct IV:** May be administered undiluted for rapid control of acute psychosis or delirium. ***Rate:*** Administer at a rate of 5 mg/min.
- **Intermittent Infusion:** May be diluted in 30–50 ml of D5W. ***Rate:*** Infuse over 30 min.
- **Syringe Compatibility:** hydromorphone, lorazepam, sufentanil.
- **Syringe Incompatibility:** diphenhydramine, heparin, hydroxyzine, ketorolac.
- **Y-Site Compatibility:** amifostine, aztreonam, cimetidine, cisatracurium, cladribine, dobutamine, docetaxel, dopamine, doxorubicin liposome, etoposide phosphate, famotidine, fentanyl, filgrastim, fludarabine, gatifloxacin, gemcitabine, granisetron, hydromorphone, lidocaine, linezolid, lorazepam, melphalan, methadone, midazolam, nitroglycerin, norepinephrine, ondansetron, paclitaxel, phenylephrine, propofol, remifentanil, sufentanil, tacrolimus, teniposide, theophylline, thiotepa, vinorelbine.
- **Y-Site Incompatibility:** allopurinol, amphotericin B cholesteryl sulfate complex, cefepime, fluconazole, foscarnet, heparin, piperacillin/tazobactam, sargramostim.

- Advise patient to take medication as directed. Take missed doses as soon as remembered, with remaining doses evenly spaced throughout the day. May require several weeks to obtain desired effects. Do not increase dose or discontinue medication without consulting health care professional. Abrupt withdrawal may cause dizziness; nausea; vomiting; GI upset; trembling; or uncontrolled movements of mouth, tongue, or jaw.
- Inform patient of possibility of extrapyramidal symptoms and tardive dyskinesia. Caution patient to report symptoms immediately.
- Advise patient to change positions slowly to minimize orthostatic hypotension.
- May cause drowsiness. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Caution patient to avoid taking alcohol or other CNS depressants concurrently with this medication.
- Advise patient to use sunscreen and protective clothing when exposed to the sun to prevent photosensitivity reactions. Extremes of temperature should also be avoided, because this drug impairs body temperature regulation.
- Instruct patient to use frequent mouth rinses, good oral hygiene, and sugarless gum or candy to minimize dry mouth.
- Advise patient to notify health care professional of medication regimen prior to treatment or surgery.
- Instruct patient to notify health care professional promptly if weakness, tremors, visual disturbances, dark-colored urine or clay-colored stools, sore throat, or fever is noted.
- Emphasize the importance of routine follow-up exams.

Evaluation/Desired Outcomes

- Decrease in hallucinations, insomnia, agitation, hostility, and delusions.
- Decreased tics and vocalization in Tourette's syndrome. If no therapeutic effects are seen in 2–4 wk, dosage may be increased.

♣ = Canadian drug name.

* CAPITALS indicates life-threatening, underlines indicate most frequent.

therapeutic effects of **levodopa** or **pergolide**. Acute encephalopathic syndrome may occur when used with **lithium**. Dementia may occur with **methyldopa**.

Drug-Natural Products: Kava, valerian, or **chamomile** can ↑ CNS depression.

Route/Dosage

Haloperidol

PO (Adults): 0.5–5 mg 2–3 times daily. Patients with severe symptoms may require up to 100 mg/day.

PO (Geriatric Patients or Debilitated Patients): 0.5 mg–2 mg twice daily initially; may be gradually increased as needed.

PO (Children 3–12 yr or 15–40 kg): 50 mcg/kg/day in 2–3 divided doses; may increase by 500 mcg (0.5 mg)/day q 5–7 days as needed (up to 75 mcg/kg/day for nonpsychotic disorders or Tourette's syndrome or 150 mcg/kg/day for psychoses).

IM (Adults): 2–5 mg q 1–8 hr (not to exceed 100 mg/day).

IV (Adults): 0.5–5 mg, may be repeated q 30 min (unlabeled).

Haloperidol Decanoate

IM (Adults): 10–15 times the previous daily PO dose, but not to exceed 100 mg initially, given monthly (not to exceed 300 mg/mo).

NURSING IMPLICATIONS

Assessment

- Assess mental status (orientation, mood, behavior) prior to and periodically during therapy.
- Monitor blood pressure (sitting, standing, lying) and pulse prior to and frequently during the period of dosage adjustment. May cause QT interval changes on ECG.
- Observe patient carefully when administering medication, to ensure that medication is actually taken and not hoarded.
- Monitor intake and output ratios and daily weight. Assess patient for signs and symptoms of dehydration (decreased thirst, lethargy, hemoconcentration), especially in geriatric patients.
- Assess fluid intake and bowel function. Increased bulk and fluids in the diet help minimize constipating effects.
- Monitor patient for onset of akathisia (restlessness or desire to keep moving), which may appear within 6 hr of 1st dose and may be difficult to distinguish from psychotic agitation; benztropine may be used to differentiate. Observe closely for extrapyramidal side effects (*parkinsonian*—difficulty speaking or swallowing, loss of balance control, pill rolling, mask-like face, shuffling gait, rigidity, tremors; and *dystonic*—muscle spasms, twisting motions, twitching, inability to move eyes, weakness of arms or legs).
- Monitor for tardive dyskinesia (uncontrolled rhythmic movement of mouth, face, and extremities; lip smacking or puckering; puffing of cheeks; uncontrolled chewing; rapid or worm-like movements of tongue). Report immediately; may be irreversible.
- Monitor for development of neuroleptic malignant syndrome (fever, respiratory distress, tachycardia, seizures, diaphoresis, hypertension or hypotension, pallor, tiredness, severe muscle stiffness, loss of bladder control). Report symptoms immediately. May also cause leukocytosis, elevated liver function tests, elevated CPK.
- ***Lab Test Considerations:*** Monitor CBC with differential and liver function tests periodically during therapy.

Potential Nursing Diagnoses

Disturbed thought process (Indications)

Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- Avoid skin contact with oral solution; may cause contact dermatitis.
- **PO:** Administer with food or full glass of water or milk to minimize GI irritation.

CONTINUED

Why was this drug prescribed for your patient?

High Alert

heparin (hep-a-rin)

♣Calcilean, ♣Calciparine, ♣Hepalean, ♣Heparin Leo, Hep-Lock, Hep-Lock U/P

Classification

Therapeutic: anticoagulants
Pharmacologic: antithrombotics

Pregnancy Category C

Indications

Prophylaxis and treatment of various thromboembolic disorders including Venous thromboembolism, Pulmonary emboli, Atrial fibrillation with embolization, Acute and chronic consumptive coagulopathies, Peripheral arterial thromboembolism. Used in very low doses (10–100 units) to maintain patency of IV catheters (heparin flush).

Action

Potentiates the inhibitory effect of antithrombin on factor Xa and thrombin. In low doses prevents the conversion of prothrombin to thrombin by its effects on factor Xa. Higher doses neutralize thrombin, preventing the conversion of fibrinogen to fibrin. **Therapeutic Effects:** Prevention of thrombus formation. Prevention of extension of existing thrombi (full dose).

Pharmacokinetics

Absorption: Well absorbed following subcut administration.
Distribution: Does not cross the placenta or enter breast milk.
Protein Binding: Very high (to low-density lipoproteins, globulins, and fibrinogen).
Metabolism and Excretion: Probably removed by the reticuloendothelial system (lymph nodes, spleen).
Half-life: 1–2 hr (increases with increasing dosage).

TIME/ACTION PROFILE (anticoagulant effect)

ROUTE	ONSET	PEAK	DURATION
Heparin subcut	20–60 min	2 hr	8–12 hr
Heparin IV	immediate	5–10 min	2–6 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Hypersensitivity to pig or beef proteins (some products are derived from pig intestinal mucosa, others from beef lung). Uncontrolled bleeding. Severe thrombocytopenia. Open wounds (full dose). Products containing benzyl alcohol should not be used in premature infants.
Use Cautiously in: Severe liver or kidney disease; Retinopathy (hypertensive or diabetic); Untreated hypertension; Ulcer disease; Spinal cord or brain injury; History of congenital or acquired bleeding disorder; Malignancy; Women >60 yr (increased risk of bleeding); May be used during pregnancy, but use with caution during the last trimester and in the immediate postpartum period
Exercise Extreme Caution in: Severe uncontrolled hypertension; Bacterial endocarditis, bleeding disorders; GI bleeding/ulceration/pathology; Hemorrhagic stroke; Recent CNS or ophthalmologic surgery; Active GI bleeding/ulceration; History of thrombocytopenia related to heparin.

Adverse Reactions/Side Effects

GI: drug-induced hepatitis. **Derm:** alopecia (long-term use), rashes, urticaria. **Hemat:** BLEEDING, anemia, thrombocytopenia. **Local:** pain at injection site. **MS:** osteoporosis (long-term use). **Misc:** fever, hypersensitivity.

Interactions

Frequently used concurrently sequentially with other agents affecting coagulation. Risk of serious interactions is greatest with full anticoagulation
Drug-Drug: Risk of bleeding may be ↑ by concurrent use of **drugs that affect platelet function,** including **aspirin, dextran, dipyridamole, NSAIDs,** some **penicillins,** and **ticlopidine, abciximab, eptifibitide,**

♣ = Canadian drug name.

* CAPITALS indicates life-threatening, underlines indicate most frequent.

CONTINUED

heparin

- May also cause hyperkalemia and elevated AST and ALT levels.
- ***Toxicity and Overdose:*** Protamine sulfate is the antidote. However, because of heparin's short half-life, overdose can often be treated by withdrawing the drug.

Potential Nursing Diagnoses

Ineffective tissue perfusion (Indications)
Risk for injury (Side Effects)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- ***High Alert:*** Unintended concomitant use of two heparin products (unfractionated heparin and LMW heparins) has resulted in serious harm or death. Review patients' recent (emergency department, operating room) and current medication administration records before administering any heparin or LMW heparin product. Dosage calculation and infusion pump programming errors have also occurred. Have second practitioner independently check original order, dose calculation and infusion pump settings. Do not confuse heparin with Hespan (hetastarch in sodium chloride). Do not confuse vials of heparin with vials of insulin.
- Inform all personnel caring for patient of anticoagulant therapy. Venipunctures and injection sites require application of pressure to prevent bleeding or hematoma formation. IM injections of other medications should be avoided, because hematomas may develop.
- Dose of heparin should be checked with a second licensed professional prior to administration.
- In patients requiring long-term anticoagulation, oral anticoagulant therapy should be instituted 4–5 days prior to discontinuing heparin therapy.
- Solution is colorless to slightly yellow.
- **Subcut:** Administer deep into subcut tissue. Alternate injection sites between the left and right abdominal wall above the iliac crest. Inject entire length of needle at a 45° or 90° angle into a skin fold held between thumb and forefinger; hold skin fold throughout injection. Do not aspirate or massage. Rotate sites frequently. Do not administer IM because of danger of hematoma formation. Solution should be clear; do not inject solution containing particulate matter.
- **Direct IV:** Loading dose usually precedes continuous infusion. ***Rate:*** May be given undiluted over at least 1 min.
- **Intermittent Infusion, Continuous Infusion:** Dilute in prescribed amount of 0.9% NaCl, D5W, or Ringer's solution for injection and give as a continuous or intermittent infusion. Ensure adequate mixing of heparin in solution by inverting container at least 6 times initially and periodically mixing during infusing. ***Rate:*** Infusion may be administered over 4–24 hr. Use an infusion pump to ensure accuracy.
- **Flush:** To prevent clot formation in intermittent infusion (heparin lock) sets, inject dilute heparin solution of 10–100 units/0.5–1 ml after each medication injection or every 8–12 hr. To prevent incompatibility of heparin with medication, flush lock set with sterile water or 0.9% NaCl for injection before and after medication is administered.
- **Syringe Compatibility:** aminophylline, amphotericin B, ampicillin, atropine, bleomycin, cefazolin, cefoperazone, cefotaxime, cefoxitin, chloramphenicol, cimetidine, cisplatin, clindamycin, cyclophosphamide, diazoxide, digoxin, dimenhydrinate, epinephrine, fentanyl, fluorouracil, furosemide, leucovorin, lidocaine, methotrexate, metoclopramide, mitomycin, nafcillin, naloxone, neostigmine, pancuronium, penicillin G, phenobarbital, piperacillin, succinylcholine, trimethoprim/sulfamethoxazole, verapamil, vincristine.
- **Syringe Incompatibility:** amikacin, amiodarone, chlorpromazine, diazepam, doxorubicin, droperidol, erythromycin lactobionate, gentami-

♣ = Canadian drug name.

* CAPITALS indicates life-threatening, underlines indicate most frequent.

and **tirofiban.** Risk of bleeding may be ↑ by concurrent use of **drugs that cause hypoprothrombinemia,** including, **cefoperazone, cefotetan, quinidine,** and **valproic acid.** Concurrent use of **thrombolytic agents** ↑ the risk of bleeding. Heparin affects the prothrombin time used in assessing the response to **warfarin. Antihistamines, digoxin, smoking,** and **tetracyclines** may ↓ the anticoagulant effect of heparin. **Streptokinase** may be followed by relative resistance to heparin.

