CONTINUED

THROMBOLYTIC AGENTS

Intracoronary: (Adults): 20,000 IU bolus followed by 2000 IU/min infusion for 60 min (140,000 IU total dose).

Deep Vein Thrombosis, Pulmonary Emboli, Arterial Emboli, or Thromboses

IV (Adults): 250,000 IU loading dose, followed by 100,000 IU/hr for 24 hr for pulmonary emboli, 72 hr for recurrent pulmonary emboli or DVT.

AV Cannula Occlusion

Into Cannula: (Adults): 100,000 IU–250,000 IU; clamp for 2 hr, then aspirate (unlabeled).

Tenecteplase

IV (Adults <60 kg): 30 mg.
IV (Adults ≥60 kg and <70 kg): 35 mg.
IV (Adults ≥70 kg and <80 kg): 40 mg.
IV (Adults ≥80 kg and <90 kg): 45 mg.
IV (Adults ≥90 kg): 50 mg.

Urokinase

Pulmonary Emboli

IV (Adults): 4400 IU/kg loading dose, followed by 4400 IU/kg/hr for 12 hr.

NURSING IMPLICATIONS

Assessment

- Begin therapy as soon as possible after the onset of symptoms.
- Monitor vital signs, including temperature, continuously for coronary thrombosis and at least every 4 hr during therapy for other indications. Do not use lower extremities to monitor blood pressure. Notify physician if systolic BP >180 mm Hg or diastolic BP >110 mm Hg. Tenecteplase should not be given if hypertension is uncontrolled. Inform physician if hypotension occurs. Hypotension may result from the drug, hemorrhage, or cardiogenic shock.
- **Assess patient carefully for bleeding every 15 min during the 1st hr of therapy, every 15–30 min during the next 8 hr, and at least every 4 hr for the duration of therapy. Frank bleeding may occur from sites of invasive procedures or from body orifices. Internal bleeding may also occur (decreased neurologic status; abdominal pain with coffee-grounds emesis or black, tarry stools; hematuria; joint pain). If uncontrolled bleeding occurs, stop medication and notify physician immediately.**
- **Inquire about previous reaction to anistreplase or streptokinase therapy. Assess patient for hypersensitivity reaction (rash, dyspnea, fever, changes in facial color, swelling around the eyes, wheezing). If these occur, inform physician promptly. Keep epinephrine, an antihistamine, and resuscitation equipment close by in the event of an anaphylactic reaction.**
- Inquire about recent streptococcal infection. *Anistreplase* and *streptokinase* may be less effective if administered between 5 days and 6 mo of a streptococcal infection.
- **Assess neurologic status throughout therapy. Altered sensorium or neurologic changes may be indicative of intracranial bleeding.**
- **Coronary Thrombosis:** Monitor ECG continuously. Notify physician if significant arrhythmias occur. IV lidocaine or procainamide (Pronestyl) may be ordered prophylactically. Monitor cardiac enzymes. Radionuclide myocardial scanning and/or coronary angiography may be ordered 7–10 days after therapy to monitor effectiveness of therapy.
- Assess intensity, character, location, and radiation of chest pain. Note presence of associated symptoms (nausea, vomiting, diaphoresis). Administer analgesics as directed. Notify physician if chest pain is unrelieved or recurs.
- Monitor heart sounds and breath sounds frequently. Inform physician if signs of CHF occur (rales/crackles, dyspnea, S_3 heart sound, jugular venous distention, relieved CVP).

CONTINUED

THROMBOLYTIC AGENTS

powder for a concentration of 1 mg/ml. Allow slight foaming to dissipate by letting vial stand undisturbed. Do not use bacteriostatic water. Mix by gently swirling to dissolve; complete dissolution should occur within 3 min. Do not shake. Solution should be colorless to pale yellow. Use solution within 8 hr.

- Withdraw 2.0 ml of reconstituted solution and instill into occluded catheter. After 30 min dwell time, attempt to aspirate blood. If catheter remains occluded, allow 120 min dwell time. If catheter function is not restored after one dose, second dose may be instilled. If catheter function is restored, aspirate 4–5 ml of blood to remove Cathflo Activase and residual clot. Gently irrigate catheter with 0.9% NaCl.

Anistreplase

- **Direct IV:** Reconstitute with 5 ml of sterile water for injection (direct to sides of vial) and swirl gently; do not shake to minimize foaming. Do not dilute further. Use reconstituted solution within 30 min of preparation. ***Rate:*** Administer via IV line or vein over 2–5 min.
- **Y-Site Incompatibility:** Do not admix or administer via Y-site injection with any other medications.

Reteplase

- **Direct IV:** Reconstitute using diluent, needle, syringe, and dispensing pin provided. Reconstitute only with sterile water for injection without preservatives. Solution is colorless. Do not administer solutions that are discolored or contain a precipitate. Slight foaming may occur; allow vial to stand undisturbed for several min to dissipate bubbles. Reconstitute immediately before use. Stable for 4 hr at room temperature. ***Rate:*** Administer each bolus over 2 min into an IV line containing D5W; flush line before and after bolus.
- **Y-Site Incompatibility:** heparin; No other medication should be infused or injected into line used for reteplase.

Streptokinase

- **Intracoronary:** Dilute 250,000 IU vial to a total volume of 125 ml with 0.9% NaCl or D5W. Administer 20,000 IU (10 ml) via bolus injection. ***Rate:*** Intracoronary bolus is administered over 15 sec–2 min.
- **Intermittent Infusion:** Reconstitute with 5 ml of 0.9% NaCl or D5W (direct to sides of vial) and swirl gently; do not shake. Dilute further with 0.9% NaCl for a total volume of 45–500 ml (45 ml for MI, 90 ml for deep vein thrombosis or pulmonary embolism). Solution is slightly yellow in color. Administer through 0.8-micron pore–size filter. Use reconstituted solution within 24 hr. ***Rate:*** Administer dose for MI within 60 min.
- Intracoronary bolus should be followed by an intracoronary maintenance infusion of 2000 IU/min for 60 min.
- Loading dose for *deep vein thrombosis* or *pulmonary embolism* is administered over 30 min, followed by an infusion of 100,000 IU/hr.
- Use infusion pump to ensure accurate dose.
- **Y-Site Compatibility:** dobutamine, dopamine, heparin, lidocaine, nitroglycerin.
- **Additive Incompatibility:** Do not admix with any other medication.
- **Cannula/Catheter Clearance:** Dilute 250,000 IU in 2 ml of 0.9% NaCl or D5W. ***Rate:*** Administer slowly, over 25–35 min, into each occluded limb of cannula, and then clamp for at least 2 hr. Aspirate contents carefully and flush lines with 0.9% NaCl.

Tenecteplase

- **Intermittent Infusion:** Vials are packaged with sterile water for injection (without preservatives) to be used as diluent. Do not use bacteriostatic water for injection. Do not discard shield assembly. To reconstitute aseptically withdraw 10 ml of diluent and inject into the tenectplase vial, directing the stream into the powder. Slight foaming may occur; large bubbles will dissipate if left standing undisturbed for several minutes. Swirl gently until contents are completely dissolved; do not shake. Solution containing 5 mg/ml is clear and colorless to pale yellow. Withdraw dose from reconstituted vial with the syringe and discard unused portion.

- **Pulmonary Embolism:** Monitor pulse, blood pressure, hemodynamics, and respiratory status (rate, degree of dyspnea, ABGs).
- **Deep Vein Thrombosis/Acute Arterial Occlusion:** Observe extremities and palpate pulses of affected extremities every hour. Notify physician immediately if circulatory impairment occurs. Computerized tomography, impedance plethysmography, quantitative Doppler effect determination, and/or angiography or venography may be used to determine restoration of blood flow and duration of therapy; however, repeated venograms are not recommended.
- **Cannula/Catheter Occlusion:** Monitor ability to aspirate blood as indicator of patency. Ensure that patient exhales and holds breath when connecting and disconnecting IV syringe to prevent air embolism.
- **Acute Ischemic Stroke:** Assess neurologic status. Determine time of onset of stroke symptoms. Alteplase must be administered within 3 hr of onset.
- ***Lab Test Considerations:*** Hematocrit, hemoglobin, platelet count, fibrin/fibrin degradation product (FDP/fdp) titer, fibrinogen concentration, prothrombin time, thrombin time, and activated partial thromboplastin time may be evaluated before and frequently during therapy. Bleeding time may be assessed before therapy if patient has received platelet aggregation inhibitors.
- Obtain type and crossmatch and have blood available at all times in case of hemorrhage.
- Stools should be tested for occult blood loss and urine for hematuria periodically during therapy.
- ***Toxicity and Overdose: High Alert:*** If local bleeding occurs, apply pressure to site. If severe or internal bleeding occurs, discontinue infusion. Clotting factors and/or blood volume may be restored through infusions of whole blood, packed RBCs, fresh frozen plasma, or cryoprecipitate. Do not administer dextran; it has antiplatelet activity. Aminocaproic acid (Amicar) may be used as an antidote.

Implementation

- ***High Alert:*** Overdosage and under-dosage of thrombolytic medications have resulted in patient harm and/or death. Have second practitioner independently check original order, dosage calculations, and infusion pump settings. Do not confuse the abbreviation *t-PA* for alteplase (Activase) with the abbreviation *TNK t-PA* for tenecteplase (TNKase). Clarify orders that contain either of these abbreviations.
- Thrombolytic agents should be used only in settings in which hematologic function and clinical response can be adequately monitored.
- Starting two IV lines before therapy is recommended: one for the thrombolytic agent, the other for any additional infusions.
- Avoid invasive procedures, such as IM injections or arterial punctures, with this therapy. If such procedures must be performed, apply pressure to all arterial and venous puncture sites for at least 30 min. Avoid venipunctures at noncompressible sites (jugular vein, subclavian site).
- Systemic anticoagulation with heparin is usually begun several hours after the completion of thrombolytic therapy.
- Acetaminophen may be ordered to control fever.