Drug-Natural Products: Increased risk of bleeding with **arnica, anise, chamomile, clove, dong quai, fever few, garlic, ginger,** and **Panax ginseng.**

Route/Dosage

Therapeutic Anticoagulation

IV (Adults): *Intermittent boluses*—10,000 units, followed by 5000–10,000 units q 4–6 hr. *Continuous infusion*—5000 units (35–70 units/kg), followed by 20,000–40,000 units infused over 24 hr (approx. 1000 units/hr or 15–18 units/kg/hr).

IV (Children): *Intermittent boluses*—50 units/kg, followed by 50–100 units/kg q 4 hr. *Continuous Infection*—50 units/kg, followed by 100 units/kg/4 hr or 20,000 units/m²/24 hr.

Subcut: (Adults): 5000 units IV, followed by initial subcut dose of 10,000–20,000 units, then 8000–10,000 units q 8 hr, or 15,000–20,000 units q 12 hr.

Prophylaxis of Thromboembolism

Subcut: (Adults): 5000 units q 8–12 hr (may be started 2 hr before surgery).

Cardiovascular Surgery

IV (Adults): At least 150 units/kg (300 units/kg if procedure <60 min; 400 units/kg if >60 min).

"Flush"

IV (Adults and Children): 10–100 units/ml solution to fill heparin lock set to needle hub, replace after each use.

NURSING IMPLICATIONS

Assessment

- **Assess patient for signs of bleeding and hemorrhage (bleeding gums; nosebleed; unusual bruising; black, tarry stools; hematuria; fall in hematocrit or blood pressure; guaiac-positive stools). Notify physician if these occur.**
- Assess patient for evidence of additional or increased thrombosis. Symptoms will depend on area of involvement.
- Monitor patient for hypersensitivity reactions (chills, fever, urticaria). Report signs to physician.
- **Subcut:** Observe injection sites for hematomas, ecchymosis, or inflammation.
- ***Lab Test Considerations:*** Activated partial thromboplastin time (aPTT) and hematocrit should be monitored prior to and periodically throughout therapy. When *intermittent IV* therapy is used, draw aPTT levels 30 min before each dose during initial therapy and then periodically. During *continuous* administration, monitor aPTT levels every 4 hr during early therapy. For *Subcut* therapy, draw blood 4–6 hr after injection.
- Monitor platelet count every 2–3 days throughout therapy. May cause mild thrombocytopenia, which appears on 4th day and resolves despite continued heparin therapy. Thrombocytopenia, which necessitates discontinuing medication, may develop on 8th day of therapy. Patients who have received a previous course of heparin may be at higher risk for severe thrombocytopenia for several months after the initial course.
- May cause prolonged PT levels, elevations of serum thyroxine, T resin and false-negative 121 fibrinogen uptake tests.
- May cause decreased serum triglyceride and cholesterol levels and increased plasma free fatty acid concentrations.

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cin, haloperidol, kanamycin, meperidine, pentazocine, promethazine, streptomycin, tobramycin, triflupromazine, vancomycin, warfarin.

- **Y-Site Compatibility:** acyclovir, aldesleukin, allopurinol, amifostine, aminophylline, ampicillin, ampicillin/sulbactam, atracurium, atropine, aztreonam, betamethasone, bleomycin, calcium gluconate, cefazolin, cefotetan, ceftazidime, ceftriaxone, cephapirin, chlordiazepoxide, chlorpromazine, cimetidine, cisplatin, cladribine, clindamycin, conjugated estrogens, cyanocobalamin, cyclophosphamide, cytarabine, dexamethasone, digoxin, diphenhydramine, dopamine, doxorubicin liposome, edrophonium, enalaprilat, epinephrine, erythromycin lactobionate, esmolol, ethacrynate, famotidine, fentanyl, fluconazole, fludarabine, fluorouracil, foscarnet, furosemide, hydralazine, hydrocortisone, hydromorphone, insulin, isoproterenol, kanamycin, leucovorin, lidocaine, lorazepam, magnesium sulfate, melphalan, meperidine, meropenem, methotrexate, methoxamine, methyldopate, methylergonovine, metoclopramide, metronidazole, midazolam, milrinone, minocycline, mitomycin, morphine, nafcillin, neostigmine, nitroglycerin, nitroprusside, norepinephrine, ondansetron, oxacillin, oxytocin, paclitaxel, pancuronium, penicillin G potassium, pentazocine, piperacillin, piperacillin/tazobactam, potassium chloride, prednisolone, procainamide, prochlorperazine, propofol, propranolol, pyridostigmine, ranitidine, remifentanil, sargramostim, scopolamine, sodium bicarbonate, streptokinase, succinylcholine, tacrolimus, teniposide, theophylline, thiotepa, ticarcillin, ticarcillin/clavulanate, trimethobenzamide, trimethophan camsylate, vecuronium, vinblastine, vincristine, vinorelbine, warfarin, zidovudine.
- **Y-Site Incompatibility:** alteplase, amiodarone, amphotericin B cholesteryl, ciprofloxacin, diazepam, doxycycline, ergotamine tartrate, filgrastim, gentamicin, haloperidol, idarubicin, phenytoin, tobramycin, triflupromazine, vancomycin.
- **Additive Compatibility:** It is recommended that heparin not be mixed in solution with other medications when given for anticoagulation, even those that are compatible, because changes in rate of heparin infusion may be required that would also affect admixtures. If heparin is added to an admixture, the following drugs are compatible:, aminophylline, amphotericin, calcium gluconate, cefepime, chloramphenicol, clindamycin, colistimethate, dopamine, erythromycin gluceptate, fluconazole, flumazenil, furosemide, lidocaine, magnesium sulfate, meropenem, methyldopate, methylprednisolone, nafcillin, octreotide, potassium chloride, prednisolone, ranitidine, sodium bicarbonate, verapamil, vitamin B complex, vitamin B complex with C. Also compatible with TPN solutions or fat emulsion.
- **Additive Incompatibility:** alteplase, amikacin, ciprofloxacin, cytarabine, daunorubicin, erythromycin lactobionate, gentamicin, hyaluronidase, kanamycin, meperidine, methadone, morphine, polymyxin B, streptomycin.

Patient/Family Teaching

- **Advise patient to report any symptoms of unusual bleeding or bruising to health care professional immediately.**
- Instruct patient not to take medications containing aspirin or NSAIDs while on heparin therapy.
- Caution patient to avoid IM injections and activities leading to injury and to use a soft toothbrush and electric razor during heparin therapy.
- Advise patient to inform health care professional of medication regimen prior to treatment or surgery.
- Patients on anticoagulant therapy should carry an identification card with this information at all times.

Evaluation/Desired Outcomes

- Prolonged PTT of 1.5–2.5 times the control, without signs of hemorrhage.
- Prevention of deep vein thrombosis and pulmonary emboli.
- Patency of IV catheters.

Why was this drug prescribed for your patient?

High Alert

HEPARINS (LOW MOLECULAR WEIGHT)/HEPARINOIDS

dalteparin (dal-**te**-pa-rin)
Fragmin

enoxaparin (e-nox-a-**pa**-rin)
Lovenox

tinzaparin (tin-za-**pa**-rin)

Classification
Therapeutic: anticoagulants
Pharmacologic: antithrombotics

Pregnancy Category B

Indications

Prevention of deep vein thrombosis (DVT) and pulmonary embolism (PE) after abdominal surgery, knee/hip surgery or replacement. **Enoxaparin and dalteparin only:** Prevention of ischemic complications (with aspirin) from unstable angina/non–Q–wave MI, non–Q–wave MI, **Enoxaparin and dalteparin:** Prevention/treatment of DVT in patients at risk for thromboembolic complications due to severely restricted mobility during acute illness.

Action

Potentiate the inhibitory effect of antithrombin on factor Xa and thrombin.
Therapeutic Effects: Prevention of thrombus formation.

Pharmacokinetics

Absorption: Well absorbed after subcut administration (87% for dalteparin, 92% for enoxaparin).
Distribution: Unknown.

Metabolism and Excretion: *Dalteparin*—unknown; *enoxaparin*—weakly metabolized by the liver; renally eliminated; *tinzaparin*—partially metabolized, elimination is primarily renal.
Half-life: *Dalteparin*—2.1–2.3 hr (increased in renal insufficiency); *enoxaparin*—3–6 hr; *tinzaparin*—3.9 hr.

TIME/ACTION PROFILE (anticoagulant effect)

ROUTE	ONSET	PEAK	DURATION
Dalteparin subcut	rapid	4 hr	up to 24 hr
Enoxaparin subcut	unknown	unknown	12 hr
Tinzaparin subcut	rapid	4–6 hr	24 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity to specific agents or pork products; cross-sensitivity may occur. Uncontrolled bleeding. Some products contain sulfites or benzyl alcohol and should be avoided in patients with known hypersensitivity or intolerance. Active major bleeding. Thrombocytopenia associated with the presence of anti-platelet antibodies associated with low-molecular weight heparins. *Tinzaparin*—history of heparin-induced thrombocytopenia. *Dalteparin*—regional anesthesia during treatment for unstable angina/non-Q wave MI.
Use Cautiously in: Severe liver or kidney disease (adjust dose of enoxaparin if CCr <30 ml/min); Weight <45 kg (adjust dose of enoxaparin); Retinopathy (hypertensive or diabetic); Untreated hypertension; Geriatric patients (consider body size, age-related decreased in hepatic/renal/cardiovascular function and concurrent medications); Recent history of ulcer disease; History of congenital or acquired bleeding disorder; Malignancy; Pregnancy, lactation, or children (safety not established)
Exercise Extreme Caution in: Severe uncontrolled hypertension; Bacterial endocarditis, bleeding disorders; GI bleeding/ulceration/pathology; Hemorrhagic stroke; Recent CNS or ophthalmologic surgery; Active GI bleeding/ulceration; History of thrombocytopenia related to heparin; Spinal/epidural anesthesia (increased risk of spinal/epidural hematomas, es-

CONTINUED

HEPARINS (LOW MOLECULAR WEIGHT)/HEPARINOIDS

continued for 5–10 days; *prophylaxis of deep vein thrombosis in patients undergoing orthopedic procedures (unlabeled)*—75 anti-Xa units/kg daily starting 12–24 hr after surgery; doses of 4500 anti-Xa units 12 hr before surgery and following surgery have also been used (unlabeled).

NURSING IMPLICATIONS

Assessment

- Assess for signs of bleeding and hemorrhage (bleeding gums; nosebleed; unusual bruising; black, tarry stools; hematuria; fall in hematocrit or blood pressure; guaiac-positive stools); bleeding from surgical site. Notify physician if these occur.
- Assess for evidence of additional or increased thrombosis. Symptoms depend on area of involvement. Monitor neurological status frequently for signs of neurological impairment. May require urgent treatment.
- Monitor for hypersensitivity reactions (chills, fever, urticaria). Report signs to physician.
- Monitor patients with epidural catheters frequently for signs and symptoms of neurologic impairment.
- **Subcut:** Observe injection sites for hematomas, ecchymosis, or inflammation.
- ***Lab Test Considerations:*** Monitor CBC, platelet count, and stools for occult blood periodically during therapy. If thrombocytopenia occurs, monitor closely. If hematocrit ↓ unexpectedly, assess patient for potential bleeding sites. In patients receiving *fondaparinux or tinzaparin*, if platelet count is <100,000/mm³, discontinue *fondaparinux or tinzaparin*.
- *Fondaparinux* is not accurately measured by prothrombin time (PT), activated thromboplastin time (aPTT), or international standards of heparin or low–molecular–weight heparins. If unexpected changes in coagulation parameters or major bleeding occur, discontinue fondaparinux.
- Special monitoring of clotting times (aPTT) is not necessary. Patients receiving both *tinzaparin* and warfarin should have blood for PT/INR drawn just prior to the next scheduled dose of *tinzaparin*.
- May cause ↑ in AST and ALT levels.
- ***Toxicity and Overdose:*** For *enoxaparin* overdose, protamine sulfate 1 mg for each mg of *enoxaparin* should be administered by slow IV injection. For *dalteparin* overdose, protamine sulfate 1 mg for each 100 anti–factor Xa IU of *dalteparin* should be administered by slow IV injection. If the aPTT measured 2–4 hr after protamine administration remains prolonged, a 2nd infusion of protamine 0.5 mg/100 anti–factor Xa IU of *dalteparin* may be administered.

Potential Nursing Diagnoses

Ineffective tissue perfusion (Indications)
Risk for injury (Side Effects)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- ***High Alert:*** Unintended concomitant use of two heparin products (unfractionated heparin and LMW heparins) has resulted in serious harm and death. Review patients' recent and current medication administration records before administering any heparin or LMW heparin product.
- Cannot be used interchangeably (unit for unit) with unfractionated heparin or other low-molecular-weight heparins.
- **Subcut:** Administer deep into subcut tissue. Alternate injection sites daily between the left and right anterolateral and left and right posterolateral abdominal wall, the upper thigh, or buttocks. Inject entire length of needle at a 45° or 90° angle into a skin fold held between thumb and forefinger; hold skin fold throughout injection. Do not aspirate or massage. Ro-

pecially with concurrent NSAIDs, repeated or traumatic epidural puncture, or indwelling epidural catheter).