Alteplase

- **Intermittent Infusion:** Vials are packaged with sterile water for injection (without preservatives) to be used as diluent. Do not use bacteriostatic water for injection. Reconstitute 20-mg vials with 20-ml and 50-mg vials with 50 ml using an 18-gauge needle. Avoid excess agitation during dilution; swirl or invert gently to mix. Solution may foam upon reconstitution. Bubbles will resolve upon standing a few min. Solution will be clear to pale yellow. Stable for 8 hr at room temperature. May be administered as reconstituted (1 mg/ml) or may be further diluted immediately before use in an equal amount of 0.9% NaCl or D5W. ***Rate:*** Flush line with 20–30 ml of saline at completion of infusion to ensure entire dose is received.
- Standard dose for *MI* is administered over 3 hr.
- For *pulmonary embolism*, administer over 2 hr.
- For *acute ischemic stroke*, administer 10% of total dose IV bolus over 1 min, with the remaining dose infused over 60 min.
- **Y-Site Compatibility:** lidocaine, metoprolol, propranolol.
- **Y-Site Incompatibility:** dobutamine, dopamine, heparin, nitroglycerin.
- **Cathflo Activase:** Reconstitute by withdrawing 2.2 ml of sterile water (provided) and injecting into Cathflo Activase vial, directing diluent into

CONTINUED

Once dose is in syringe, stand the shield vertically on a flat surface (with green side down) and passively recap the red hub cannula. Remove the entire shield assembly, including the red hub cannula, by twisting counter clockwise. Shield assembly also contains the clear-ended blunt plastic cannula; retain for split septum IV access. Reconstitute immediately before use. May be refrigerated and administered within 8 hrs. ***Rate:*** Administer as a single IV bolus over 5 seconds.

- **Y-Site Incompatibility:** Precipate forms in line when administered with dextrose-containing solutions. Flush line with saline-containing solution prior to and following administration of tenecteplase.
- **Additive Incompatibility:** Do not admix.

Urokinase

- **Intermittent Infusion:** Reconstitute each 250,000 IU vial with 5 ml of sterile water for injection without preservatives (direct to sides of vial) and swirl gently; do not shake. Solution is light straw colored. Do not administer solutions that are discolored or contain a precipitate. Use reconstituted solution immediately after preparation. Infuse through a 0.45-micron filter.
- For *pulmonary embolism*, dilute the reconstituted solution further with 190 ml of 0.9% NaCl or D5W. ***Rate:*** For *pulmonary embolism*, administer loading dose over 10 min and follow with infusion of 4400 IU/kg/hr for 12 hr.
- Administer via infusion pump to ensure accurate dosage.

Patient/Family Teaching

- Explain purpose of medication and the need for close monitoring to patient and family. Instruct patient to report hypersensitivity reactions (rash, dyspnea) and bleeding or bruising.
- Explain need for bedrest and minimal handling during therapy to avoid injury. Avoid all unnecessary procedures such as shaving and vigorous tooth brushing.

Evaluation/Desired Outcomes

- Lysis of thrombi and restoration of blood flow.
- Prevention of neurologic sequelae in acute ischemic stroke.
- Cannula or catheter patency.

Why was this drug prescribed for your patient?

THYROID PREPARATIONS

levothyroxine (lee-voe-thye-**rox**-een)
Eltroxin, Levo-T, Levothroid, Levoxyl, Novothyrox, PMS-Levothyroxine Sodium, Synthroid, T_4, Unithroid

liothyronine (lye-oh-**thye**-roe-neen)
Cytomel, l-triiodothyronine, T_3, Triostat

liotrix (**lye**-oh-trix)
T_3/T_4, Thyrolar

thyroid (**thye**-royd)
Armour Thyroid, Thyrar, Thyroid Strong, Westhroid

Classification
Therapeutic: hormones
Pharmacologic: thyroid preparations

Pregnancy Category A

Indications
Replacement or substitution therapy in diminished or absent thyroid function of many causes. Treatment of some types of thyroid cancer.

Action
Principal effect is increasing metabolic rate of body tissues Promotes gluconeogenesis, Increases utilization and mobilization of glycogen stores, Stimulates protein synthesis, Promotes cell growth and differentiation, Aids in the development of the brain and CNSContains T_3 (triiodothyronine) and T_4 (thyroxine) activity. **Therapeutic Effects:** Replacement in deficiency states with restoration of normal hormonal balance. Suppression of thyrotropin-dependent thyroid cancers.

Pharmacokinetics
Absorption: Levothyroxine is variably (50–80%) absorbed from the GI tract. Liothyronine and thyroid hormone are well absorbed.
Distribution: Distributed into most body tissues. Thyroid hormones do not readily cross the placenta; minimal amounts enter breast milk.
Metabolism and Excretion: Metabolized by the liver and other tissues. Thyroid hormone undergoes enterohepatic recirculation and is excreted in the feces via the bile.
Half-life: *Liothyronine* (T_3)—1–2 days; *thyroxine* (T_4)—6–7 days.

TIME/ACTION PROFILE (effects on thyroid function tests)

ROUTE	ONSET	PEAK	DURATION
Levothyroxine PO	unknown	1–3 wk	1–3 wk
Levothyroxine IV	6–8 hr	24 hr	unknown
Liothyronine PO	unknown	24–72 hr	72 hr
Liothyronine IV	unknown	unknown	unknown
Thyroid PO	days–wks	1–3 wk	days–wks

Contraindications/Precautions
Contraindicated in: Hypersensitivity. Recent MI. Thyrotoxicosis. Known alcohol intolerance (liothyronine injection only). Hypersensitivity to beef (Thyrar product).
Use Cautiously in: Cardiovascular disease (initiate therapy with lower doses); Severe renal insufficiency; Uncorrected adrenocortical disorders; Swallowing difficulty (levothyroxine tablets); Geriatric and myxedematous patients (extremely sensitive to thyroid hormones—initial dosage should be markedly reduced).

Adverse Reactions/Side Effects
Seen mostly with excessive doses **CNS:** insomnia, irritability, nervousness, headache. **CV:** CARDIOVASCULAR COLLAPSE, arrhythmias, tachycardia, angina pectoris, hypotension, increased blood pressure, increased cardiac output. **GI:** cramps, diarrhea, vomiting; *levothyroxine tablets:*—choking, gagging, dysphagia. **Derm:** hair loss (in children), increased sweating. **Endo:** hy-

= Canadian drug name

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

CONTINUED

THYROID PREPARATIONS

Thyroid
PO (Adults and Children): *Hypothyroidism* –60 mg/day; increase q month by 30 mg; usual maintenance dose is 60–120 mg/day. *Myxedema/hypothyroidism with cardiovascular disease*—15 mg/day initially; increase by 30 mg/day q 2 wk, then may increase by 30–60 mg q 2 wk; usual maintenance dose is 60–120 mg/day.
PO (Geriatric Patients): 7.5–15 mg/day initially; may double dose q 6–8 wk until desired effect is obtained.

NURSING IMPLICATIONS

Assessment
- **Assess apical pulse and blood pressure prior to and periodically during therapy. Assess for tachyarrhythmias and chest pain.**
- **Children:** Monitor height, weight, and psychomotor development.
- ***Lab Test Considerations:*** Monitor thyroid function studies prior to and during therapy.
- Monitor blood and urine glucose in diabetic patients. Insulin or oral hypoglycemic dose may need to be increased.
- ***Toxicity and Overdose:*** Overdose is manifested as hyperthyroidism (tachycardia, chest pain, nervousness, insomnia, diaphoresis, tremors, weight loss). Usual treatment is to withhold dose for 2–6 days. Acute overdose is treated by induction of emesis or gastric lavage, followed by activated charcoal. Sympathetic overstimulation may be controlled by antiadrenergic drugs (beta blockers), such as propranolol. Oxygen and supportive measures to control symptoms such as fever are also used.

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

Implementation
- Administer as a single dose, preferably before breakfast to prevent insomnia.
- Initial dose is low, especially in geriatric and cardiac patients. Dose is increased gradually, based on thyroid function tests. Side effects occur more rapidly with liothyronine because of its rapid onset of effect.
- For patients with difficulty swallowing, levothyroxine tablets can be crushed and placed in 5–10 mL of water and administered immediately via dropper or spoon; do not store suspension.

Levothyroxine
- **Direct IV:** Dilute the 200-mcg and 500-mcg vials with 2 or 5 ml, respectively, of 0.9% NaCl without preservatives (diluent usually provided), for a concentration of 100 mcg/ml. Shake well to dissolve completely. Administer solution immediately after preparation; discard unused portion. ***Rate:*** Administer at a rate of 100 mcg over 1 min. Do not add to IV infusions; may be administered through Y-tubing.
- **Y-Site Incompatibility:** Do not admix with other IV solutions.

Liothyronine
- **IV:** Liothyronine injection is for IV use only. Do not give IM or subcut. Administer doses at least 4 hr and not more than 12 hr apart. Base doses on continuous monitoring of patient and response to therapy.
- Resume PO therapy as soon as patient is stable and able to take PO medication. When switching to PO therapy, discontinue IV liothyronine and initiate PO at low dose, increasing gradually according to patient's response.
- **Direct IV:** May be administered undiluted. ***Rate:*** Administer as a bolus.

= Canadian drug name

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

perthyroidism, menstrual irregularities. **Metab:** weight loss, heat intolerance. **MS:** accelerated bone maturation in children.

Interactions

Drug-Drug: Bile acid sequestrants ↓ absorption of orally administered thyroid preparations. May alter the effectiveness of **warfarin**. May ↑ requirement for **insulin** or **oral hypoglycemic agents** in diabetics. Concurrent **estrogen** therapy may ↑ thyroid replacement requirements. ↑ cardiovascular effects with **adrenergics** (sympathomimetics). May ↓ response to **beta blockers.**

Route/Dosage

Each 1 gr = 60 mg and is equivalent to 100 mcg or less of levothyroxine (T_4) or 25 mcg of liothyronine (T_3).

Levothyroxine

PO (Adults): *Hypothyroidism*—50 mcg as a single dose initially; may be increased q 2–3 wk; usual maintenance dose is 75–125 mcg/day (1.5 mcg/kg/day). *Severe hypothyroidism*—12.5–25 mcg/day; may be increased q 2–4 wk by 25 mcg/day; usual maintenance dose is 75–125 mcg/day (1.5 mcg/kg/day).
PO (Geriatric Patients and Patients with Increased Sensitivity to Thyroid Hormones): 12.5–25 mcg as a single dose initially; may be increased q 6–8 wk; usual maintenance dose is 75 mcg/day.
PO (Children >10 yr): 2–3 mcg/kg/day (up to 150–200 mcg/day).
PO (Children 6–10 yr): 4–5 mcg/kg/day (100–150 mcg/day).
PO (Children 1–5 yr): 3–5 mcg/kg/day (75–100 mcg/day).
PO (Children 6–12 mo): 5–6 mcg/kg/day (50–75 mcg/day).
PO (Infants <6 mo): 5–6 mcg/kg/day (25–50 mcg/day).
PO (Infants <2000 g or Infants at Risk for Cardiac Failure): 25 mcg/day; may be increased after 4–6 wk to 50 mcg.
IM, IV (Adults): *Hypothyroidism*—50–100 mcg/day as a single dose. *Myxedema coma/stupor*—200–500 mcg IV; additional 100–300 mcg may be given on second day; followed by daily administration of smaller doses.
IM, IV (Children): *Hypothyroidism*—50% of the calculated oral dose.