Adverse Reactions/Side Effects

CNS: dizziness, headache, insomnia. **CV:** edema. **GI:** constipation, nausea, reversible increase in liver enzymes, vomiting. **GU:** urinary retention. **Derm:** ecchymoses, pruritus, rash, urticaria. **Hemat:** BLEEDING, anemia, thrombocytopenia. **Local:** erythema at injection site, hematoma, irritation, pain. **Misc:** fever.

Interactions

Drug-Drug: Risk of bleeding may be ↑ by concurrent use of **warfarin** or **drugs that affect platelet function**, including **aspirin**, **NSAIDs**, **dipyridamole**, some **penicillins**, **clopidogrel**, **ticlopidine**, **abciximab**, **eftifibatide**, **tirofiban**, and **dextran**.

Drug-Natural Products: ↑ bleeding risk with **anise**, **arnica**, **chamomile**, **clove**, **feverfew**, **garlic**, **ginger**, **ginkgo**, **Panax ginseng**, and others.

Route/Dosage

Dalteparin

Subcut: (Adults): *Prophylaxis of DVT before abdominal surgery*—2500 IU 1–2 hr before surgery, then once daily for 5–10 days; *prophylaxis of DVT in high-risk patients undergoing abdominal surgery*—5000 IU evening before surgery, then once daily for 5–10 days *or* 2500 IU 1–2 hr before surgery, another 2500 IU 12 hr later, then 5000 IU daily for 5–10 days; *prophylaxis of DVT in patients undergoing hip replacement surgery*—2500 IU within 2 hr before surgery, another 2500 IU evening of the day of surgery ≥6 hr after first dose, then 5000 IU daily for 5–10 days (if surgery is in the evening, omit second dose day of surgery) *or* 5000 IU evening before surgery, then 5000 IU daily for 5–10 days; *medical patients with severely restricted mobility*: 5000 IU for 12 to 14 days. *angina/non–Q-wave MI*—120 IU/kg (not to exceed 10,000 IU) q 12 hr with concurrent aspirin (75–165 mg/day); *systemic anticoagulation (unlabeled)*—200 IU/kg once daily or 100 IU/kg twice daily.

Enoxaparin

Subcut (Adults): *DVT prophylaxis before knee/hip surgery*—30 mg every 12 hr for knee replacement surgery starting 12–24 hr postop, 40 mg every 12 hr for hip surgery starting 12 before surgery, then continued for up to 3 wk; *DVT prophylaxis before abdominal surgery*—40 mg once daily starting 2 hr before surgery and then every 24 hr postop for 7–10 days or until ambulatory (up to 14 days); *treatment of DVT/PE*—1 mg/kg every 12 hr or 1.5 mg/kg q 24 hr; *angina/non–Q-wave MI*—1 mg/kg q 12 hr (with aspirin 100–325 mg/day) for 2–8 days.

Fondaparinux

Treatment of DVT/PE

Subcut (Adults): *<50 kg* 5 mg once daily for at least 5 days until therapeutic anticoagulation (INR 2–3) is achieved; warfarin may be started within 72 hr of fondaparinux (has been used for up to 26 days). *50–100 kg* 7.5 mg once daily for at least 5 days until therapeutic anticoagulation (INR 2–3) is achieved; *>100 kg* 10 mg once daily for at least 5 days until therapeutic anticoagulation (INR 2–3) is achieved; warfarin may be started within 72 hr of fondaparinux (has been used for up to 26 days).

Prevention of DVT/PE

Subcut (Adults): 2.5 mg once daily, starting 6–8 hr after surgery, continuing for 5–9 days (up to 11 days) following abdominal surgery or knee/hip replacement or continuing for 24 days following hip fracture surgery (up to 32 days).

Tinzaparin

Subcut (Adults): *Treatment of deep vein thrombosis*—175 anti-Xa IU/kg once daily for at least 6 days and until adequate anticoagulation is achieved with warfarin; *prophylaxis of deep vein thrombosis*—3500 anti-Xa units (50 anti-Xa units/kg) once daily started 1–2 hr prior to surgery and

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tate sites frequently. Do not administer IM because of danger of hematoma formation. Solution should be clear; do not inject solution containing particulate matter.

- If excessive bruising occurs, ice cube massage of site before injection may lessen bruising.
- **Enoxaparin:** To avoid the loss of drug, do not expel the air bubble from the syringe before the injection.
- Per manufacturer's recommendations, to enhance absorption, inject enoxaparin into left or right anterolateral or posterolateral abdominal wall only.
- To minimize risk of bleeding after vascular instrumentation for unstable angina, recommended intervals between doses should be followed closely. Leave vascular access sheath in place for 6–8 hr after enoxaparin dose. Give next enoxaparin dose ≥6–8 hr after sheath removal. Observe site for bleeding or hematoma formation.
- **Fondaparinux:** Fondaparinux cannot be used interchangeably with heparin, low–molecular–weight heparins, or heparinoids as they differ in manufacturing process, anti-Xa and anti-IIa activity, units, and dosage. Each of these medications has its own instructions for use.
- Initial dose should be administered 6-8 hr after surgery. Administration before 6 hr after surgery has been associated with risk of major bleeding.
- Fondaparinux is provided in a single-dose prefilled syringe with an automatic needle protection system. Do not expel air bubble from prefilled syringe before injection to prevent loss of drug.
- **Tinzaparin:** Tinzaparin should be administered daily for at least 6 days and until patient is adequately anticoagulated with warfarin (INR at least 2.0 for 2 consecutive days). Warfarin therapy should be started within 1–3 days of tinzaparin initiation.
- Solution is clear and colorless to slightly yellow; do not administer solutions that are discolored or contain particulate matter.
- Multiple dose vial contains benzyl alcohol; use with caution in pregnant women.

Patient/Family Teaching

- Advise patient to report any symptoms of unusual bleeding or bruising, dizziness, itching, rash, fever, swelling, or difficulty breathing to health care professional immediately.
- Instruct patient not to take aspirin or NSAIDs without consulting health care professional while on therapy.

Evaluation/Desired Outcomes

- Prevention of deep vein thrombosis and pulmonary emboli.
- Treatment of deep vein thrombosis and pulmonary embolism.
- Prevention of ischemic complications (with aspirin) in patients with unstable angina or non-Q-wave MI.

Why was this drug prescribed for your patient?

HISTAMINE H_2 ANTAGONISTS

cimetidine (sye-**me**-ti-deen)
♣Apo-Cimetidine, ♣Novocimetine, ♣Peptol, Tagamet, Tagamet HB

famotidine (fa-**moe**-ti-deen)
Maximum Strength Pepcid, Mylanta AR, Pepcid, Pepcid AC, Pepcid AC Acid Controller, Pepcid RPD

nizatidine (ni-**za**-ti-deen)
Axid, Axid AR

ranitidine (ra-**ni**-ti-deen)
Apo-Ranitidine, Zantac, ♣Zantac-C, Zantac 75

ranitidine bismuth citrate (ra-**ni**-ti-deen**biss**-muth**sye**-trate)
Tritec

Classification
Therapeutic: antiulcer agents
Pharmacologic: histamine H2 antagonists

Pregnancy Category B, C (ranitidine bismuth citrate [with clarithromycin])

Indications

Short-term treatment of active duodenal ulcers and benign gastric ulcers. Prophylaxis of duodenal ulcers (at lower doses). Management of gastroesophageal reflux disease (GERD). Treatment and prevention of heartburn, acid indigestion, and sour stomach (OTC use). **Cimetidine, famotidine, ranitidine:** Management of gastric hypersecretory states (Zollinger-Ellison syndrome). **Cimetidine, famotidine, ranitidine IV:** Prevention and treatment of stress-induced upper GI bleeding in critically ill patients. **Ranitidine bismuth citrate:** With clarithromycin to eradicate *Helicobacter pylori* in the treatment of duodenal ulcers (should not be used alone to treat duodenal ulcers). **Unlabeled uses:** Management of GI symptoms associated with the use of NSAIDs. Prevention of stress ulceration or aspiration pneumonitis. Prevention of acid inactivation of supplemental pancreatic enzymes in patients with pancreatic insufficiency. Management of urticaria.

Action

Inhibits the action of histamine at the H_2-receptor site located primarily in gastric parietal cells, resulting in inhibition of gastric acid secretion. In addition, ranitidine bismuth citrate has some antibacterial action against *H. pylori*. **Therapeutic Effects:** Healing and prevention of ulcers. Decreased symptoms of gastroesophageal reflux. Decreased secretion of gastric acid.

Pharmacokinetics

Absorption: *Cimetidine*—well absorbed after oral and IM administration. *Famotidine*—40–45% absorbed after oral administration. *Nizatidine*—70–95% absorbed after oral administration. *Ranitidine*—50% absorbed after PO and IM administration. *Ranitidine bismuth citrate*—splits into ranitidine and bismuth in the GI tract; bismuth is not absorbed.
Distribution: All agents enter breast milk and cerebrospinal fluid.
Metabolism and Excretion: *Cimetidine*—30% metabolized by the liver; remainder is eliminated unchanged by the kidneys. *Famotidine*—up to 70% excreted unchanged by the kidneys, 30–35% metabolized by the liver. *Nizatidine*—60% excreted unchanged by the kidneys; some hepatic metabolism; at least 1 metabolite has histamine-blocking activity. *Ranitidine*—metabolized by the liver, mostly on first pass; 30% excreted unchanged by the kidneys after PO administration, 70–80% after parenteral administration.
Half-life: *Cimetidine*—2 hr; *famotidine*—2.5–3.5 hr; *nizatidine*—1.6 hr; *ranitidine*—1.7–3 hr (all are increased in renal impairment).

TIME/ACTION PROFILE

ROUTE	ONSET	PEAK	DURATION
Cimetidine PO	30 min	45–90 min	4–5 hr
Cimetidine IM, IV	10 min	30 min	4–5 hr
Famotidine PO	within 60 min	1–4 hr	6–12 hr

♣ = Canadian drug name.

* CAPITALS indicates life-threatening, underlines indicate most frequent.

CONTINUED

HISTAMINE H_2 ANTAGONISTS

mg twice daily for up to 12 wk for esophagitis with erosions, ulcerations, and continuing symptoms. *Gastric hypersecretory conditions*—20 mg q 6 hr initially, up to 160 mg q 6 hr. *Prophylaxis of aspiration pneumonitis*—40 mg night before or morning of surgery (unlabeled). *OTC use*—10 mg for relief of symptoms; for prevention—10 mg 60 min before eating or take 10 mg as chewable tablet 15 minutes before heartburn-inducing foods or beverages (not to exceed 20 mg/24 hr for up to 2 wk).
PO (Children 1–16 yr): *Peptic ulcer*—0.5 mg/kg/day as a single bedtime dose or in divided doses twice daily (up to 40 mg daily); *GERD*—1 mg/kg/day in divided doses twice daily (up to 40 mg twice daily); *GERD*—1—2 mg/kg/day in 2 divided doses for patients >10 kg or 3 divided doses for patients <10 kg (up to 40 mg twice daily).
IV (Adults): 20 mg q 12 hr.

Nizatidine

PO (Adults): *Short-term treatment of active ulcers*—300 mg once daily at bedtime or 150 mg twice daily. *Duodenal ulcer prophylaxis*—150 mg once daily at bedtime. *GERD*—150 mg twice daily. *OTC use*—75 mg 0–60 min before foods or beverages expected to cause symptoms.

Ranitidine

PO (Adults): *Short-term treatment of active ulcers*—100–150 mg twice daily *or* 300 mg once daily at bedtime. *Duodenal ulcer prophylaxis*—150 mg once daily at bedtime. *GERD*—150 mg twice daily. *Erosive esophagitis*—150 mg 4 times daily initially, then 150 mg twice daily as maintenance. *Gastric hypersecretory conditions*—150 mg twice daily initially; up to 6 g/day have been used. *OTC use*—75 mg when symptoms occur (up to twice daily).
IV, IM (Adults): 50 mg q 6–8 hr (not to exceed 400 mg/day). *Continuous IV infusion*—6.25 mg/hr. *Gastric hypersecretory conditions*—1 mg/kg/hr; may be increased by 0.5 mg/kg/hr (not to exceed 2.5 mg/kg/hr).
PO (Children 1 mo-16 yr): *Treatment of gastric/duodenal ulcers* 2–4 mg/kg/day in two divided doses (up to 300 mg/day) *Maintenance treatment of ulcers* 2–4 mg/kg/day as a single dose(up to 150 mg/day); *GERD/erosive esophagitis* 5–10 mg/kg/day in two divided doses.
IV (Children 1 mo-16 yr): 2–4 mg/kg/day in divided doses every 6–8 hr (up to 50 mg/dose).

Ranitidine Bismuth Citrate

PO (Adults): 400 mg twice daily for 4 wk with clarithromycin 500 mg 3 times daily for first 2 wk.