Liothyronine

PO (Adults): *Mild hypothyroidism*—25 mcg once daily; may increase by 12.5–25 mcg/day q 1- to 2-wk intervals; usual maintenance dose is 25–50 mcg/day. *Myxedema*—2.5–5 mcg once daily initially; increase by 5–10 mcg/day q 1–2 wk up to 25 mcg/day, then increase by 12.5–25 mcg/day; usual maintenance dose is 25–50 mcg/day. *Simple goiter*—5 mcg once daily initially; increase by 5–10 mcg/day q 1–2 wk up to 25 mcg/day, then increase by 12.5–25 mcg/day q wk until desired effect is obtained; usual maintenance dose is 50–100 mcg/day. *T_3 suppression test*—75–100 mcg daily for 7 days. Radioactive 131I is administered before and after 7-day course.
PO (Geriatric Patients or Patients with Cardiovascular Disease): 5 mcg/day initially; increase by not more than 5 mcg/day q 2 wk.
IV (Adults): *Myxedema coma/precoma*—25–50 mcg initially (if cardiovascular disease is present, initial dose should be 10–20 mcg). Additional doses may be given to a total of at least 65 mcg/day (not to exceed 100 mcg/day). Doses should be at least 4 hr but not more than 12 hr apart.

Liotrix

Contains T_4 and T_3 in a ratio of 4:1.

Hypothyroidism

PO (Adults): *Hypothyroidism*—Start with 50 mcg levothyroxine/12.5 mg liothyronine, increase by 50 mcg levothyroxine/12.5 mcg liothyronine q mo until desired effect is obtained; usual maintenance dose is 50–100 mcg levothyroxine/12.5–25 mcg liothyronine daily. *Myxedema/hypothyroidism with cardiovascular disease*—12.5 mcg levothyroxine/3.1 mcg liothyronine/day, increase by 12.5 mcg levothyroxine/3.1 mcg liothyronine q 2–3 wk until desired effect is obtained.
PO (Geriatric Patients): 12.5–25 mcg levothyroxine/3.1–6.2 mcg liothyronine/day, increase by 12.5–25 mcg levothyroxine/3.1–6.2 mcg liothyronine q 6–8 wk until desired effect is obtained.

CONTINUED

Patient/Family Teaching

- Instruct patient to take medication as directed at the same time each day. Take missed doses as soon as remembered unless almost time for next dose. If more than 2–3 doses are missed, notify health care professional. Do not discontinue without consulting health care professional.
- Instruct patient and family on correct technique for checking pulse. Dose should be withheld and health care professional notified if resting pulse >100 bpm.
- Explain to patient that medication does not cure hypothyroidism; it provides a thyroid hormone. Therapy is lifelong.
- Caution patient not to change brands of thyroid preparations, as this may affect drug bioavailability.
- Advise patient to notify health care professional if headache, nervousness, diarrhea, excessive sweating, heat intolerance, chest pain, increased pulse rate, palpitations, weight loss >2 lb/wk, or any unusual symptoms occur.
- Caution patient to avoid taking other medications concurrently with thyroid preparations unless instructed by health care professional.
- Instruct patient to inform health care professional of thyroid therapy.
- Emphasize importance of follow-up exams to monitor effectiveness of therapy. Thyroid function tests are performed at least yearly.
- **Levothyroxine:** Advise patients to take Levoxyl tablets with water. Levoxyl tablets may rapidly swell and disintegrate resulting in choking, gagging, the tablet getting stuck in the throat, and difficulty swallowing. Taking with water usually prevents this.
- **Children:** Discuss with parents the need for routine follow-up studies to ensure correct development. Inform patient that partial hair loss may be experienced by children on thyroid therapy. This is usually temporary.

Evaluation/Desired Outcomes

- Resolution of symptoms of hypothyroidism. Response includes:
- Diuresis.
- Weight loss.
- Increased sense of well-being.
- Increased energy, pulse rate, appetite, psychomotor activity.
- Normalization of skin texture and hair.
- Correction of constipation.
- Increased T_3 and T_4 levels.
- In children, effectiveness of therapy is determined by:
- Appropriate physical and psychomotor development.

Why was this drug prescribed for your patient?

ticarcillin (tye-kar-**sil**-in)

Ticar

ticarcillin/clavulanate (tye-kar-**sil**-in/klav-yoo-**la**-nate)

Timentin

Classification

Therapeutic: anti-infectives
Pharmacologic: extended spectrum penicillins

Pregnancy Category B

Indications

Treatment of Skin/skin structure infections, Bone/joint infections, Septicemia, Respiratory tract infections, Intra-abdominal, gynecologic, and urinary tract infections.

Action

Binds to bacterial cell wall membrane, causing cell death. Clavulanate enhances resistance to beta-lactamase, an enzyme that can inactivate penicillins. **Therapeutic Effects:** Bactericidal action. **Spectrum:** Similar to penicillin but also includes several gram-negative aerobic pathogens, notably: *Pseudomonas aeruginosa*, *Escherichia coli*, *Proteus mirabilis*, *Providencia rettgeri*. Active against some anaerobic bacteria, including *Bacteroides*.

Pharmacokinetics

Absorption: Ticarcillin is well absorbed after IM administration.
Distribution: Widely distributed. Enters CSF well when meninges are inflamed. Crosses the placenta; enters breast milk in low concentrations.
Metabolism and Excretion: 10% of ticarcillin is metabolized by the liver; 90% is excreted unchanged by the kidneys. Clavulanate is metabolized by the liver.
Half-life: *Ticarcillin*—0.9–1.3 hr (increased in renal impairment); *clavulanate*—1.1–1.5 hr.

TIME/ACTION PROFILE

ROUTE	ONSET	PEAK	DURATION
IM	rapid	30–75 min	4–6 hr
IV	rapid	end of infusion	4–6 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity to penicillins.
Use Cautiously in: Renal impairment (dosage reduction and/or increased interval required if CCr <60 ml/min); Severe liver disease; Pregnancy and lactation (safety not established).

Adverse Reactions/Side Effects

CNS: SEIZURES (high doses), confusion, lethargy. **CV:** CHF, arrhythmias. **GI:** PSEUDOMEMBRANOUS COLITIS, diarrhea, nausea. **GU:** hematuria (children only). **Derm:** rashes, urticaria. **F and E:** hypokalemia, hypernatremia. **Hemat:** bleeding, blood dyscrasias, increased bleeding time. **Local:** phlebitis. **Metab:** metabolic acidosis. **Misc:** hypersensitivity reactions including ANAPHYLAXIS, superinfection.

Interactions

Drug-Drug: Probenecid increases blood levels. May alter **lithium** excretion. **Amphotericin**, **diuretics**, and **corticosteroids** increase the risk of hypokalemia. Hypokalemia increases the risk of **digoxin** toxicity.

Route/Dosage

Ticarcillin

IV (Adults and Children >40 kg): *Most infections*—3 g q 4 hr or 4 g q 6 hr (150–300 mg/kg/day in divided doses, not to exceed 24 g/day). *Complicated urinary tract infections*—3 g q 6 hr IV. *Uncomplicated urinary tract infections*—1 g q 6 hr IM/IV.
IV (Children <40 kg): *Most infections*—33.3–50 mg/kg q 4 hr or 50–75 mg/kg q 6 hr IV. *Complicated urinary tract infections*—25–33.3 mg/kg q 4 hr or 37.5–50 mg/kg q 6 hr IV. *Uncomplicated urinary tract infections*—12.5–25 mg/kg q 6 hr or 16.7–33.3 mg/kg q 8 hr IM/IV.

ticlopidine (tye-**cloe**-pi-deen)

Ticlid

Classification

Therapeutic: antiplatelet agents
Pharmacologic: platelet aggregation inhibitors

Pregnancy Category B

Indications

Prevention of stroke in patients who have had a completed thrombotic stroke or precursors to stroke and who are unable to tolerate aspirin. **Unlabeled uses:** Prevention of early restenosis in intracoronary stents.

Action

Inhibits platelet aggregation by altering the function of platelet membranes. Prolongs bleeding time. **Therapeutic Effects:** Decreased incidence of stroke in high-risk patients.

Pharmacokinetics

Absorption: >80% after oral administration.
Distribution: Unknown.
Metabolism and Excretion: Extensively metabolized by the liver. Minimal excretion of unchanged drug by the kidneys.
Half-life: Single dose—12.6 hr; multiple dosing—4–5 days.

TIME/ACTION PROFILE (effect on platelet function)

ROUTE	ONSET	PEAK	DURATION
PO	within 4 days	8–11 days	2 wk

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Bleeding disorders. Active bleeding. Severe liver disease.

Use Cautiously in: Risk of bleeding (trauma, surgery, history of ulcer disease); Renal or hepatic impairment (dosage adjustments may be necessary); Geriatric patients (increased sensitivity); Pregnancy, lactation, or children <18 yr (safety not established).

Adverse Reactions/Side Effects

CNS: dizziness, headache, weakness. **EENT:** epistaxis, tinnitus. **GI:** diarrhea, abnormal liver function tests, anorexia, GI fullness, GI pain, nausea, vomiting. **GU:** hematuria. **Derm:** rashes, ecchymoses, pruritus, urticaria. **Hemat:** AGRANULOCYTOSIS, APLASTIC ANEMIA, INTRACEREBRAL BLEEDING, NEUTROPENIA, bleeding, thrombocytopenia. **Metab:** hypercholesterolemia, hypertriglyceridemia.

Interactions

Drug-Drug: Aspirin potentiates the effect of ticlopidine on platelets (concurrent use not recommended). Increased risk of bleeding with **heparins**, **warfarin**, **tirofiban**, **eptifibatide** , **clopidogrel**, or **thrombolytic agents**. **Cimetidine** decreases metabolism of ticlopidine and may increase the risk of toxicity. Ticlopidine decreases metabolism of **theophylline** and increases the risk of toxicity.
Drug-Food: Absorption of ticlopidine is increased by taking with **food.**

Route/Dosage

PO (Adults): 250 mg bid.