NURSING IMPLICATIONS

Assessment

- Assess patient for epigastric or abdominal pain and frank or occult blood in the stool, emesis, or gastric aspirate.
- Assess geriatric and debilitated patients routinely for confusion. Report promptly.
- ***Lab Test Considerations:*** Monitor CBC with differential periodically throughout therapy.
- Antagonize effects of pentagastrin and histamine during gastric acid secretion testing. Avoid administration for 24 hr before the test.
- May cause false-negative results in skin tests using allergenic extracts. Histamine H_2 antagonists should be discontinued 24 hr before the test.
- May cause an increase in serum transaminases and serum creatinine.
- Serum prolactin concentration may be increased after IV bolus of *cimetidine*. May also cause decreased parathyroid concentrations.
- *Nizatidine* may cause elevated alkaline phosphatase concentrations or false-positive tests for urobilinogen.

♣ = Canadian drug name.

* CAPITALS indicates life-threatening, underlines indicate most frequent.

Famotidine IV	within 60 min	0.5–3 hr	8–15 hr
Nizatidine PO	unknown	unknown	8–12 hr
Ranitidine PO	unknown	1–3 hr	8–12 hr
Ranitidine IM	unknown	15 min	8–12 hr
Ranitidine IV	unknown	15 min	8–12 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Cross-sensitivity may occur. Some products contain alcohol and should be avoided in patients with known intolerance. Porphyria (ranitidine bismuth citrate only). Some products contain aspartame and should be avoided in patients with phenylketonuria.
Use Cautiously in: Renal impairment (more susceptible to adverse CNS reactions; increased dosage interval may be recommended); Geriatric patients (more susceptible to adverse CNS reactions; dosage reduction recommended); Pregnancy or lactation.

Adverse Reactions/Side Effects

CNS: confusion, dizziness, drowsiness, hallucinations, headache. **CV:** ARRHYTHMIAS. **GI:** altered taste, black tongue (ranitidine bismuth citrate only), constipation, dark stools (ranitidine bismuth citrate only), diarrhea, drug-induced hepatitis (nizatidine, cimetidine), nausea. **GU:** decreased sperm count, impotence. **Endo:** gynecomastia. **Hemat:** AGRANULOCYTOSIS, APLASTIC ANEMIA, anemia, neutropenia, thrombocytopenia. **Local:** pain at IM site. **Misc:** hypersensivity reactions, vasculitis.

Interactions

Drug-Drug: Cimetidine inhibits drug-metabolizing enzymes (cytochrome P450 pathway) in the liver; may lead to ↑ levels and toxicity with the following—some **benzodiazepines** (especially **chlordiazepoxide**, **diazepam**, and **midazolam**), some **beta blockers** (**labetalol**, **metoprolol**, **propranolol**), **caffeine**, **calcium channel blockers**, **carbamazepine**, **chloroquine**, **lidocaine**, **metronidazole**, **moricizine**, **pentoxifylline**, **phenytoin**, **propafenone**, **quinidine**, **quinine**, **metformin**, **sulfonylureas**, **tacrine theophylline**, **triamterene**, **tricyclic antidepressants**, **valproic acid**, and **warfarin**. Famotidine, nizatidine, and ranitidine have a much smaller and less significant effect on the metabolism of other drugs. The effects of **succinylcholine**, **flecainide**, **procainamide**, **carmustine**, and **fluorouracil** are ↑ by cimetidine. All agents ↓ absorption of **ketoconazole**. **Antacids** and **sucralfate** ↓ absorption of all agents. **Clarithromycin** ↑ ranitidine levels.

Route/Dosage

Cimetidine

PO (Adults): *Short-term treatment of active ulcers*—300 mg 4 times daily *or* 800 mg at bedtime *or* 400–600 mg twice daily (not to exceed 2.4 g/day). *Duodenal ulcer prophylaxis*—300 mg twice daily *or* 400 mg at bedtime. *GERD*—800–1600 mg/day in divided doses. *Gastric hypersecretory conditions*—300–600 mg q 6 hr (2400 mg/day been used). *OTC use*—up to 200 mg may be taken twice daily (not more than 2 wk) *or* 100 mg taken with a glass of water 0–30 min before food or beverages expected to cause symptoms.
PO (Children): *Short-term treatment of active ulcers*—20–40 mg/kg/day in 4 divided doses.
IM, IV (Adults): *Short-term treatment of active ulcers*—300 mg q 6 hr (not to exceed 2.4 g/day). *Continuous IV infusion*—900 mg infused over 24 hr (37.5 mg/hr); may be preceded by a 150-mg bolus dose. *Gastric hypersecretory conditions*—300–600 mg q 6 hr (up to 12 g/day have been used). *Prevention of aspiration pneumonitis*—300 mg IM 1 hr before anesthesia, then 300 mg IV q 4 hr until patient is conscious (unlabeled). *Prevention of upper GI bleeding in critically ill patients*—50 mg/hr.
IM, IV (Children): *Short-term treatment of active ulcers*—5–10 mg/kg q 6–8 hr.
PO (Children): 10–15 mg/kg/day.

Famotidine

PO (Adults): *Short-term treatment of active ulcers*—40 mg/day at bedtime or 20 mg twice daily for up to 8 wk. *Duodenal ulcer prophylaxis*—20 mg once daily at bedtime. *GERD*—20 mg twice daily for up to 6 wk; up to 40

CONTINUED

- *Ranitidine* may cause false-positive results for urine protein; test with sulfosalicylic acid.

Potential Nursing Diagnoses

Acute pain (Indications)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- **PO:** Administer with meals or immediately afterward and at bedtime to prolong effect.
- Doses administered once daily should be administered at bedtime to prolong effect.
- Cimetidine tablets have a characteristic odor.
- Shake oral suspension before administration. Discard unused suspension after 30 days.
- Open blister for *famotidine* oral disintegrating tablets with dry hands, place tablet on tongue to disintegrate and swallow with saliva; no water is needed.
- Remove foil from *ranitidine effervescent tablets* and dissolve in 6–8 oz water before drinking.

Cimetidine

- **Direct IV:** Dilute each 300 mg in 20 ml of 0.9% NaCl for injection. ***Rate:*** Administer over at least 5 min. Rapid administration may cause hypotension and arrhythmias.
- **Intermittent Infusion:** Dilute each 300 mg in 50 ml of 0.9% NaCl, D5W, D10W, D5/LR, D5/0.9% NaCl, D5/0.45% NaCl, D5/0.25% NaCl, Ringer's or LR, or sodium bicarbonate. Diluted solution is stable for 48 hr at room temperature. Refrigeration may cause cloudiness but will not affect potency. Do not use solution that is discolored or contains precipitate. ***Rate:*** Administer over 15–20 min.
- **Continuous Infusion:** Dilute cimetidine 900 mg in 100–1000 ml of compatible solution (see Intermittent Infusion). ***Rate:*** Usually infused at a rate of 37.5 mg/hr or greater but should be individualized.
- **Syringe Compatibility:** atropine, butorphanol, diazepam, diphenhydramine, doxapram, droperidol, fentanyl, glycopyrrolate, hydromorphone, hydroxyzine, lorazepam, meperidine, midazolam, morphine, nafcillin, nalbuphine, penicillin G sodium, pentazocine, perphenazine, prochlorperazine, prochlorperazine edisylate, promethazine, scopolamine, sodium acetate, sodium chloride, sodium lactate, sterile water.
- **Syringe Incompatibility:** chlorpromazine, pentobarbital, secobarbital.
- **Y-Site Compatibility:** acyclovir, amifostine, aminophylline, atracurium, aztreonam, bivalirudin, cisatracurium, cisplatin, cladribine, cyclophosphamide, cytarabine, dexmedetomidine, diltiazem, docetaxel, doxorubicin, doxorubicin liposome, enalaprilat, esmolol, etoposide phosphate, fenoldopam, filgrastim, fluconazole, fludarabine, foscarnet, gatifloxacin, gemcitabine, granisetron, haloperidol, heparin, idarubicin, inamrinone, labetalol, levofloxacin, linezolid, melphalan, meropenem, methotrexate, midazolam, milrinone, ondansetron, paclitaxel, pancuronium, piperacillin/tazobactam, propofol, remifentanil, sargramostim, tacrolimus, teniposide, theophylline, thiotepa, tolazoline, topotecan, vecuronium, vinorelbine, zidovudine.
- **Y-Site Incompatibility:** allopurinol, amphotericin B cholesteryl sulfate, cefepime, indomethacin, warfarin.

Famotidine

- **Direct IV:** Dilute 2 ml (10 mg/ml solution) in 5 or 10 ml of 0.9% NaCl for injection. ***Rate:*** Administer over at least 2 min. Rapid administration may cause hypotension.
- **Intermittent Infusion:** Dilute each 20 mg in 100 ml of 0.9% NaCl, D5W, D10W, or LR for a concentration of 0.2 mg/ml. Diluted solution is stable for 48 hr at room temperature. Do not use solution that is discolored or contains a precipitate. ***Rate:*** Administer over 15–30 min.

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HISTAMINE H_2 ANTAGONISTS

- **Y-Site Compatibility:** acyclovir, allopurinol, amifostine, aminophylline, amiodarone, ampicillin, ampicillin/sulbactam, atropine, aztreonam, bivalirudin, calcium gluconate, cefazolin, cefoperazone, cefotaxime, cefotetan, cefoxitin, ceftazidime, ceftizoxime, ceftriaxone, cefuroxime, chlorpromazine, cisatracurium, cisplatin, cladribine, cyclophosphamide, cytarabine, dexamethasone, dexmedetomidate, dextran 40, digoxin, diphenhydramine, dobutamine, docetaxel, dopamine, doxorubicin, doxorubicin liposome, droperidol, enalaprilat, epinephrine, erythromycin lactobionate, esmolol, etoposide phosphate, filgrastim, fluconazole, fludarabine, folic acid, gatifloxin, gemcitabine, gentamicin, granisetron, haloperidol, heparin, hydrocortisone, hydrocortisone sodium succinate, hydromorphone, imipenem/cilastatin, insulin, isoproterenol, labetalol, lidocaine, linezolid, lorazepam, magnesium sulfate, melphalan, meperidine, methotrexate, methylprednisolone, metoclopramide, midazolam, morphine, nafcillin, nitroglycerin, nitroprusside, norepinephrine, ondansetron, oxacillin, paclitaxel, perphenazine, phenylephrine, phenytoin, phytonadione, piperacillin, potassium chloride, potassium phosphate, procainamide, propofol, remifentanil, sargramostim, sodium bicarbonate, teniposide, theophylline, thiamine, thiotepa, ticarcillin, ticarcillin/clavulanate, tirofiban, verapamil, vinorelbine.
- **Y-Site Incompatibility:** amphotericin B cholesteryl sulfate, azithromycin, cefepime, piperacillin/tazobactam.

Ranitidine

- **Direct IV:** Dilute each 50 mg in 20 ml of 0.9% NaCl or D5W for injection. ***Rate:*** Administer over at least 5 min. Rapid administration may cause hypotension and arrhythmias.
- **Intermittent Infusion:** Dilute each 50 mg in 100 ml of 0.9% NaCl or D5W. Diluted solution is stable for 48 hr at room temperature. Do not use solution that is discolored or that contains precipitate. ***Rate:*** Administer over 15–20 min.
- **Continuous Infusion:** Add ranitidine to D5W for a concentration of 150 mg/250 ml (no greater than 2.5 mg/ml for Zollinger-Ellison patients). ***Rate:*** Administer at a rate of 6.25 mg/hr. In patients with Zollinger-Ellison syndrome, start infusion at 1 mg/kg/hr. If gastric acid output is >10 mEq/hr or patient becomes symptomatic after 4 hr, adjust dose by 0.5 mg/kg/hr increments and remeasure gastric output.
- **Syringe Compatibility:** atropine, cyclizine, dimenhydrinate, diphenhydramine, fentanyl, glycopyrrolate, hydromorphone, meperidine, metoclopramide, morphine, nalbuphine, oxymorphone, pentazocine, perphenazine, prochlorperazine, promethazine, scopolamine, thiethylperazine.
- **Syringe Incompatibility:** hydroxyzine, midazolam, pentobarbital, phenobarbital.
- **Y-Site Compatibility:** acyclovir, aldesleukin, allopurinol, amifostine, aminophylline, atracurium, aztreonam, bivalirudin, cefazolin, cefepime, cefoperazone, cefoxitin, ceftazidime, ceftizoxime, ciprofloxacin, cisatracurium, cisplatin, cladribine, cyclophosphamide, cytarabine, dexmedetomidine, diltiazem, dobutamine, docetaxel, dopamine, doxorubicin, doxorubicin liposome, enalaprilat, epinephrine, esmolol, etoposide phosphate, fenoldopam, fentanyl, filgrastim, fluconazole, fludarabine, foscarnet, furosemide, gatifloxacin, gemcitabine, granisetron, heparin, hydromorphone, idarubicin, labetalol, linezolid, lorazepam, melphalan, meperidine, methotrexate, midazolam, milrinone, morphine, nitroglycerin, norepinephrine, ondansetron, paclitaxel, pancuronium, piperacillin, piperacillin/tazobactam, procainamide, propofol, remifentanil, sargramostim, tacrolimus, teniposide, theophylline, thiopental, thiotepa, vecuronium, vinorelbine, warfarin, zidovudine.
- **Y-Site Incompatibility:** amphotericin B cholesteryl sulfate, insulin.
- **Additive Compatibility:** amikacin, aminophylline, chloramphenicol, ciprofloxacin, dexamethasone, dobutamine, dopamine, doxycycline, fu-

HMG-CoA REDUCTASE INHIBITORS

atorvastatin
(a-**tore**-va-sta-tin)
Lipitor

fluvastatin
(**floo**-va-sta-tin)
Lescol, Lescol XL

lovastatin
(**loe**-va-sta-tin)
Altocor, Altoprev, Mevacor

pravastatin
(**pra**-va-stat-in)
Pravachol

rosuvastatin
(roe-**soo**-va-sta-tin)
Crestor

simvastatin
(**sim**-va-stat-in)
Zocor

Classification
Therapeutic: lipid-lowering agents
Pharmacologic: HMG-CoA reductase inhibitors

Pregnancy Category X

Indications

Management of primary hypercholesterolemia and mixed dyslipidemias. Reduction of the risk of myocardial infarction (MI) and stroke and their sequelae.