NURSING IMPLICATIONS

Assessment

- Assess patient for symptoms of stroke periodically throughout therapy.
- ***Lab Test Considerations:*** Monitor bleeding time throughout therapy. Prolonged bleeding time (2–5 times the normal limit), which is time- and dose-dependent, is expected.
- Monitor CBC with differential and platelet count every 2 wk from the second week to the end of the third month of therapy; more frequently if absolute neutrophil count (ANC) is declining or <30% of baseline. If neu-

IM, IV (Neonates ≥2 kg): 75 mg/kg q 8 hr for the first 7 days of life, then 75 mg/kg q 6 hr.
IM, IV (Neonates <2 kg): 75 mg/kg q 12 hr for the first 7 days of life, then 75 mg/kg q 8 hr.

Ticarcillin/Clavulanate

IV (Adults ≥60 kg): 3.1 g q 4–6 hr.
IV (Adults <60 kg): 33.3–50 mg/kg ticarcillin/1.1–1.7 mg/kg clavulanate q 4 hr or 50–75 mg/kg ticarcillin/1.7–2.5 mg clavulanate q 6 hr.
IV (Children >3 mo, <60 kg): 50 mg ticarcillin/kg plus 1.7 mg clavulanate/kg q 4–6 hr. *Children with cystic fibrosis*—up to 350–450 mg ticarcillin/kg plus 11.7–17 mg clavulanate/kg daily in divided doses.

NURSING IMPLICATIONS

Assessment

- Assess patient for infection at beginning and throughout therapy.
- Obtain a history before initiating therapy to determine use of and reactions to penicillins or cephalosporins. Persons with a negative history of penicillin sensitivity may still have an allergic response.
- Obtain specimens for culture and sensitivity before initiating therapy. First dose may be given before receiving results.
- **Observe patient for signs and symptoms of anaphylaxis (rash, pruritus, laryngeal edema, wheezing). Discontinue drug and notify physician immediately if these problems occur. Keep epinephrine, an antihistamine, and resuscitation equipment close by in case of anaphylactic reaction.**
- ***Lab Test Considerations:*** Evaluate renal and hepatic function, CBC, serum potassium levels, and bleeding times before and throughout therapy.

Potential Nursing Diagnoses

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

Implementation

- Reconstitute with 2 ml of sterile water or bacteriostatic water for injection or 1% lidocaine hydrochloride injection (without epinephrine) to each 1-g vial for a concentration of 1 g/2.5 ml.
- Inject ticarcillin only deep into a well-muscled mass to minimize discomfort and massage well. Do not administer ticarcillin/clavulanate IM.
- **IV:** Change IV sites every 48 hr to prevent phlebitis.

Ticarcillin

- **Direct IV:** Add at least 4 ml of sterile water for injection to 1-g vial. Further dilute to at least 20 ml with 0.9% NaCl, D5W, Ringer's, or LR. Stable for 48 hr at room temperature or for 14 days if refrigerated. ***Rate:*** Administer as slowly as possible to minimize vein irritation. Do not administer concentrations >50 mg/ml.
- **Intermittent Infusion:** Dilute further for a concentration of 10–100 mg/ml and administer over 30 min to 2 hr.

Ticarcillin/Clavulanate

- **Intermittent Infusion:** Add 13 ml of sterile water or 0.9% NaCl for injection to 3.1-g vial for a concentration of ticarcillin 200 mg/ml and clavulanic acid 6.7 mg/ml. Further dilute in 0.9% NaCl, D5W, Ringer's, or LR. Stable for 6 hr at room temperature or for 72 hr if refrigerated. ***Rate:*** Administer over 30 min via Y site or direct IV.

Patient/Family Teaching

- Advise patient to report signs of superinfection (black furry growth on tongue, vaginal itching or discharge, loose or foul-smelling stools) and allergy.

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?

tropenia occurs, ticlopidine should be discontinued. Neutrophil counts usually return to normal within 1–3 wk of discontinuation of therapy. After the first 3 months of therapy, CBCs need to be obtained only for patients with signs and symptoms of infection.

- May cause thrombocytopenia, usually within 3–12 wk of initiation of therapy. If platelet count is <80,000/mm^3, discontinue ticlopidine.
- May cause increased serum total cholesterol and triglyceride levels. Levels usually increase 8–10% within the first month and persist at that level.
- May cause elevated alkaline phosphatase, bilirubin, AST, and ALT levels during the first 4 mo of therapy.
- ***Toxicity and Overdose:*** Prolonged bleeding time is normalized within 2 hr after administration of IV methylprednisolone. May also use platelet transfusions to reverse effects of ticlopidine on bleeding time.

Potential Nursing Diagnoses

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

Implementation

- **PO:** Administer with food or immediately after eating to minimize GI discomfort and increase absorption.

Patient/Family Teaching

- Instruct patient to take medication exactly as directed. Missed doses should be taken as soon as possible unless almost time for next dose; do not double doses.
- Advise patient to notify health care professional promptly if fever, chills, sore throat, unusual bleeding or bruising, severe or persistent diarrhea, skin rash, jaundice, dark-colored urine, or light-colored stools occur.
- Advise patient to notify health care professional of medication regimen before treatment or surgery. Medication may need to be discontinued 10–14 days before surgery.
- Emphasize the importance of routine lab tests during the first 3 months of therapy to monitor for side effects.

Evaluation/Desired Outcomes

- Prevention of stroke.

Why was this drug prescribed for your patient?

tigecycline (tye-gi-sye-kleen)

Tygacil

Classification

Therapeutic: anti-infectives
Pharmacologic: glycylcyclines

Pregnancy Category D

Indications

Complicated skin/skin structure infections or complicated intra-abdominal infections caused by susceptible bacteria.

Action

Inhibits bacterial protein synthesis by binding to the 30S ribosomal subunit. **Therapeutic Effects:** Resolution of infection. **Spectrum:** Active against the following Gram-positive bacteria: *Enterococcus faecalis* (vancomycin-susceptible strains only), *Staphylococcus aureus Streptococcus agalactiae Streptococcus anginosus* and *Streptococcus pyogenes*. Also active against these Gram-positive organisms: *CItrobacter freundii ENterobacter cloacae Escherichia coli Klebsiella oxytoca* and *Klebsiella pneumoniae*. Additionally active against the following anaerobes: *Bacteroides fragilis Bacteroides thetaiotaomicron Bacteroides uniformis Bacteroides vulgatus Clostridium perfringens* and *Peptostreptococcus micros*.

Pharmacokinetics

Absorption: IV administration results in complete bioavailability.
Distribution: Widely distributed with good penetration into gall bladder, lung and colon; crosses the placenta.
Metabolism and Excretion: Minimal metabolism; primary route of elimination is biliary/fecal excretion of unchanged drug and metabolites (59%), 33% renal (22% unchanged).
Half-life: 27.1 hr (after one dose); 42.4 hr after multiple doses.

TIME/ACTION PROFILE (blood levels)

ROUTE	ONSET	PEAK	DURATION
IV	rapid	end of infusion	12 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Children <18 yr.
Use Cautiously in: Complicated intra-abdominal infections due to perforation; Severe hepatic impairment (reduced maintenance dose recommended); Older patients may be more sensitive to adverse effects; Use in pregnancy only when potential maternal benefit outweighs fetal risk; use cautiously during lactation;.

Adverse Reactions/Side Effects

CNS: somnolence. **CV:** changes in heart rate, vasodilation. **GI:** PSEUDOMEMBRANOUS COLITIS, nausea, vomiting, altered taste, anorexia, dry mouth, jaundice. **GU:** ↑ creatinine. **Endo:** hyperglycemia. **F and E:** hypocalcemia, hyponatremia. **Local:** injection site reactions. **Misc:** allergic reactions.

Interactions

Drug-Drug: May ↓ the effectiveness of **hormonal contraceptives**. Effects on **warfarin** are unknown (monitoring recommended).

Route/Dosage

IV (Adults >18 yr): 100 mg initially, then 50 mg every 12 hr for 5–14 days

Hepatic Impairment

IV (Adults >18 yr): *Child Pugh C*—100 mg initially, then 25 mg every 12 hr.

NURSING IMPLICATIONS

Assessment

- Assess patient for infection (vital signs; appearance of wound, sputum, urine, and stool; WBC) at beginning of and throughout therapy.

tipranavir (ti-**pran**-a-veer)

Aptivus

Classification

Therapeutic: antiretrovirals
Pharmacologic: protease inhibitors

Pregnancy Category C

Indications

Advanced HIV disease resistant to other anti-HIV therapies (must be used with ritonavir).

Action

Inhibits processing of viral polyproteins, preventing formation of mature virions. **Therapeutic Effects:** Decreased viral load and sequelae of HIV infection.

Pharmacokinetics

Absorption: Well absorbed following oral administration.
Distribution: Unknown.
Protein Binding: >99.9%.
Metabolism and Excretion: Rapidly and extensively metabolized (primarily by CYP 3A4), requiring co-administration with ritonavir as a metabolic inhibitor to achieve therapeutic blood levels; eliminated mostly in feces, minimal renal excretion.
Half-life: 5.5–6 hr.

TIME/ACTION PROFILE (blood levels*)

ROUTE	ONSET	PEAK	DURATION
PO	rapid	2 hr	12 hr

* with ritonavir

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Moderate to severe hepatic impairment (Child-Pugh Class B or C). Concurrent use of some antiarrhythmics (amiodarone, flecainide, propafenone, quinidine), ergot derivatives, midazolam or triazolam.
Use Cautiously in: Known sulfonamide allergy (contains sulfa moiety); Pre-existing liver disease (may increase the risk of hepatotoxicity); History of or risk factors for diabetes (may cause hyperglycemia); Hemophilia (may ↑ risk of bleeding); Safe use in children not established.

Adverse Reactions/Side Effects

GI: HEPATOTOXICITY. **Derm:** rash (↑ in women). **Endo:** hyperglycemia. **Metab:** ↑ cholesterol, ↑ triglycerides. **Misc:** allergic reactions, fat redistribution, immune reconstitution syndrome.

Interactions

Drug-Drug: Increases blood levels and risk of toxicity from some **antiarrhythmics (amiodarone, flecainide, propafenone, quinidine), ergot derivatives (dihydorergotamine, ergonovine, ergotamine, methylergonovine). Antacids** ↓ absorption (separate dosing). **Hormonal contraceptives** may ↑ risk of rash. May ↓ effectiveness of **hormonal contraceptives**.

Route/Dosage

PO (Adults): 500 mg twice daily; must be taken with ritonavir 200 mg.

NURSING IMPLICATIONS

Assessment

- Assess patient for change in severity of HIV symptoms and for symptoms of opportunistic infections during therapy.
- Monitor for hepatitis (fatigue, malaise, anorexia, nausea, jaundice, bilirubinuria, acholic stools, liver tenderness, hepatomegaly).
- Assess patient for sulfa allergy. May be cross sensitive.

- Obtain specimens for culture and sensitivity before initiating therapy. First dose may be given before receiving results.
- Before initiating therapy, obtain a history of tetracycline hypersensitivity; may also have an allergic response to tigecycline.
- ***Lab Test Considerations:*** May cause anemia, leukocytosis, and thrombocythemia.
- May cause ↑ serum alkaline phosphatase, amylase, bilirubin, LDH, AST, and ALT.
- May cause hyperglycemia, hypokalemia, hypoproteinemia, hypocalcemia, hyponatremia and ↑ BUN level.

Potential Nursing Diagnoses

Risk for infection (Indications)

Implementation

- **Intermittent Infusion:** Reconstitute each vial with 5.3 mL of 0.9% NaCl or D5W for a concentration of 10 mg/mL. Swirl gently until dissolved. Immediately withdraw 5 mL of reconstituted solution and add to 100 mL IV bag of 0.9% NaCl or D5W. Maximum concentration of solution in IV bag should be 1 mg/mL. Reconstituted solution should be yellow to orange in color. If discolored or containing particulate matter, discard. May be stored in IV bag for up to 6 hr at room temperature or 24 hr if refrigerated. ***Rate:*** May be administered through a dedicated IV line or through a Y-site. Flush line before and after use with 0.9% NaCl or D5W. Administer over 30–60 min every 12 hr.
- **Y-Site Compatibility:** dobutamine, dopamine, LR, lidocaine, potassium chloride, ranitidine, theophylline.

Patient/Family Teaching

- Advise patient that full course of therapy should be completed, even if feeling better. Skipping doses or not completing full course of therapy may result in decreased effectiveness and increased risk of bacterial resistance.
- Advise female patient to use a nonhormonal method of contraception while taking tigecycline and until next menstrual period.
- 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.
- Advise patient to report the signs of superinfection (black, furry overgrowth on the tongue, vaginal itching or discharge, loose or foul-smelling stools). Skin rash, pruritus, and urticaria should also be reported.

Evaluation/Desired Outcomes

- Resolution of signs and symptoms of infection.

Why was this drug prescribed for your patient?

- ***Lab Test Considerations:*** Monitor viral load and CD4 counts regularly during therapy.
- May cause ↑ ASTand ↑ ALT; monitor prior to and frequently during therapy.
- Monitor triglyceride and cholesterol levels prior to and periodically during therapy; may cause elevations.
- May cause hyperglycemia. Monitor blood glucose carefully, especially in patients with diabetes.

Potential Nursing Diagnoses

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

Implementation

- **PO:** Administer with ritonavir twice daily with meals. Bioavailability is increased with high at meal.
- Store capsules in refrigerator. Use within 60 days of opening bottle. Write opening date on label; do not use after expiration date written. If used away from home, bottle may be kept at room temperature in a cool place.

Patient/Family Teaching

- Emphasize the importance of taking tipranavir exactly as directed, at evenly spaced times throughout day. Patients should read the *Patient Package Insert* before initiating therapy and with each prescription refill. 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 tipranavir should not be shared with others.
- Advise patient to avoid taking other Rx, OTC, or herbal products without consulting health care professional.
- Inform patient that tipranavir does not cure AIDS or prevent associated or opportunistic infections. Tipranavir does not reduce the risk of transmission of HIV to others through sexual contact or blood contamination. Caution patient to use a condom during sexual contact and to avoid sharing needles or donating blood to prevent spreading the AIDS virus to others.
- Advise patients stop taking tipranavir and ritonavir and notify health care professional immediately if signs of hepatitis (fatigue, malaise, anorexia, nausea, jaundice) occur. May require discontinuation of therapy.
- Inform patient that tipranavir may cause hyperglycemia. Advise patient to notify health care professional if increased thirst or hunger; unexplained weight loss; increased urination; fatigue; or dry, itchy skin occurs.
- Advise women taking hormonal contraceptives to use a nonhormonal form of contraception during tipranavir therapy, and of increased risk of rash.
- Inform patient that redistribution and accumulation of body fat may occur, causing central obesity, dorsocervical fat enlargement (buffalo hump), peripheral wasting, breast enlargement, and cushingoid appearance. The cause and long-term effects are not known.
- 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 improvement in CD4 cell counts.

Why was this drug prescribed for your patient?

tizanidine (tye-**zan**-i-deen)

Zanaflex

Classification

Therapeutic: antispasticity agents (centrally acting)
Pharmacologic: adrenergics

Pregnancy Category C

Indications

Increased muscle tone associated with spasticity due to multiple sclerosis or spinal cord injury.

Action

Acts as an agonist at central alpha-adrenergic receptor sites. Reduces spasticity by increasing presynaptic inhibition of motor neurons. **Therapeutic Effects:** Decreased spasticity, allowing better function.

Pharmacokinetics

Absorption: Completely absorbed after oral administration but rapidly metabolized, resulting in 40% bioavailability.
Distribution: Widely distributed.
Metabolism and Excretion: 95% metabolized by the liver.
Half-life: 2.5 hr.

TIME/ACTION PROFILE (reduced muscle tone)

ROUTE	ONSET	PEAK	DURATION
PO	unknown	1–2 hr	3–6 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity.

Use Cautiously in: Renal impairment; Concurrent antihypertensive therapy; Geriatric patients; Pregnancy, lactation, or children (safety not established)

Exercise Extreme Caution in: Impaired hepatic function.

Adverse Reactions/Side Effects

CNS: anxiety, depression, dizziness, sedation, weakness, dyskinesia, hallucinations, nervousness. **EENT:** blurred vision, pharyngitis, rhinitis. **CV:** hypotension, bradycardia. **GI:** abdominal pain, diarrhea, dry mouth, dyspepsia, constipation, hepatocellular injury, increased liver enzymes, vomiting. **GU:** urinary frequency. **Derm:** rash, skin ulcers, sweating. **MS:** back pain, myasthenia, paresthesia. **Misc:** fever, speech disorder.

Interactions

Drug-Drug: Blood levels and effects ↑ by concurrent use of **hormonal contraceptives** or **alcohol.** ↑ risk of hypotension with **alpha$_2$-adrenergic agonist antihypertensives** (avoid concurrent use). ↑ CNS depression may occur with **alcohol** or other **CNS depressants** including some **antidepressants**, **sedative/hypnotics**, **antihistamines**, and **opioid analgesics**.

Route/Dosage

PO (Adults): 4 mg q 6–8 hr initially (no more than 3 doses/24 hr), increase by 2–4 mg/dose up to 8 mg/dose or 24 mg/day (not to exceed 36 mg/day). Some patients may tolerate twice daily dosing.

NURSING IMPLICATIONS

Assessment

- Assess muscle spasticity before and periodically during therapy.
- Monitor blood pressure and pulse, especially during dose titration. May cause orthostatic hypotension, bradycardia, dizziness, and rarely syncope. Effects are usually dose-related.
- Observe patient for drowsiness, dizziness, and asthenia. A change in dose may alleviate these problems.

topiramate (toe-**peer**-i-mate)

Topamax

Classification

Therapeutic: anticonvulsants

Pregnancy Category C

Indications

Seizures including partial-onset, primary generalized tonic-clonic, seizures due to Lennox-Gastaut syndrome. Prevention of migraine headache in adults.

Action

Action may be a result of Blockade of sodium channels in neurons, Enhancement of gamma-aminobutyrate, an inhibitory neurotransmitter, Prevention of activation of excitatory receptors. **Therapeutic Effects:** Decreased incidence/severity of migraine headaches.

Pharmacokinetics

Absorption: Well absorbed (80%) after oral administration.
Distribution: Unknown.
Metabolism and Excretion: 70% excreted unchanged in urine.
Half-life: 21 hr.

TIME/ACTION PROFILE (blood levels†)

ROUTE	ONSET	PEAK	DURATION
PO	unknown	2 hr	unknown

†After single dose

Contraindications/Precautions

Contraindicated in: Hypersensitivity.
Use Cautiously in: Renal impairment (dosage reduction recommended if CCr <70 ml/min/1.73 m^2); Hepatic impairment; Children (more prone to oligohydrosis and hyperthermia); Dehydration; Pregnancy, lactation, or children <2 yr (safety not established).

Adverse Reactions/Side Effects

CNS: INCREASED SEIZURES, dizziness, drowsiness, fatigue, impaired concentration/memory, nervousness, psychomotor slowing, speech problems, aggressive reaction, agitation, anxiety, cognitive disorders, confusion, depression, malaise, mood problems. **EENT:** abnormal vision, diplopia, nystagmus, acute myopia/secondary angle closure glaucoma,. **GI:** nausea, abdominal pain, anorexia, constipation, dry mouth. **GU:** kidney stones. **Derm:** oligohydrosis (↑ in children). **F and E:** hyperchloremic metabolic acidosis. **Hemat:** leukopenia. **Metab:** weight loss, hyperthermia(↑ in children). **Neuro:** ataxia, paresthesia, tremor. **Misc:** SUICIDE ATTEMPT, fever.

Interactions

Drug-Drug: Blood levels and effects may be ↓ by **phenytoin**, **carbamazepine**, or **valproic acid**. May ↑ blood levels and effects of **phenytoin** or **amitriptyline**. May ↓ blood levels and effects of **hormonal contraceptives**, **risperidone**, **lithium** or **valproic acid**. ↑ risk of CNS depression with **alcohol** or other **CNS depressants. Carbonic anhydrase inhibitors (acetazolamide)** may ↑ risk of kidney stones. COncurrent use with **valproic acid** may ↑ risk of hyperammonemia/encephalopathy.

Route/Dosage

PO (Adults and children ≥17 yr): 25–50 mg/day initially, gradually increased by 25–50 mg weekly up to 200 mg twice daily.
PO (Children 2–17 yr): 5–9 mg/kg/day in 2 divided doses; initiate with 25 mg (or less based in 1–3 mg/kg) nightly for 7 days then increase at 1–2 wk intervals in increments of 1–3 mg/kg/day in 2 divided doses; titration should be based on clinical outcome.

NURSING IMPLICATIONS

Assessment

- **Assess location, duration, and characteristics of seizure activity.**
- **Migraines:** Assess pain location, intensity, duration, and associated symptoms (photophobia, phonophobia, nausea, vomiting) during migraine attack.

- ***Lab Test Considerations:*** Monitor liver function tests before and at 1, 3, and 6 months of therapy. May cause ↑ serum glucose, alkaline phosphatase, AST, and ALT levels.