Action

Inhibits 3-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase, which is responsible an early step in the synthesis of cholesterol. **Therapeutic Effects:** Lowered total and low-density lipoproteins (LDL) cholesterol. Increased high-density lipoproteins (HDL) and decrease very low-density lipoproteins (VLDL) cholesterol and triglycerides. Slowing of the progression of coronary artery disease with a decrease in MI and need for myocardial revascularization.

Pharmacokinetics

Absorption: *Atorvastatin*—rapidly absorbed but undergoes extensive GI and hepatic metabolism, resulting in 14% bioavailability (30% for lipid-lowering activity); *fluvastatin*—98% absorbed after oral administration; *lovastatin, pravastatin*—poorly and variably absorbed after oral administration; *rosuvastatin*—20% absorbed following oral administration; *simvastatin*—85% absorbed but rapidly metabolized.
Distribution: *Atorvastatin*—probably enters breast milk. *Fluvastatin*—enters breast milk. *Lovastatin*—crosses the blood-brain barrier and placenta. *Pravastatin*—enters hepatocytes, where action occurs; small amounts enter breast milk.
Metabolism and Excretion: All agents are extensively metabolized by the liver (*atorvastatin, lovastatin*, and *simvastatin* are metabolized by CYP3A4), most during first pass; excreted in bile and feces. Small amounts (*atorvastatin*—<2%; *fluvastatin*—5%; *pravastatin*—20%; *lovastatin*—10%; *rosuvastatin*—10% metabolized, 90% excreted in feces; *simvastatin*—13%) excreted unchanged by the kidneys. *Atorvastatin*—has 2 lipid-lowering metabolites.
Half-life: *Atorvastatin*—14 hr (lipid-lowering activity due to atorvastatin and its metabolites—20–30 hr); *fluvastatin*—1.2 hr; *lovastatin*—3 hr; *pravastatin*—1.3–2.7 hr; *rosuvastatin*—19 hr; *simvastatin*—unknown.

TIME/ACTION PROFILE (cholesterol-lowering effect)

ROUTE	ONSET	PEAK	DURATION
Atorvastatin	unknown	unknown	20–30 hr
Fluvastatin	1–2 wk	4–6 wk	unknown
Lovastatin	2 wk	4–6 wk	6 wk‡
Pravastatin	unknown	unknown	unknown
Rosuvastatin	unknown	2–4 wk	unknown
Simvastatin	unknown	unknown	unknown

‡After discontinuation

rosemide, gentamicin, heparin, insulin, regular, lidocaine, methylprednisolone, penicillin G potassium, penicillin G sodium, potassium chloride, ticarcillin, tobramycin, vancomycin.
- **Additive Incompatibility:** amphotericin B.

Patient/Family Teaching

- Instruct patient to take medication as directed for the full course of therapy, even if feeling better. Take missed doses as soon as remembered but not if almost time for next dose. Do not double doses.
- Advise patients taking OTC preparations not to take the maximum dose continuously for more than 2 wk without consulting health care professional. Notify health care professional if difficulty swallowing occurs or abdominal pain persists or if vomiting blood or bloody or tarry stools occur.
- Inform patient that smoking interferes with the action of histamine antagonists. Encourage patient to quit smoking or at least not to smoke after last dose of the day.
- May cause drowsiness or dizziness. Caution patient to avoid driving or other activities requiring alertness until response to the drug is known.
- Advise patient to avoid alcohol, products containing aspirin or NSAIDs, and foods that may cause an increase in GI irritation.
- Inform patient that increased fluid and fiber intake and exercise may minimize constipation.
- Advise patient to report onset of black, tarry stools; fever; sore throat; diarrhea; dizziness; rash; confusion; or hallucinations to health care professional promptly.
- **Ranitidine Bismuth Citrate:** Inform patient that medication may temporarily cause stools and tongue to appear gray-black.

Evaluation/Desired Outcomes

- Decrease in abdominal pain.
- Prevention and treatment of gastric irritation and bleeding. Healing of duodenal ulcers can be seen by x-rays or endoscopy. Therapy is continued for at least 6 wk in treatment of ulcers but not usually longer than 8 wk.
- Decreased symptoms of esophageal reflux.
- Treatment of heartburn, acid indigestion, and sour stomach (OTC use).
- Eradication of *H. pylori* in the treatment of duodenal ulcers (ranitidine and bismuth citrate only with anti-infectives).

Why was this drug prescribed for your patient?

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Cross-sensitivity among agents may occur. Sepsis, acute hypotension, major surgery, trauma, severe metabolic disturbances, endocrine or electrolyte disorders, uncontrolled seizures (↑ risk of rhabdomyolysis; temporarily discontinue use until condition is resolved). Active liver disease. Pregnancy or lactation. Concurrent use of gemfibrozil or azole antifungals. Concurrent use of nelfinavir or ritonavir (with lovastatin or simvastatin).

Use Cautiously in: History of liver disease or significant alcohol use/abuse; *Rosuvastatin only*—patients with Asian ancestry (may have ↑ blood levels); Renal impairment, advanced age or hypothyroidism (↑ risk of rhabdomyolysis); Visual disturbances; Myopathy; Women of childbearing age; Children <8 yr (safety not established; some products approved for use in adults only).

Adverse Reactions/Side Effects

CNS: dizziness, headache, insomnia, weakness. **EENT:** *lovastatin*—blurred vision. **GI:** abdominal cramps, constipation, diarrhea, flatus, heartburn, altered taste, drug-induced hepatitis, dyspepsia, elevated liver enzymes, nausea, pancreatitis. **GU:** impotence. **Derm:** rashes, pruritus. **MS:** RHABDOMYOLYSIS, arthralgia, myalgia, myositis. **Misc:** hypersensitivity reactions.

Interactions

Drug-Drug: Atorvastatin, lovastatin and simvastatin may interact with **CYP3A4 inhibitors.** Cholesterol-lowering effect may be ↑ with **bile acid sequestrants.** Bioavailability and effectiveness may be ↓ by **bile acid sequestrants.** Blood levels and the risk of myopathy are ↑ with **amiodarone**, **cyclosporine**, **gemfibrozil**, **clofibrate**, **diltiazem**, **verapamil**, **erythromycin**, **clarithromycin**, **telithromycin**, **nefazodone**, large doses of **niacin**, **azole**, **antifungals**, **nelfinavir** and **ritonavir** (combined use with **clofibrate** or **gemfibrozil** with pravastin contraindicated; temporary discontinuation recommended during **azole** antifungal therapy (affects pravastatin, fluvastatin and rosuvastatin less). Atorvastatin and fluvastatin may slightly ↑ serum **digoxin** levels. Fluvastatin ↑ **diclofenac** levels. Atorvastatin and rosuvastatin may ↑ levels of **hormonal contraceptives**. May ↑ risk of bleeding with **warfarin**. **Isradipine** may ↓ the effectiveness of lovastatin. **Propranolol** ↓ blood levels of simvastatin. **Alcohol**, **cimetidine**, **ranitidine**, and **omeprazole** may ↑ fluvastatin levels. **Saquinavir** may ↑ blood levels risk of myopathy with atorvastatin, lovastatin and simvastatin. **Amprenavir** ↑ atrovastatin levels and risk of myopathy(consider fluvastatin, rosuvastatin or pravastatin). **Antacids** ↓ absorption of rosuvastatin (administer 2 hr after rosuvastatin. **Cyclosporine** and **Gemfibrozil** ↑ levels and risk of toxicity of rosuvastatin (dosage adjustment required). **Saquinavir** and **ritonavir** may ↓ levels and effects of pravastatin. Fluvastatin ↑ levels of **glyburide**; **glyburide** ↑ fluvastatin levels (monitoring of both agents recommended). Fluvastatin ↑ levels of **phenytoin**; **phenytoin** ↑ fluvastatin levels (monitoring of both agents recommended).

Drug-Natural Products: *St. John's wort*may ↓ levels and effectiveness (lovastatin and simvastatin).

Drug-Food: Large amounts of **grapefruit juice** (more than 1 qt/day) ↑ blood levels and increases risk of toxicity (for all except rosuvastatin). **Food** enhances blood levels of lovastatin.

Route/Dosage

Atorvastatin

PO (Adults): 10—20 mg once daily initially (may start with 40 mg/day if LDL-C should be lowered by >45%); may be increased q 2–4 wk up to 80 mg/day.

PO (Children 10–17 yr): 10 mg/day initially, may be increased every 4 wk up to 20 mg/day.

Fluvastatin

PO (Adults): 20 mg once daily at bedtime; may be increased to 40 mg once daily or 20 mg twice daily.

Lovastatin

PO (Adults): *Immediate-release tablets*—20 mg once daily with evening meal. Increase at 4-wk intervals to a maximum of 80 mg/day in single or divided doses. *Extended—tablets*—10-60 mg/day as a single dose at bed-

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CONTINUED

HMG-CoA REDUCTASE INHIBITORS

time(not to exceed 20 mg/day if also receiving fibrates, cyclosporine, danazol or niacin).
PO (Children /Adolescents 10-17 yr): *Familial heterozygous hypercholesterolemia*—10-40 mg/day.

Rosuvastatin
PO (Adults): 10 mg once daily initially (range 5–20 mg); dose may be adjusted at 2–4 wk intervals, some patients may require up to 40 mg/day; *concurrent cyclosporine therapy*—not to exceed 5 mg once daily; *concurrent gemfibrozil therapy*—not to exceed 10 mg once daily; *CCr <30 ml/min*—5 mg once daily intially, may be increased to but not exceed 10 mg/day.

Pravastatin
PO (Adults): 10–40 mg once daily.
PO (Children Children 14-18 yrs): 40 mg once daily.
PO (Children Children 8-13 yrs): 20 mg once daily.

Simvastatin
PO (Adults): 5–10 mg once daily in the evening. *Geriatric patients, patients with LDL <190 mg/dl, or patients receiving cyclosporine*—5 mg/day initially. Increase at 4-wk intervals (up to 40 mg/day, not to exceed 10 mg/day in patients receiving cyclosporine).

NURSING IMPLICATIONS

Assessment
- Obtain a dietary history, especially with regard to fat consumption.
- Ophthalmic exams are recommended before and yearly during therapy.
- ***Lab Test Considerations:*** Evaluate serum cholesterol and triglyceride levels before initiating, after 4–6 wk of therapy, and periodically thereafter.
- Monitor liver function tests, including AST, before, at 6–12 wk after initiation of therapy or after dose elevation, and then every 6 mo. If AST levels ↑ to 3 times normal, HMG-CoA reductase inhibitor therapy should be discontinued. May also cause ↑ alkaline phosphatase and bilirubin levels.
- **If patient develops muscle tenderness during therapy, monitor CPK levels. If CPK levels are markedly ↑ or myopathy occurs, therapy should be discontinued.**
- May cause thyroid function test abnormalities.

Potential Nursing Diagnoses
Deficient knowledge, related to medication regimen (Patient/Family Teaching)
Noncompliance (Patient/Family Teaching)

Implementation
- **Do not confuse Pravachol (pravastatin) with Prevacid (lansoprazole).**
- **PO:** Administer *lovastatin* with food. Administration on an empty stomach decreases absorption by approximately 30%. Initial once-daily dose is administered with the evening meal. Administer extended-release tablets at bedtime. Extended-release tablets should be swallowed whole; **do not crush, break, or chew.** Atorvastatin, pravastatin and rosuvastatin can be taken any time of day.
- Avoid large amounts of grapefruit juice during therapy (except with rosuvastatin); may increase risk of toxicity.
- Administer *fluvastatin, pravastatin,* and *simvastatin* once daily in the evening. May be administered without regard to food.
- If *fluvastatin,* or *pravastatin* is administered in conjunction with bile acid sequestrants (cholestyramine, colestipol), administer 1 hr before or at least 2 hr *(fluvastatin)* or 4 hr *(pravastatin)* after bile acid sequestrant.

Patient/Family Teaching
- Instruct patient to take medication as directed and not to skip doses or double up on missed doses. Advise patient to avoid drinking more than 1

♣ = Canadian drug name.