Potential Nursing Diagnoses

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

Implementation

- **Do not confuse tizanidine with tiagabine.**
- Doses should be titrated carefully to prevent side effects.
- **PO:** May be taken without regard to meals.

Patient/Family Teaching

- Instruct patient to take tizanidine as directed. Tizanidine may need to be discontinued gradually.
- May cause dizziness and drowsiness. Advise patient to avoid driving or other activities requiring alertness until response to drug is known.
- Instruct patient to change position slowly to minimize orthostatic hypotension.
- Advise patient to avoid concurrent use of alcohol or other CNS depressants while taking this medication.

Evaluation/Desired Outcomes

- Decrease in muscle spasticity with an increased ability to perform activities of daily living.

Why was this drug prescribed for your patient?

- ***Lab Test Considerations:*** Monitor CBC with differential and platelet count before therapy to determine baseline levels and periodically during therapy. Frequently causes anemia.
- Hepatic function should be monitored periodically during therapy. May cause ↑ AST and ALT levels.
- Evaluate serum bicarbonate prior to and periodically during therapy. If metabolic acidosis occurs, dosing taper or discontinuation may be necessary.

Potential Nursing Diagnoses

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

Implementation

- Implement seizure precautions.
- **Do not confuse Topamax (topiramate) with Toprolol (metoprolol).**
- **PO:** May be administered without regard to meals.
- **Do not break/crush tablets due to bitter taste.**
- Contents of the sprinkle capsules can be sprinkled on a small amount (teaspoon) of soft food, such as applesauce, custard, ice cream, oatmeal, pudding, or yogurt. To open, hold the capsule upright so that you can read the word "TOP." Carefully twist off the clear portion of the capsule. It may be best to do this over the small portion of the food onto which you will be pouring the sprinkles. Sprinkle the entire contents of the capsule onto the food. Be sure the patient swallows the entire spoonful of the sprinkle/food mixture immediately. Avoid chewing. Follow with fluids immediately to make sure all of the mixture is swallowed. Never store a sprinkle/food mixture for use at another time.

Patient/Family Teaching

- Instruct patient to take topiramate exactly as directed. Take missed doses as soon as possible but not just before next dose; do not double doses. Notify health care professional if more than 1 dose is missed. **Medication should be gradually discontinued to prevent seizures and status epilepticus.**
- May cause decreased sweating and increased body temperature. Advise patients, especially parents of pediatric patients, to provide adequate hydration and monitoring, especially during hot weather.
- May cause dizziness, drowsiness, confusion, and difficulty concentrating. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Advise patient to maintain a fluid intake of 2000–3000 ml of fluid/day to prevent the formation of kidney stones.
- Instruct patient to notify health care professional immediately if periorbital pain or blurred vision occur. Medication should be discontinued if ocular symptoms occur. May lead to permanent loss of vision.
- Caution patient to change position slowly to minimize orthostatic hypotension.
- Advise patient not to take alcohol or other CNS depressants concurrently with this medication.
- Advise patient to use a nonhormonal form of contraception while taking topiramate.
- Instruct patient to notify health care professional of medication regimen before treatment or surgery.
- Advise patient to use sunscreen and wear protective clothing to prevent photosensitivity reactions.
- Advise patient to carry identification describing disease and medication regimen at all times.

Evaluation/Desired Outcomes

- Absence or reduction of seizure activity.
- Decrease in incidence and severity of migraine headaches.

Why was this drug prescribed for your patient?

tramadol (tra-ma-dol)

Ultram

Classification

Therapeutic: analgesics (centrally acting)

Pregnancy Category C

Indications

Moderate to moderately severe pain.

Action

Binds to mu-opioid receptors. Inhibits reuptake of serotonin and norepinephrine in the CNS. **Therapeutic Effects:** Decreased pain.

Pharmacokinetics

Absorption: 75% absorbed after oral administration.
Distribution: Crosses the placenta; enters breast milk.
Metabolism and Excretion: Mostly metabolized by the liver; one metabolite has analgesic activity; 30% is excreted unchanged in urine.
Half-life: *Tramadol*—5–9 hr; *active metabolite*—5–9 hr (both are increased in renal or hepatic impairment).

TIME/ACTION PROFILE (analgesia)

ROUTE	ONSET	PEAK	DURATION
PO	1 hr	2–3 hr	4–6 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Cross-sensitivity with opioids may occur. Patients who are acutely intoxicated with alcohol, sedative/hypnotics, centrally acting analgesics, opioid analgesics, or psychotropic agents. Patients who are physically dependent on opioids (may precipitate withdrawal). Not recommended for use during pregnancy or lactation.

Use Cautiously in: History of epilepsy / risk factors for seizures; Renal impairment (increased dosing interval recommended if CCr >30 ml/min); Hepatic impairment (increased interval recommended in patients with cirrhosis); Concurrent MAO inhibitors or CNS depressants; Increased intracranial pressure or head trauma; Acute abdomen (may preclude accurate clinical assessment); Recent use of large doses of opioids large doses of opioids; Geriatric patients (not to exceed 300 mg/day in patients >75 yr); Children <16 yr (safety not established).

Adverse Reactions/Side Effects

CNS: SEIZURES, dizziness, headache, somnolence, anxiety, CNS stimulation, confusion, coordination disturbance, euphoria, malaise, nervousness, sleep disorder, weakness. **EENT:** visual disturbances. **CV:** vasodilation. **GI:** constipation, nausea, abdominal pain, anorexia, diarrhea, dry mouth, dyspepsia, flatulence, vomiting. **GU:** menopausal symptoms, urinary retention/frequency. **Derm:** pruritus, sweating. **Neuro:** hypertonia. **Misc:** physical dependence, psychological dependence, tolerance.

Interactions

Drug-Drug: Increased risk of CNS depression when used concurrently with other **CNS depressants**, including **alcohol, antihistamines, sedative/hypnotics, opioid analgesics, anesthetics**, or **psychotropic agents.** ↑ risk of seizures with large doses of **penicillins** or **cephalosporins, phenothiazines, opioids**, or **antidepressants**. **Carbamazepine** ↑ the metabolism and ↓ the effectiveness of tramadol (↑ doses may be required). Use cautiously in patients who are receiving **MAO inhibitors** (↑ risk of adverse reactions). Effectiveness may be altered by concurrent **quinidine**.
Drug-Natural Products: Concomitant use of **kava, valerian**, or **chamomile** can ↑ CNS depression.

Route/Dosage

PO (Adults): *Rapid Titration*—50–100 mg q 4–6 hr (not to exceed 400 mg/day or 300 mg in patients >75 yr); *Gradual Titration*—25 mg/day ini-

CONTINUED

tramadol

- Encourage patient to turn, cough, and breathe deeply every 2 hr to prevent atelectasis.

Evaluation/Desired Outcomes

- Decrease in severity of pain without significant alteration in level of consciousness or respiratory status.

Why was this drug prescribed for your patient?

tially, increase by 25 mg/day every 3 days to 100 mg/day, then increase by 50 mg/day every 3 days up to 200 mg/day.

NURSING IMPLICATIONS

Assessment

- Assess type, location, and intensity of pain before and 2–3 hr (peak) after administration.
- Assess blood pressure and respiratory rate before and periodically during administration. Respiratory depression has not occurred with recommended doses.
- Assess bowel function routinely. Prevention of constipation should be instituted with increased intake of fluids and bulk and laxatives to minimize constipating effects.
- Assess previous analgesic history. Tramadol is not recommended for patients dependent on opioids or who have previously received opioids for more than 1 wk; may cause opioid withdrawal symptoms.
- Prolonged use may lead to physical and psychological dependence and tolerance, although these may be milder than with opioids. This should not prevent patient from receiving adequate analgesia. Most patients who receive tramadol for pain do not develop psychological dependence. If tolerance develops, changing to an opioid agonist may be required to relieve pain.
- Monitor patient for seizures. May occur within recommended dose range. Risk is increased with higher doses and in patients taking antidepressants (SSRIs, tricyclics, or MAO inhibitors), opioids, or other drugs that decrease the seizure threshold.
- ***Lab Test Considerations:*** May cause ↑ serum creatinine, elevated liver enzymes, decreased hemoglobin, and proteinuria.
- ***Toxicity and Overdose:*** Overdose may cause respiratory depression and seizures. Naloxone (Narcan) may reverse some, but not all, of the symptoms of overdose. Treatment should be symptomatic and supportive. Maintain adequate respiratory exchange. Hemodialysis is not helpful; it removes only a small portion of administered dose. Seizures may be managed with barbiturates or benzodiazepines; naloxone increases risk of seizures.

Potential Nursing Diagnoses

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

Implementation

- **Do not confuse tramadol with Toradol (ketorolac).**
- Tramadol is considered to provide more analgesia than codeine 60 mg but less than combined aspirin 650 mg/codeine 60 mg for acute postoperative pain.
- For chronic pain, daily doses of 250 mg of tramadol provide pain relief similar to that of 5 doses/day of acetaminophen 300 mg/codeine 30 mg, 5 doses/day of aspirin 325 mg/codeine 30 mg, or 2–3 doses/day of acetaminophen 500 mg/oxycodone 5 mg.
- Explain therapeutic value of medication before 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.
- Tramadol should be discontinued gradually after long-term use to prevent withdrawal symptoms.
- **PO:** Tramadol may be administered without regard to meals.

Patient/Family Teaching

- Instruct patient on how and when to ask for pain 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 change position slowly to minimize orthostatic hypotension.
- Caution patient to avoid concurrent use of alcohol or other CNS depressants with this medication.

CONTINUED

High Alert

trastuzumab (traz-too-zoo-mab)

Herceptin

Classification

Therapeutic: antineoplastics
Pharmacologic: monoclonal antibodies

Pregnancy Category B

Indications

Metastatic breast cancer alone or with paclitaxel IN tumors that display overexpression of human epidermal growth factor receptor 2 (HER2) protein.

Action

A monoclonal antibody that binds to HER2 sites in breast cancer tissue and inhibits proliferation of cells that overexpress HER2 protein. **Therapeutic Effects:** Regression of breast cancer and metastases.

Pharmacokinetics

Absorption: IV administration results in complete bioavailability.
Distribution: Binds to HER2 proteins.
Metabolism and Excretion: Unknown.
Half-life: 10-mg dose—1.7 days; 500-mg dose—12 days.

TIME/ACTION PROFILE (blood levels)

ROUTE	ONSET	PEAK	DURATION
IV	unknown	unknown	unknown

Contraindications/Precautions

Contraindicated in: None known.
Use Cautiously in: Pre-existing pulmonary conditions; Hypersensitivity to trastuzumab, Chinese hamster ovary cell proteins, or other components of the product; Hypersensitivity to benzyl alcohol (use sterile water for injection instead of bacteriostatic water, which accompanies the vial); Geriatric patients (may have increased risk of cardiac dysfunction); Pregnancy (use only if clearly needed); Lactation (use not recommended); Children (safety not established)
Exercise Extreme Caution in: Patients with pre-existing cardiac dysfunction.

Adverse Reactions/Side Effects

CNS: dizziness, headache, insomnia, weakness, depression. **Resp:** dyspnea, increased cough, pharyngitis, rhinitis, sinusitis. **CV:** CARDIOTOXICITY, tachycardia. **GI:** abdominal pain, anorexia, diarrhea, nausea, vomiting. **Derm:** rash, acne, herpes simplex. **F and E:** edema. **Hemat:** anemia, leukopenia. **MS:** back pain, arthralgia, bone pain. **Neuro:** neuropathy, paresthesia, peripheral neuritis. **Misc:** HYPERSENSITIVITY REACTIONS, chills, fever, infection, pain, allergic reactions, flu-like syndrome.

Interactions

Drug-Drug: Concurrent **anthracycline** (**daunorubicin**, **doxorubicin**, or **idarubicin**) therapy may ↑ risk of cardiotoxicity. Blood levels are ↑ by concurrent **paclitaxel**.

Route/Dosage

IV (Adults): 4 mg/kg initially followed by 2 mg/kg weekly.

NURSING IMPLICATIONS

Assessment

- Assess for infusion-related symptoms (chills, fever) following initial infusion. May be treated with acetaminophen, diphenhydramine, and meperidine. Rarely requires discontinuation.
- **Assess for signs and symptoms of cardiotoxicity (dyspnea, increased cough, paroxysmal nocturnal dyspnea, peripheral edema, S_3 gallop, reduced ejection fraction) prior to and frequently during therapy. Baseline cardiac assessment of history, physical exam, and one or more of: ECG, echocardiogram, and multiple**

trazodone (traz-oh-done)

Desyrel, Trazon, Trialodine

Classification

Therapeutic: antidepressants

Pregnancy Category C

Indications

Treatment of major depression, often in conjunction with psychotherapy.
Unlabeled uses: Management of insomnia and chronic pain syndromes, including diabetic neuropathy.

Action

Alters the effects of serotonin in the CNS. **Therapeutic Effects:** Antidepressant action that may develop only over several weeks.

Pharmacokinetics

Absorption: Well absorbed after oral administration.
Distribution: Widely distributed.
Metabolism and Excretion: Extensively metabolized by the liver; minimal excretion of unchanged drug by the kidneys.
Half-life: 5–9 hr.

TIME/ACTION PROFILE (antidepressant effect)

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

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Recovery period after MI. Concurrent electroconvulsive therapy.
Use Cautiously in: Cardiovascular disease; Suicidal behavior; Severe hepatic or renal disease (dosage reduction recommended); Geriatric patients (initial dosage reduction recommended); May ↑ risk of suicide attempt/ideation especially during dose early treatment or dose adjustment; risk may be greater in children and adolescents (safe use in children/adolescents not established); Pregnancy or lactation (safety not established).

Adverse Reactions/Side Effects

CNS: drowsiness, confusion, dizziness, fatigue, hallucinations, headache, insomnia, nightmares, slurred speech, syncope, weakness. **EENT:** blurred vision, tinnitus. **CV:** hypotension, arrhythmias, chest pain, hypertension, palpitations, tachycardia. **GI:** dry mouth, altered sense of taste, constipation, diarrhea, excess salivation, flatulence, nausea, vomiting. **GU:** hematuria, impotence, priapism, urinary frequency. **Derm:** rashes. **Hemat:** anemia, leukopenia. **MS:** myalgia. **Neuro:** tremor.

Interactions

Drug-Drug: May increase **digoxin** or **phenytoin** serum levels. Additive CNS depression with other **CNS depressants**, including **alcohol**, **opioid analgesics**, and **sedative/hypnotics**. Additive hypotension with **antihypertensives**, acute ingestion of **alcohol**, or **nitrates**. Concurrent use with **fluoxetine** increases levels and risk of toxicity from trazodone. **Drugs that inhibit the CYP3A4 enzyme system**, including **ritonavir**, **indinavir** and **ketoconazole** ↑ levels and the risk of toxicity. **Drugs that induce the CYP3A4 enzyme system**, including **carbamazepine** ↓ levels and may decrease effectiveness.
Drug-Natural Products: Concomitant use of **kava**, **valerian**, **skullcap**, **chamomile**, or **hops** can increase CNS depression. Increased risk of serotinergic side effects including serotonin syndrome with **St. John's wort** and **SAMe**.

Route/Dosage

PO (Adults): *Depression*—150 mg/day in 3 divided doses; increase by 50 mg/day q 3–4 days until desired response (not to exceed 400 mg/day in outpatients or 600 mg/day in hospitalized patients). *Insomnia*—25–100 mg at bedtime.
PO (Geriatric Patients): 75 mg/day in divided doses initially; may be increased q 3–4 days.
PO (Children 6–18 yr): 1.5–2 mg/kg/day in divided doses. May be increased q 3–4 days up to 6 mg/kg/day.

gated acquisition (MUGA) scan. CHF associated with trastuzumab may be severe, resulting in cardiac failure, death, and stroke. Trastuzumab should be discontinued upon the development of significant CHF.

- **Monitor patient for signs of pulmonary hypersensitivity reactions (dyspnea, pulmonary infiltrates, pleural effusion, noncardiogenic pulmonary edema, pulmonary insufficiency, hypoxia, acute respiratory distress syndrome). Patients with symptomatic pulmonary disease or extensive lung tumor involvement are at increased risk. Infusion should be discontinued if severe symptoms occur.**
- ***Lab Test Considerations:*** HER2 protein overexpression is used to determine whether treatment with trastuzumab is indicated. HER2 protein overexpression is detected by HercepTest× (IHC assay) and PathVysion× (FISH assay).
- May cause anemia and leukopenia.

Potential Nursing Diagnoses

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

Implementation

- ***High Alert:*** Fatalities have occurred with 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, dose calculations, and infusion pump settings.
- May be administered in the outpatient setting.
- **Intermittent Infusion:** Dilute each vial with 20 ml of bacteriostatic water for injection, directing the stream of diluent into lyophilized cake of trastuzumab, resulting in a multidose solution containing 21 mg/ml. Swirl the vial gently; do not shake. May foam slightly; allow the vial to stand undisturbed for 5 min. Solution should be clear to slightly opalescent and colorless to pale yellow, without particulate matter. Label vial immediately in the area marked "Do not use after" with the date 28 days from the date of reconstitution. Stable for 24 hr at room temperature or 28 days if refrigerated. If patient is allergic to benzyl alcohol, use sterile water for injection for reconstitution. Use immediately and discard any unused portion. Calculate to volume required for the desired dose, withdraw, and add it to an infusion containing 250 ml of 0.9% NaCl. Invert bag gently to mix. ***Rate:*** Infuse the 4 mg/kg loading dose over 90 min and the weekly 2 mg/kg dose over 30 min if the loading dose was well tolerated. Do not administer as an IV push or bolus.
- **Additive Incompatibility:** Do not dilute trastuzumab with or add to solutions containing dextrose. Do not mix or dilute with other drugs.

Patient/Family Teaching

- Instruct patient to notify health care professional promptly if symptoms of cardiotoxicity, fever, sore throat, signs of infection, lower back or side pain, or difficult or painful urination occur. Caution patient to avoid crowds and persons with known infections.
- Advise patient not to receive any vaccinations without advice of health care professional.

Evaluation/Desired Outcomes

- Regression of breast cancer and metastases.

Why was this drug prescribed for your patient?

NURSING IMPLICATIONS

Assessment

- Monitor blood pressure and pulse rate before and during initial therapy. Patients with pre-existing cardiac disease should have ECGs monitored before and periodically during therapy to detect arrhythmias.
- **Depression:** Assess mental status and mood changes frequently. Assess for suicidal tendencies, especially during early therapy. Restrict amount of drug available to patient.
- **Pain:** Assess location, duration, intensity, and characteristics of pain before and periodically during therapy.
- ***Lab Test Considerations:*** Assess CBC and renal and hepatic function before and periodically during therapy. Slight, clinically insignificant decrease in leukocyte and neutrophil counts may occur.

Potential Nursing Diagnoses

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

Implementation

- **PO:** Administer with or immediately after meals to minimize side effects (nausea, dizziness) and allow maximal absorption of trazodone. A larger portion of the total daily dose may be given at bedtime to decrease daytime drowsiness and dizziness.

Patient/Family Teaching

- Instruct patient to take medication exactly as directed. If a dose is missed, take as soon as remembered, do not take if within 4 hr of next scheduled dose; do not double doses. Consult health care professional before discontinuing medication; gradual dosage reduction is necessary to prevent aggravation of condition.
- May cause drowsiness and blurred vision. Caution patient to avoid driving and other activities requiring alertness until response to drug is known.
- Caution patient to change position slowly to minimize orthostatic hypotension.
- Advise patient to avoid concurrent use of alcohol or other CNS depressant drugs.
- Inform patient that frequent rinses, good oral hygiene, and sugarless candy or gum may diminish dry mouth. Health care professional should be notified if this persists >2 wk. An increase in fluid intake, fiber, and exercise may prevent constipation.
- Advise patient to notify health care professional of medication regimen before treatment or surgery.
- Instruct patient to notify health care professional if priapism, irregular heartbeat, fainting, confusion, skin rash, or tremors occur or if dry mouth, nausea and vomiting, dizziness, headache, muscle aches, constipation, or diarrhea become pronounced.
- Emphasize the importance of follow-up exams to evaluate progress.

Evaluation/Desired Outcomes

- Resolution of depression
- Increased sense of well-being.
- Renewed interest in surroundings.
- Increased appetite.
- Improved energy level.
- Improved sleep.
- Decrease in severity of pain in chronic pain syndromes. Therapeutic effects are usually seen within 2 wk, although 4 wk may be required to obtain significant therapeutic results.

Why was this drug prescribed for your patient?

triazolam (trye-**az**-oh-lam)

♣Apo-Triazo, ♣Gen-Triazolam, Halcion, ♣Novo-Triolam, ♣Nu-Triazo

Classification

Therapeutic: sedative/hypnotics
Pharmacologic: benzodiazepines

Schedule IV

Pregnancy Category X

Indications

Short-term management of insomnia.