* CAPITALS indicates life-threatening, underlines indicate most frequent.

hydralazine (hye-**dral**-a-zeen)
Apresoline, ♣Novo-Hylazin

Classification
Therapeutic: antihypertensives
Pharmacologic: vasodilators

Pregnancy Category C

Indications
Moderate to severe hypertension (with a diuretic). **Unlabeled uses:** Congestive heart failure (CHF) unresponsive to conventional therapy.

Action
Direct-acting peripheral arteriolar vasodilator. **Therapeutic Effects:** Lowering of BP in hypertensive patients. Decreased afterload in patients with CHF.

Pharmacokinetics
Absorption: Rapidly absorbed following oral administration; well absorbed from IM sites.
Distribution: Widely distributed. Crosses the placenta; enters breast milk in minimal concentrations.
Metabolism and Excretion: Mostly metabolized by GI mucosa and liver.
Half-life: 2–8 hr.

TIME/ACTION PROFILE (antihypertensive effect)

ROUTE	ONSET	PEAK	DURATION
PO	45 min	2 hr	3–8 hr
IM	10–30 min	1 hr	3–8 hr
IV	10–20 min	15–30 min	3–8 hr

Contraindications/Precautions
Contraindicated in: Hypersensitivity. Some products contain tartrazine and should be avoided in patients with known intolerance.
Use Cautiously in: Cardiovascular/cerebrovascular disease; Severe renal/hepatic disease; Pregnancy or lactation (has been used safely during pregnancy).

Adverse Reactions/Side Effects
CNS: dizziness, drowsiness, headache. **CV:** tachycardia, angina, arrhythmias, edema, orthostatic hypotension. **GI:** diarrhea, nausea, vomiting. **Derm:** rashes. **F and E:** sodium retention. **MS:** arthralgias, arthritis. **Neuro:** peripheral neuropathy. **Misc:** drug-induced lupus syndrome.

Interactions
Drug-Drug: Additive hypotension with acute ingestion of **alcohol**, other **antihypertensives**, or **nitrates. MAO inhibitors** may exaggerate hypotension. May reduce the pressor response to **epinephrine**. **NSAIDs** may decrease antihypertensive response. **Beta blockers** decrease tachycardia from hydralazine (therapy may be combined for this reason). **Metoprolol** and **propranolol** increase hydralazine levels. Increases blood levels of **metoprolol** and **propranolol**.

Route/Dosage
PO (Adults): *Hypertension*—10 mg 4 times daily initially. After 2–4 days may increase to 25 mg 4 times daily for the rest of the first week, may then increase to 50 mg 4 times daily (up to 300 mg/day). Once maintenance dose is established, twice-daily dosing may be used. *CHF*—25–37.5 mg 4 times daily; may be increased up to 300 mg/day in 3–4 divided doses.
PO (Children): 0.75 mg/kg/day in 4 divided doses; may increase gradually to 7.5 mg/kg/day (200 mg/day) in 4 divided doses.
IM, IV (Adults): *Hypertension*—5–40 mg repeated as needed. *Eclampsia*—5 mg q 15–20 min; if no response after a total of 20 mg, consider an alternative agent.
IM, IV (Children): 1.7–3.5 mg/kg/day in 4–6 divided doses.

♣ = Canadian drug name.

* CAPITALS indicates life-threatening, underlines indicate most frequent.

qt/day of grapefruit juice during therapy. Medication helps control but does not cure elevated serum cholesterol levels.
- Advise patients taking *fluvastatin* to take missed doses as soon as remembered; if more than 12 hr since last dose, wait and take the next dose at the regular time. Do not double doses. Advise patient to read *Patient Information* sheet prior to therapy and with each Rx refill.
- Advise patient that this medication should be used in conjunction with diet restrictions (fat, cholesterol, carbohydrates, alcohol), exercise, and cessation of smoking.
- Instruct patient to notify health care professional if unexplained muscle pain, tenderness, or weakness occurs, especially if accompanied by fever or malaise.
- Advise patient to wear sunscreen and protective clothing to prevent photosensitivity reactions (rare).
- Instruct female patients to notify health care professional promptly if pregnancy is planned or suspected.
- Advise patient to notify health care professional of medication regimen before treatment or surgery.
- Emphasize the importance of follow-up exams to determine effectiveness and to monitor for side effects.

Evaluation/Desired Outcomes
- Decrease in serum low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), and total cholesterol levels
- Increase in high-density lipoprotein (HDL) cholesterol levels.
- Decrease in triglyceride levels.
- Slowing of the progression of coronary artery disease.

Why was this drug prescribed for your patient?

NURSING IMPLICATIONS

Assessment
- Monitor BP and pulse frequently during initial dosage adjustment and periodically throughout therapy. Report significant changes.
- ***Lab Test Considerations:*** CBC, electrolytes, lupus erythematosus (LE) cell prep, and antinuclear antibody (ANA) titer should be monitored before and periodically during prolonged therapy.

Potential Nursing Diagnoses
Ineffective tissue perfusion (Indications)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)
Noncompliance (Patient/Family Teaching)

Implementation
- IM or IV route should be used only when drug cannot be given orally.
- May be administered concurrently with diuretics or beta blockers to permit lower doses and minimize side effects.
- Available in combination with hydrochlorothiazide (see Appendix A).
- **PO:** Always administer with meals to enhance absorption. Pharmacist may prepare oral solution from injection for patient with difficulty swallowing.
- **Direct IV:** Administer undiluted. Use solution as quickly as possible after drawing through needle into syringe. Hydralazine changes color after contact with a metal filter. ***Rate:*** Administer at a rate of 10 mg over at least 1 min. Monitor BP and pulse frequently after injection.

Patient/Family Teaching
- Emphasize the importance of continuing to take this medication, even if feeling well. Instruct patient to take medication at the same time each day; last dose of the day should be taken at bedtime. If a dose is missed, take as soon as remembered; do not double doses. If more than 2 doses in a row are missed, consult health care professional. Must be discontinued gradually to avoid sudden increase in blood pressure. Hydralazine controls but does not cure hypertension.
- Encourage patient to comply with additional interventions for hypertension (weight reduction, low-sodium diet, smoking cessation, moderation of alcohol intake, regular exercise, and stress management). Instruct patient and family on proper technique for blood pressure monitoring. Advise them to check blood pressure at least weekly and report significant changes.
- Patient should weigh self twice weekly and assess feet and ankles for fluid retention.
- May occasionally cause drowsiness. Advise patient to avoid driving or other activities requiring alertness until response to medication is known.
- Caution patient to avoid sudden changes in position to minimize orthostatic hypotension.
- Advise patient to consult health care professional before taking any Rx, OTC, or herbal cough, cold, or allergy remedies.
- Instruct patient to notify health care professional of medication before treatment or surgery.
- Advise patient to notify health care professional immediately if general tiredness, fever, muscle or joint aching, chest pain, skin rash, sore throat or numbness, tingling, pain, or weakness of hands and feet occur. Vitamin B_6 (pyridoxine) may be used to treat peripheral neuritis.
- Emphasize the importance of follow-up exams to evaluate effectiveness of medication.

Evaluation/Desired Outcomes
- Decrease in BP without appearance of side effects.
- Decreased afterload in patients with CHF.

Why was this drug prescribed for your patient?

High Alert

hydrocodone (hye-droe-koe-done)

Hycodan, ♣Robidone, Tussigon (U.S. antitussive formulations contain homatropine)

hydrocodone/acetaminophen

Anexsia, Bancap HC, Ceta-Plus, Co-Gesic, Dolacet, Duocet, Hydrocet, Hydrogesic, Hy-Phen, Lorcet, Lortab, Margesic-H, Norco, Oncet, Panacet, Stagesic, T-Gesic, Vanacet, Vicodin, Zydone

hydrocodone/aspirin

Alor, Azdone, Damason-P, Lortab ASA, Panasal

hydrocodone/ibuprofen

Vicoprofen

Classification

Therapeutic: allergy, cold, and cough remedies (antitussive), nonopioid analgesics, opioid analgesics

Pharmacologic: opioid agonists/nonopioid analgesic combinations

Schedule III (in combination)

Pregnancy Category C (acetaminophen, ibuprofen), UK (aspirin)

For information on the acetaminophen, aspirin, and ibuprofen components of these formulations, see the acetaminophen, aspirin, and ibuprofen monographs

Indications

Mainly with nonopioid analgesics (acetaminophen/aspirin/ibuprofen) in the management of moderate to severe pain. Antitussive (usually with decongestants).

Action

Binds to opiate receptors in CNS. Alters perception of and response to painful stimuli while producing generalized CNS depression. Suppresses cough reflex centrally. **Therapeutic Effects:** Decreased pain. Decreased cough.

Pharmacokinetics

Absorption: Well absorbed.
Distribution: Unknown.
Metabolism and Excretion: Mostly metabolized by the liver.
Half-life: 3.8 hr.

TIME/ACTION PROFILE (analgesic effect)

ROUTE	ONSET	PEAK	DURATION
PO	10–30 min	30–60 min	4–6 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Hypersensitivity to acetaminophen/aspirin/ibuprofen (for combination products). Bleeding disorders/thrombocytopenia (aspirin and ibuprofen-cintaining products only). Severe hepatic/renal disease (avoid acetaminophen). Products containing alcohol, aspartame, saccharin, sugar, or tartrazine (FDC yellow dye #5) should be avoided in patients who have hypersensitivity/intolerance. Pregnancy/lactation (avoid chronic use).

Use Cautiously in: Head trauma; ↑ intracranial pressure; Severe renal, hepatic, or pulmonary disease; Hypothyroidism; Adrenal insufficiency; Alcoholism; Geriatric/debilitated patients (initial dosage reduction required; more prone to CNS depression, constipation); Undiagnosed abdominal pain; Prostatic hypertrophy.

Adverse Reactions/Side Effects

Noted for hydrocodone only; see acetaminophen/aspirin/ibuprofen monographs for specific information on individual components **CNS:** confusion, sedation, dysphoria, euphoria, floating feeling, hallucinations, headache, unusual dreams. **EENT:** blurred vision, diplopia, miosis. **Resp:** respiratory depression. **CV:** hypotension, bradycardia. **GI:** constipation, nausea, vomiting. **GU:** urinary retention. **Derm:** sweating. **Misc:** physical dependence, psychological dependence, tolerance.

♣ = Canadian drug name.

* CAPITALS indicates life-threatening, underlines indicate most frequent.

CONTINUED

hydrocodone

- Regularly administered doses may be more effective than prn administration. Analgesic is more effective if given before pain becomes severe.
- Combination with nonopioid analgesics may have additive analgesic effects and permit lower doses. Maximum doses of nonopioid agents limit the titration of hydrocodone doses.
- Medication should be discontinued gradually after long-term use to prevent withdrawal symptoms.
- **PO:** May be administered with food or milk to minimize GI irritation.

Patient/Family Teaching

- Advise patient to take medication exactly as directed and not to take more than the recommended amount. Severe and permanent liver damage may result from prolonged use or high doses of acetaminophen. Renal damage may occur with prolonged use of acetaminophen or aspirin. Doses of nonopioid agents should not exceed the maximum recommended daily dose.
- Instruct patient on how and when to ask for pain medication.
- May cause drowsiness or dizziness. Advise patient to call for assistance when ambulating or smoking. Caution patient to avoid driving or other activities requiring alertness until response to the medication is known.
- Advise patient to change positions slowly to minimize orthostatic hypotension.
- Caution patient to avoid concurrent use of alcohol or other CNS depressants with this medication.
- Encourage nonambulatory patient to turn, cough, and breathe deeply every 2 hr to prevent atelectasis.
- Advise patient that good oral hygiene, frequent mouth rinses, and sugarless gum or candy may decrease dry mouth.

Evaluation/Desired Outcomes

- Decrease in severity of pain without a significant alteration in level of consciousness or respiratory status.
- Suppression of nonproductive cough.

Why was this drug prescribed for your patient?

♣ = Canadian drug name.

* CAPITALS indicates life-threatening, underlines indicate most frequent.

Interactions

Drug-Drug: Use with extreme caution in patients receiving MAO inhibitors (may produce severe, unpredictable reactions— ↓ initial dose of hydrocodone to 25% of usual). ↑ CNS depression with **alcohol**, **antihistamines**, and **sedative/hypnotics**. Partial antagonist opioids (**buprenorphine**, **butorphanol**, **nalbuphine**, or **pentazocine**) may precipitate opioid withdrawal in physically dependent patients. **Buprenorphine** or **pentazocine** may ↓ analgesia.

Drug-Natural Products: Concomitant use of **kava**, **valerian**, **skullcap**, **chamomile**, or **hops** can increase CNS depression.

Route/Dosage

PO (Adults): *Analgesic*—5–10 mg q 3–6 hr as needed; if using combination products, acetaminophen or aspirin dosage should not exceed 4 g/day; *Antitussive*—5 mg q 4–6 hr as needed.

PO (Children): *Analgesic*—0.15–0.2 mg/kg q 3–6 hr.

NURSING IMPLICATIONS

Assessment

- Assess blood pressure, pulse, and respirations before and periodically during administration. If respiratory rate is <10/min, assess level of sedation. Physical stimulation may be sufficient to prevent significant hypoventilation. Dose may need to be decreased by 25–50%. Initial drowsiness will diminish with continued use.
- Assess bowel function routinely. Prevention of constipation should be instituted by increased intake of fluids and bulk, and laxatives to minimize constipating effects. Stimulant laxatives should be administered routinely if opioid use exceeds 2–3 days, unless contraindicated.
- **Pain:** Assess type, location, and intensity of pain before and 1 hr (peak) after administration. When titrating opioid doses, increases of 25–50% should be administered until either there is a 50% reduction in the patient's pain rating on a numerical or visual analogue scale or the patient reports satisfactory pain relief. A repeat dose can be safely administered at the time of the peak if previous dose is ineffective and side effects are minimal.
- An equianalgesic chart (see Appendix B) should be used when changing routes or when changing from one opioid to another.
- Prolonged use may lead to physical and psychological dependence and tolerance. This should not prevent patient from receiving adequate analgesia. Most patients who receive opioids for pain do not develop psychological dependence. If progressively higher doses are required, consider conversion to a stronger opioid.
- **Cough:** Assess cough and lung sounds during antitussive use.
- ***Lab Test Considerations:*** May cause increased plasma amylase and lipase concentrations.
- ***Toxicity and Overdose:*** If an opioid antagonist is required to reverse respiratory depression or coma, naloxone (Narcan) is the antidote. Dilute the 0.4-mg ampule of naloxone in 10 ml of 0.9% NaCl and administer 0.5 ml (0.02 mg) by direct IV push every 2 min. For children and patients weighing <40 kg, dilute 0.1 mg of naloxone in 10 ml of 0.9% NaCl for a concentration of 10 mcg/ml and administer 0.5 mcg/kg every 2 min. Titrate dose to avoid withdrawal, seizures, and severe pain.

Potential Nursing Diagnoses

Acute pain (Indications)
Disturbed sensory perception (visual, auditory) (Side Effects)
Risk for injury (Side Effects)

Implementation

- ***High Alert:*** Accidental overdosage of opioid analgesics has resulted in fatalities. Before administering, clarify all ambiguous orders; have second practitioner independently check original order and dose calculations. Do not confuse hydrocodone with hydrocortisone. Do not confuse Lortab with Lorabid (loracarbef).
- Explain therapeutic value of medication prior to administration to enhance the analgesic effect.

CONTINUED

High Alert

hydromorphone (hye-droe-**mor**-fone)

Dilaudid, Dilaudid-HP, Hydrostat IR, Palladone, PMS Hydromorphone

Classification

Therapeutic: allergy, cold, and cough remedies (antitussives), opioid analgesics
Pharmacologic: opioid agonists

Schedule II

Pregnancy Category C

Indications

Moderate to severe pain (alone and in combination with nonopioid analgesics); extended release product for opioid-tolerant patients required around-the-clock management of persistent pain. Antitussive (lower doses).

Action

Binds to opiate receptors in the CNS—alters perception of/response to painful stimuli while producing generalized CNS depression. Suppresses cough reflex via direct central action. **Therapeutic Effects:** Decreased pain. Suppression of cough.

Pharmacokinetics

Absorption: Well absorbed following oral, rectal, subcut, and IM administration. Extended-release product results in an initial release of drug, followed by a second sustained phase of absorption.
Distribution: Widely distributed. Crosses the placenta; enters breast milk.
Metabolism and Excretion: Mostly metabolized by the liver.
Half-life: *Oral, immediate release, or injection*—2–4 hr; *extended-release capsules*—18 hr.

TIME/ACTION PROFILE (analgesic effect)

ROUTE	ONSET	PEAK	DURATION
PO	30 min	90–120 min	4 hr
PO-ER	30 min	biphasic—90–120 min followed by one at 16 hr	24 hr
Subcut	15 min	30–90 min	4–5 hr
IM	15 min	30–60 min	4–5 hr
IV	10–15 min	15–30 min	2–3 hr
Rect	15–30 min	30–90 min	4–5 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Some products contain bisulfites and should be avoided in patients with known hypersensitivity. Avoid chronic use during pregnancy or lactation.
Use Cautiously in: Head trauma; Increased intracranial pressure; Severe renal, hepatic, or pulmonary disease; Hypothyroidism; Adrenal insufficiency; Alcoholism; Geriatric or debilitated patients (dosage reduction recommended); Undiagnosed abdominal pain; Prostatic hypertrophy; Patients <18 yr (safety of extended-capsules not established).

Adverse Reactions/Side Effects

CNS: confusion, sedation, dizziness, dysphoria, euphoria, floating feeling, hallucinations, headache, unusual dreams. **EENT:** blurred vision, diplopia, miosis. **Resp:** respiratory depression. **CV:** hypotension, bradycardia. **GI:** constipation, dry mouth, nausea, vomiting. **GU:** urinary retention. **Derm:** flushing, sweating. **Misc:** physical dependence, psychological dependence, tolerance.

Interactions

Drug-Drug: Exercise extreme caution with **MAO inhibitors** (may produce severe, unpredictable reactions—reduce initial dose of hydromorphone to 25% of usual dose; discontinue MAO inhibitor 2 wk before starting hydromorphone). ↑ risk of CNS depression with **alcohol, antidepres-**

CONTINUED

hydromorphone

- **Cough:** Assess cough and lung sounds during antitussive use.
- ***Lab Test Considerations:*** May ↑ plasma amylase and lipase concentrations.
- ***Toxicity and Overdose:*** If an opioid antagonist is required to reverse respiratory depression or coma, naloxone (Narcan) is the antidote. Dilute the 0.4-mg ampule of naloxone in 10 ml of 0.9% NaCl and administer 0.5 ml (0.02 mg) by direct IV push every 2 min. For children and patients weighing <40 kg, dilute 0.1 mg of naloxone in 10 ml of 0.9% NaCl for a concentration of 10 mcg/ml and administer 0.5 mcg every 2 min. Titrate dose to avoid withdrawal, seizures, and severe pain.

Potential Nursing Diagnoses

Acute pain (Indications)
Disturbed sensory perception (visual, auditory) (Side Effects)
Risk for injury (Side Effects)

Implementation

- ***High Alert:*** Accidental overdosage of opioid analgesics has resulted in fatalities. Before administering, clarify all ambiguous orders; have second practitioner independently check original order, dose calculations, and infusion pump settings. Do not confuse with meperidine or morphine; fatalities have occurred. Do not confuse high-potency (HP) dose forms with regular dose forms.
- Explain therapeutic value of medication prior to administration to enhance the analgesic effect.
- Regularly administered doses may be more effective than prn administration. Analgesic is more effective if given before pain becomes severe.
- Coadministration with nonopioid analgesics may have additive analgesic effects and permit lower opioid doses.
- When transferring from other opioids or other forms of hydromorphone to extended-release tablets (Palladone), patients must be taking at least 60 mg of oral morphine/day, 30 mg or oral oxycodone/day, 8 mg of hydromorphone/day, or an equianalgesic dose of another opioid for a week or longer (see Appendix B).
- Medication should be discontinued gradually after long-term use to prevent withdrawal symptoms.
- **PO:** May be administered with food or milk to minimize GI irritation.
- Extended-release capsules should be swallowed whole, do not open, break or chew.
- **Direct IV:** Dilute with at least 5 ml of sterile water or 0.9% NaCl for injection. Inspect solution for particulate matter. Slight yellow color does not alter potency. Store at room temperature. ***Rate:*** Administer slowly, at a rate not to exceed 2 mg over 3–5 min.
- ***High Alert:*** Rapid administration may lead to increased respiratory depression, hypotension, and circulatory collapse.
- **Syringe Compatibility:** atropine, bupivacaine, ceftazidime, chlorpromazine, cimetidine, diphenhydramine, fentanyl, glycopyrrolate, hydroxyzine, lorazepam, methotrimeprizine, metoclopramide, midazolam, pentobarbital, prochlorperazine, promethazine, ranitidine, scopolamine, thiethylperazine, trimethobenzamide.
- **Syringe Incompatibility:** ampicillin, diazepam, heparin, hyaluronidase, phenobarbital, phenytoin.
- **Y-Site Compatibility:** acyclovir, allopurinol, amifostine, amikacin, atropine, aztreonam, bivalirudin, cefepime, cefoperazone, cefotaxime, cefoxitin, ceftazidime, ceftizoxime, cefuroxime, chloramphenicol, cisatracurium, cisplatin, cladribine, clindamycin, cyclophosphamide, cytarabine, dexamethasone, diltiazem, diphenhydramine, dobutamine, docetaxel, dopamine, doxorubicin, doxorubicin liposome, doxycycline, epinephrine, erythromycin lactobionate, etoposide, famotidine, fenoldopam, fentanyl, filgrastim, fludarabine, foscarnet, furosemide, gatifloxa-

sants, antihistamines, and **sedative/hypnotics** including **benzodiazepines** and **phenothiazines.** Administration of partial antagonists (**buprenorphine, butorphanol, nalbuphine,** or **pentazocine**) may precipitate opioid withdrawal in physically dependent patients. **Nalbuphine** or **pentazocine** may ↓ analgesia.
Drug-Natural Products: Concomitant use of **kava, valerian, chamomile,** or **hops** can ↑ CNS depression.

Route/Dosage
Doses depend on level of pain and tolerance.

Analgesic
PO (Adults ≥50 kg): 4–8 mg q 3–4 hr initially (some patients may respond to doses as small as 2 mg initially); *extended-release capsules*—use only if previous hydromorphone dose is at least 8 mg/24 hr or equivalent, dose range starts at 12 mg/day or more depending on previous opioid use, dose may be increased as necessary and supplemented by short-acting opioids for breakthrough pain as needed/tolerated.
PO (Adults and Children: <50 kg): 0.06 mg/kg q 3–4 hr initially.
IV, IM, Subcut: (Adults ≥50 kg): 1.5 mg q 3–4 hr as needed initially; may be increased.
IV, IM, Subcut: (Adults <50 kg): 0.015 mg/kg q 3–4 hr as needed initially; may be increased.
IV (Adults): *Continuous infusion (unlabeled)*—0.2–30 mg/hr depending on previous opioid use. An initial bolus of twice the hourly rate in mg may be given with subsequent breakthrough boluses of 50–100% of the hourly rate in mg.
Rect (Adults): 3 mg q 4–8 hr initially as needed.

Antitussive
PO (Adults): 1 mg q 3–4 hr.
PO (Children 6–12 yr): 0.5 mg q 3–4 hr.

NURSING IMPLICATIONS

Assessment
- Assess blood pressure, pulse, and respirations before and periodically during administration. If respiratory rate is < 10/min, assess level of sedation. Dose may need to be decreased by 25–50%. Initial drowsiness will diminish with continued use.
- Assess bowel function routinely. Institute prevention of constipation with increased intake of fluids and bulk, and laxatives to minimize constipating effects. Administer stimulant laxatives routinely if opioid use exceeds 2–3 days, unless contraindicated.
- **Pain:** Assess type, location, and intensity of pain prior to and 1 hr following IM and 5 min (peak) following IV administration. When titrating opioid doses, increases of 25–50% should be administered until there is either a 50% reduction in the patient's pain rating on a numerical or visual analog scale or the patient reports satisfactory pain relief. When titrating doses of short-acting hydromorphone, a repeat dose can be safely administered at the time of the peak if previous dose is ineffective and side effects are minimal.
- Patients on a continuous infusion should have additional bolus doses provided every 15–30 min, as needed, for breakthrough pain. The bolus dose is usually set to the amount of drug infused each hour by continuous infusion.
- Patients taking sustained-release hydromorphone may require additional short-acting opioid doses for breakthrough pain. Doses should be equivalent to 10–20% of 24 hr total and given every 2 hr as needed.
- An equianalgesic chart (see Appendix B) should be used when changing routes or when changing from one opioid to another.
- Prolonged use may lead to physical and psychological dependence and tolerance. This should not prevent patient from receiving adequate analgesia. Most patients who receive hydromorphone for pain do not develop psychological dependence. Progressively higher doses may be required to relieve pain with long-term therapy.

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cin, gemcitabine, gentamicin, granisetron, haloperidol, heparin, kanamycin, ketorolac, labetalol, linezolid, lorazepam, magnesium sulfate, melphalan, methotrexate, methotrimeprizine, metoclopramide, metronidazole, midazolam, milrinone, morphine, nafcillin, nitroglycerin, norepinephrine, ondansetron, oxacillin, paclitaxel, penicillin G potassium, piperacillin, piperacillin/tazobactam, propofol, ranitidine, remifentanil, scopolamine, tacrolimus, teniposide, thiotepa, ticarcillin, tobramycin, trimethoprim/sulfamethoxazole, vancomycin, vecuronium, vinorelbine.
- **Y-Site Incompatibility:** amphotericin B cholesteryl sulfate complex, minocycline, phenytoin, sargramostim, thiopental.
- **Additive Compatibility:** heparin, ondansetron, potassium chloride.
- **Additive Incompatibility:** sodium bicarbonate, thiopental.
- **Solution Compatibility:** D5W, D5/0.45% NaCl, D5/0.9% NaCl, D5/LR, D5/Ringer's solution, 0.45% NaCl, 0.9% NaCl, Ringer's and LR.

Patient/Family Teaching
- Instruct patient on how and when to ask for pain medication.
- May cause drowsiness or dizziness. Advise patient to call for assistance when ambulating or smoking. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Advise patient to change positions slowly to minimize orthostatic hypotension.
- Instruct patient to avoid concurrent use of alcohol or other CNS depressants.
- Encourage patient to turn, cough, and breathe deeply every 2 hr to prevent atelectasis.
- **Home Care Issues:** Explain to patient and family how and when to administer hydromorphone and how to care for infusion equipment properly.
- Emphasize the importance of aggressive prevention of constipation with the use of hydromorphone.

Evaluation/Desired Outcomes
- Decrease in severity of pain without a significant alteration in level of consciousness or respiratory status.
- Suppression of cough.

Why was this drug prescribed for your patient?

hydroxyzine (hye-drox-i-zeen)

♣Apo-Hydroxyzine, Atarax, Hyzine-50, ♣Multipax, ♣Novohydroxyzin, Vistaril

Classification

Therapeutic: antihistamines, sedative/hypnotics

Pregnancy Category C

Indications

Treatment of anxiety. Preoperative sedation. Antiemetic. Antipruritic. May be combined with opioid analgesics.

Action

Acts as a CNS depressant at the subcortical level of the CNS. Has anticholinergic, antihistaminic, and antiemetic properties. **Therapeutic Effects:** Sedation. Relief of anxiety. Decreased nausea and vomiting. Decreased allergic symptoms associated with release of histamine, including pruritus.

Pharmacokinetics

Absorption: Well absorbed following PO/IM administration.
Distribution: Unknown.
Metabolism and Excretion: Completely metabolized by the liver; eliminated in the feces via biliary excretion.
Half-life: 3 hr.

TIME/ACTION PROFILE (sedative, antiemetic, antipruritic effects)

ROUTE	ONSET	PEAK	DURATION
PO, IM	15–30 min	2–4 hr	4–6 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Pregnancy.

Use Cautiously in: Severe hepatic dysfunction; Geriatric patients (dosage reduction recommended); Labor (has been used safely); Lactation (safety not established).

Adverse Reactions/Side Effects

CNS: drowsiness, agitation, ataxia, dizziness, headache, weakness. **Resp:** wheezing. **GI:** dry mouth, bitter taste, constipation, nausea. **GU:** urinary retention. **Derm:** flushing. **Local:** pain at IM site, abscesses at IM sites. **Misc:** chest tightness.

Interactions

Drug-Drug: Additive CNS depression with other **CNS depressants**, including **alcohol, antidepressants, antihistamines, opioid analgesics,** and **sedative/hypnotics.** Additive anticholinergic effects with other **drugs possessing anticholinergic properties,** including **antihistamines, antidepressants, atropine, haloperidol, phenothiazines, quinidine,** and **disopyramide.**
Drug-Natural Products: Concomitant use of **kava, valerian, skullcap, chamomile,** or **hops** can increase CNS depression. Increased anticholinergic effects with **angel's trumpet, jimson weed,** and **scopolia.**

Route/Dosage

PO (Adults): *Antianxiety, sedative/hypnotic*—50–100-mg single dose. *Antiemetic/antipruritic*—25–100 mg 3–4 times daily.
PO (Children): *Antianxiety, sedative/hypnotic*—0.6 mg/kg single dose. *Antiemetic, antipruritic*—0.5 mg/kg (15 mg/m²) q 6 hr.
PO (Children 6–12 yr): *Antiemetic, antipruritic*—12.5–25 mg q 6 hr as needed.
PO (Children <6 yr): *Antiemetic, antipruritic*—12.5 mg q 6 hr as needed.
IM (Adults): *Antianxiety*—50–100 mg q 4–6 hr. *Sedative/hypnotic*—50 mg single dose. *Antiemetic, adjunct to opioid analgesics*—25–100 mg.

High Alert

HYPOGLYCEMIC AGENTS, ORAL

glimepiride (glye-me-pye-ride)

Amaryl

glipizide (glip-i-zide)

Glucotrol, Glucotrol XL

glyburide (glye-byoo-ride)

♣Apo-Glyburide, DiaBeta, ♣Euglucon, ♣Gen-Glybe, Glynase PresTab, Micronase, ♣Novo-Glyburide, ♣Nu- Glyburide

Classification

Therapeutic: antidiabetics
Pharmacologic: sulfonylureas

Pregnancy Category C (glimepiride and glipizide), B (glyburide)

Indications

PO: Controls blood glucose in adult-onset, non-insulin-dependent diabetes mellitus (type 2) when diet therapy fails. Requires some pancreatic function.

Action

Lowers blood glucose by stimulating the release of insulin from the pancreas and increasing the sensitivity to insulin at receptor sites. May also decrease hepatic glucose production. **Therapeutic Effects:** Lowering of blood glucose in diabetic patients.

Pharmacokinetics

Absorption: All agents are well absorbed following oral administration.
Distribution: *Glyburide*—reaches high concentrations in bile and crosses the placenta.
Metabolism and Excretion: All agents are mostly metabolized by the liver. *Glimepiride*—converted to a metabolite with hypoglycemic activity.
Half-life: *Glimepiride*—5–9.2 hr; *glipizide*—2.1–2.6 hr; *glyburide*—10 hr.

TIME/ACTION PROFILE (hypoglycemic activity)

	ONSET	PEAK	DURATION
Glimepiride	unknown	2–3 hr	24 hr
Glipizide	15–30 min	1–2 hr	up to 24 hr
Glyburide	45–60 min	1.5–3 hr	24 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Cross-sensitivity with sulfonamides may occur. Insulin-dependent (type I, juvenile-onset, ketosis-prone, brittle) patients with diabetes. Diabetic coma or ketoacidosis. Severe renal, hepatic, thyroid, or other endocrine disease. Uncontrolled infection, serious burns, or trauma.
Use Cautiously in: Severe cardiovascular or hepatic disease; Geriatric patients (increased sensitivity; dosage reduction may be required); Severe renal disease (increased risk of hypoglycemia); Infection, stress, or changes in diet (may alter requirements for control of blood glucose); Impaired thyroid, pituitary, or adrenal function; Malnutrition, high fever, prolonged nausea or vomiting; Pregnancy or lactation (safety not established; insulin recommended during pregnancy).

Adverse Reactions/Side Effects

CNS: dizziness, drowsiness, headache, weakness. **GI:** cramps, constipation, diarrhea, drug-induced hepatitis, heartburn, increased appetite, nausea, vomiting. **Derm:** photosensitivity, rashes. **Endo:** hypoglycemia. **F and E:** hyponatremia. **Hemat:** APLASTIC ANEMIA, agranulocytosis, leukopenia, pancytopenia, thrombocytopenia.

IM (Children): *Antiemetic, adjunct to opioid analgesics*—1 mg/kg (30 mg/m²).

NURSING IMPLICATIONS

Assessment

- Assess patient for profound sedation and provide safety precautions as indicated (side rails up, bed in low position, call bell within reach, supervision of ambulation and transfer).
- **Anxiety:** Assess mental status, mood, and behavior.
- **Nausea and Vomiting:** Assess degree of nausea and frequency and amount of emesis.
- **Pruritus:** Assess degree of itching and character of involved skin.
- ***Lab Test Considerations:*** May cause false-negative skin test results using allergen extracts. Discontinue hydroxyzine at least 72 hr before test.

Potential Nursing Diagnoses

Anxiety (Indications)
Impaired skin integrity (Indications)
Risk for injury (Side Effects)

Implementation

- Do not confuse (Atarax (hydroxyzine) with Ativan (lorazepam).
- **PO:** Tablets may be crushed and capsules opened and administered with food or fluids for patients having difficulty swallowing.
- Shake suspension well before administration.
- **IM:** Administer *only* IM deep into well-developed muscle, preferably with Z-track technique. Injection is extremely painful. Do not use deltoid site. If must be administered to children, midlateral muscles of the thigh are preferred. Significant tissue damage, necrosis, and sloughing may result from subcut or intra-arterial injections. Hemolysis may result from IV injections. Rotate injection sites frequently.
- **Syringe Compatibility:** atropine, butorphanol, chlorpromazine, cimetidine, codeine, diphenhydramine, doxapram, droperidol, fentanyl, fluphenazine, glycopyrrolate, hydromorphone, lidocaine, meperidine, metoclopramide, midazolam, morphine, nalbuphine, oxymorphone, pentazocine, perphenazine, procaine, prochlorperazine, promethazine, scopolamine, sufentanil.
- **Syringe Incompatibility:** dimenhydrinate, haloperidol, heparin, ketorolac, pentobarbital, ranitidine.

Patient/Family Teaching

- Instruct patient to take medication exactly as directed. Missed doses should be taken as soon as remembered unless it is almost time for next dose; do not double doses.
- May cause drowsiness or dizziness. Caution patient to avoid driving and other activities requiring alertness until response to medication is known.
- Advise patient to avoid concurrent use of alcohol or other CNS depressants with this medication.
- Inform patient that frequent mouth rinses, good oral hygiene, and sugarless gum or candy may help decrease dry mouth. If dry mouth persists for more than 2 wk, consult dentist about saliva substitute.

Evaluation/Desired Outcomes

- Decrease in anxiety.
- Relief of nausea and vomiting.
- Relief of pruritus.
- Sedation when used as a sedative/hypnotic.

Why was this drug prescribed for your patient?

Interactions

Drug-Drug: Ingestion of **alcohol** may result in disulfiram-like reaction. Effectiveness may be decreased by concurrent use of **diuretics, corticosteroids, phenothiazines, oral contraceptives, estrogens, thyroid preparations, phenytoin, nicotinic acid, sympathomimetics,** and **isoniazid. Alcohol, androgens** (testosterone), **chloramphenicol, clofibrate, MAO inhibitors, NSAIDs** (except diclofenac), **salicylates, fluconazole sulfonamides,** and **warfarin** may increase the risk of hypoglycemia. Concurrent use with **warfarin** may alter the response to both agents (increased effects of both initially, then decreased activity); close monitoring recommended during any changes in dosage. **Beta blockers** may alter the response to oral hypoglycemic agents (increase or decrease requirements; nonselective agents may cause prolonged hypoglycemia).
Drug-Natural Products: Glucosamine may worsen blood glucose control. **Fenugreek, chromium,** and **coenzyme Q-10** may produce additive hypoglycemic effects.

Route/Dosage

Glimepiride

PO (Adults): 1–2 mg once daily initially; may increase q 1–2 wk up to 8 mg/day (usual range 1–4 mg/day).
PO (Geriatric Patients): 1 mg/day initially.

Glipizide

PO (Adults): 5 mg/day initially, increased as needed (range 2.5–40 mg/day); XL dosage form is given once daily. Doses >15 mg/day should be given as 2 divided doses.
PO (Geriatric Patients): 2.5 mg/day initially.

Glyburide

PO (Adults): *DiaBeta/Micronase*—2.5–5 mg once daily initially (range 1.25–20 mg/day). *Glynase PresTab*—1.5–3 mg/day initially (range 0.75–12 mg/day; doses >6 mg/day should be given as divided doses). Increments should not exceed 1.5 mg/wk.
PO (Geriatric Patients): *DiaBeta/Micronase*—1.25–2.5 mg/day initially; may be increased by 2.5 mg/day weekly. *Glynase PresTab*—0.75–3 mg/day; may be increased by 1.5 mg/day weekly.

NURSING IMPLICATIONS

Assessment

- Observe for signs and symptoms of hypoglycemic reactions (sweating, hunger, weakness, dizziness, tremor, tachycardia, anxiety).
- Assess patient for allergy to sulfonamides.
- ***Lab Test Considerations:*** Monitor serum glucose and glycosylated hemoglobin periodically during therapy to evaluate effectiveness.
- **Monitor CBC periodically during therapy. Report ↓ in blood counts promptly.**
- May cause an ↑ in AST, LDH, BUN, and serum creatinine.
- ***Toxicity and Overdose:*** Overdose is manifested by symptoms of hypoglycemia. Mild hypoglycemia may be treated with administration of oral glucose. Severe hypoglycemia should be treated with IV D50W followed by continuous IV infusion of more dilute dextrose solution at a rate sufficient to keep serum glucose at approximately 100 mg/dl.

Potential Nursing Diagnoses

Imbalanced nutrition: more than body requirements (Indications)
Noncompliance (Patient/Family Teaching)

Implementation

- ***High Alert:*** Accidental administration of oral hypoglycemic agents to non-diabetic adults and children has resulted in serious harm or death. Before administering, confirm that patient is diabetic.
- ***High Alert:*** Several oral hypoglycemic agents are subject to sound-alike or look-alike confusion: Do not confuse glipizide with glyburide. Do not confuse Glucotrol with Glucotrol XL. Do not confuse micronase (glyburide) with Micro-K (potassium).
- Patients stabilized on a diabetic regimen who are exposed to stress, fever, trauma, infection, or surgery may require administration of insulin.

CONTINUED