Action

Acts at many levels in the CNS, producing generalized depression. Effects may be mediated by gamma-aminobutyric acid (GABA), an inhibitory neurotransmitter. **Therapeutic Effects:** Relief of insomnia.

Pharmacokinetics

Absorption: Well absorbed following oral administration.
Distribution: Widely distributed, crosses blood-brain barrier. Probably crosses the placenta and enters breast milk.
Metabolism and Excretion: Metabolized by the liver.
Half-life: 1.6–5.4 hr.

TIME/ACTION PROFILE (sedation)

ROUTE	ONSET	PEAK	DURATION
PO	15–30 min	6–8 hr	unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Cross-sensitivity with other benzodiazepines may occur. Pre-existing CNS depression. Uncontrolled severe pain. Pregnancy, lactation, or children.

Use Cautiously in: Pre-existing hepatic dysfunction (dosage reduction recommended); History of suicide attempt or drug addiction; Geriatric or debilitated patients (initial dosage reduction recommended).

Adverse Reactions/Side Effects

CNS: dizziness, excessive sedation, hangover, headache, anterograde amnesia, confusion, lethargy, mental depression, paradoxical excitation. **EENT:** blurred vision. **GI:** constipation, diarrhea, nausea, vomiting. **Derm:** rashes. **Misc:** physical dependence, psychological dependence, tolerance.

Interactions

Drug-Drug: Cimetidine, **erythromycin**, **fluconazole**, **indinavir**, **itraconazole**, **ketoconazole**, **nelfinavir**, **ritonavir**, or **saquinavir** may decrease metabolism and enhance actions of triazolam; combination should be avoided. Additive CNS depression with **alcohol, antidepressants, antihistamines,** and **opioid analgesics.** May decrease effectiveness of **levodopa**. May increase toxicity of **zidovudine**. **Isoniazid** may decrease excretion and increase effects of triazolam. Sedative effects may be decreased by **theophylline**.
Drug-Natural Products: Concomitant use of *kava*, *valerian*, *skullcap*, *chamomile*, or *hops* can increase CNS depression.
Drug-Food: Grapefruit juice significantly increases blood levels and effects.

Route/Dosage

PO (Adults): 125–250 mcg (up to 500 mcg) at bedtime.
PO (Geriatric Patients or Debilitated Patients): 125 mcg at bedtime initially; may be increased as needed.

NURSING IMPLICATIONS

Assessment

- Assess sleep patterns before and periodically throughout therapy.

♣ = Canadian drug name

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

trimethoprim/sulfamethoxazole

(trye-**meth**-oh-prim/sul-fa-meth-**ox**-a-zole)

♣Apo-Sulfatrim, ♣Apo-Sulfatrim DS, Bactrim, Bactrim DS, Cofatrim, Cotrim, Cotrim DS, ♣Novo-Trimel, ♣Novo-Trimel DS, ♣Nu-Cotrimox, ♣Nu-Cotrimox DS, ♣Roubac, Septra, Septra DS, SMZ/TMP, Sulfatrim, Sulfatrim DS, TMP/SMX, TMP/SMZ

Classification

Therapeutic: anti-infectives, antiprotozoals
Pharmacologic: folate antagonists, sulfonamides

Pregnancy Category C

Indications

Treatment of Bronchitis, *Shigella* enteritis, Otitis media, *Pneumocystis carinii* pneumonia (PCP), Urinary tract infections, Traveler's diarrhea. Prevention of PCP in HIV-positive patients. **Unlabeled uses:** Biliary tract infections, osteomyelitis, burn and wound infections, chlamydial infections, endocarditis, gonorrhea, intra-abdominal infections, nocardiosis, rheumatic fever prophylaxis, sinusitis, eradication of meningococcal carriers, prophylaxis of urinary tract infections, and an alternative agent in the treatment of chancroid. Prevention of bacterial infections in immunosuppressed patients.

Action

Combination inhibits the metabolism of folic acid in bacteria at two different points. **Therapeutic Effects:** Bactericidal action against susceptible bacteria. **Spectrum:** Active against many strains of gram-positive aerobic pathogens including: *Streptococcus pneumoniae*, *Staphylococcus aureus*, Group A beta-hemolytic streptococci, *Nocardia*, *Enterococcus*. Has activity against many aerobic gram-negative pathogens, such as: *Acinetobacter*, *Enterobacter*, *Klebsiella pneumoniae*, *Escherichia coli*, *Proteus mirabilis*, *Shigella*, *Haemophilus influenzae*, including ampicillin-resistant strains. *P. carinii* (a protozoa). Not active against *Pseudomonas aeruginosa*.

Pharmacokinetics

Absorption: Well absorbed from the GI tract.
Distribution: Widely distributed. Crosses the blood-brain barrier and placenta and enters breast milk.
Metabolism and Excretion: Some metabolism by the liver (20%); remainder excreted unchanged by the kidneys.
Half-life: *Trimethoprim*—8–11 hr; *sulfamethoxazole*—7–12 hr.

TIME/ACTION PROFILE (blood levels)

ROUTE	ONSET	PEAK	DURATION
PO	rapid	2–4 hr	6–12 hr
IV	rapid	end of infusion	6–12 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity to sulfonamides or trimethoprim. Megaloblastic anemia secondary to folate deficiency. Severe renal impairment. Pregnancy, lactation, or children <2 mo.
Use Cautiously in: Impaired hepatic or renal function (dosage reduction required if CCr <30 ml/min); HIV-positive patients (increased incidence of adverse reactions).

Adverse Reactions/Side Effects

CNS: fatigue, hallucinations, headache, insomnia, mental depression. **GI:** HEPATIC NECROSIS, nausea, vomiting, diarrhea, stomatitis. **GU:** crystalluria. **Derm:** TOXIC EPIDERMAL NECROLYSIS, rashes, photosensitivity. **Hemat:** AGRANULOCYTOSIS, APLASTIC ANEMIA, hemolytic anemia, leukopenia, megaloblastic anemia, thrombocytopenia. **Local:** phlebitis at IV site. **Misc:** allergic reactions including ERYTHEMA MULTIFORME, STEVENS-JOHNSON SYNDROME, fever.

♣ = Canadian drug name

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

- Prolonged high-dose therapy may lead to psychological or physical dependence. Restrict the amount of drug available to patient, especially if patient is depressed, suicidal, or has a history of addiction.

Potential Nursing Diagnoses

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

Implementation

- Supervise ambulation and transfer of patients following administration. Remove cigarettes. Side rails should be raised and call bell within reach at all times.
- **PO:** Administer with food if GI irritation becomes a problem.

Patient/Family Teaching

- Instruct patient to take triazolam exactly as directed. Discuss the importance of preparing environment for sleep (dark room, quiet, avoidance of nicotine and caffeine). If less effective after a few weeks, consult health care professional; do not increase dose.
- May cause daytime drowsiness or dizziness. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Advise patient to avoid the use of alcohol and other CNS depressants and to consult health care professional before using OTC preparations that contain antihistamines or alcohol.
- Advise patient to inform health care professional if pregnancy is planned or suspected or if confusion, depression, or persistent headaches occur. Instruct family or caregiver to notify health care professional if personality changes occur.
- Instruct patient to notify health care professional if an increase in daytime anxiety occurs. May occur after as few as 10 days of therapy. May require discontinuation of triazolam.
- Emphasize the importance of follow-up appointments to monitor progress.

Evaluation/Desired Outcomes

- Improvement in sleep patterns, which may not be noticeable until the 3rd day of therapy.

Why was this drug prescribed for your patient?

Interactions

Drug-Drug: May ↑ half-life, ↓ clearance, and exaggerate folic acid deficiency caused by **phenytoin**. May ↑ effects of **sulfonylurea oral antidiabetics** and **warfarin**. May ↑ toxicity of **methotrexate**. ↑ risk of thrombocytopenia from **thiazide diuretics** (↑ in geriatric patients). ↓ efficacy of **cyclosporine** and ↑ risk of nephrotoxicity.

Route/Dosage

(TMP = trimethoprim; SMZ = sulfamethoxazole).

Bacterial Infections

PO (Adults and Children ≥40 kg): 160 mg TMP/800 mg SMZ q 12 hr.
PO (Children >2): 4–6 mg/kg TMP/20–30 mg/kg SMZ q 12 hr.
IV (Adults and Children >2 mo): 2–2.5 mg/kg TMP/10–12.5 mg/kg SMZ q 6 hr *or* 2.7–3.3 mg/kg TMP/13.3–16.7 mg/kg SMZ q 8 hr *or* 4–5 mg/kg TMP/20–25 mg/kg SMZ q 12 hr.

P. carinii Pneumonia (Treatment)
PO (Adults and Children >2 mo): 3.75–5 mg/kg TMP/18.75–25 mg SMZ q 6 hr.
IV (Adults and Children >2 mo): 3.75–5 mg/kg TMP/18.75–25 mg SMZ q 6 hr *or* 5–6.7 mg/kg TMP/25–33.3 mg SMZ q 8 hr.

P. carinii Pneumonia (Prevention)

PO (Adults): 160 mg TMP/800 mg SMZ daily (may also be given 3 times weekly).
PO (Children >1 mo): 75 mg/m² TMP/325 mg/m² SMZ q 12 hr on 3 consecutive days/wk (not to exceed 320 mg TMP/1600 mg SMZ per day).

NURSING IMPLICATIONS

Assessment

- Assess for infection (vital signs; appearance of wound, sputum, urine, and stool; WBC) at beginning of and during therapy.
- Obtain specimens for culture and sensitivity before initiating therapy. First dose may be given before receiving results.
- Inspect IV site frequently. Phlebitis is common.
- **Assess patient for allergy to sulfonamides.**
- Monitor intake and output ratios. Fluid intake should be sufficient to maintain a urine output of at least 1200–1500 ml daily to prevent crystalluria and stone formation.
- ***Lab Test Considerations:*** **Monitor CBC and urinalysis periodically during therapy.**
- **May produce ↑ serum bilirubin, creatinine, and alkaline phosphatase.**

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 DS (double-strength) formulations with single-strength formulations.
- Do not administer medication IM.
- **PO:** Administer around the clock with a full glass of water. Use calibrated measuring device for liquid preparations.
- **Intermittent Infusion:** Dilute each 5-ml ampule with 100–125 ml of D5W. May reduce diluent to 75 ml if fluid restriction is required. Do not use if solution is cloudy or contains a precipitate. Solution is stable for 6 hr in standard dilution and 2 hr in fluid-restricted dilution at room temperature. Do not refrigerate. ***Rate:*** Infuse over 60–90 min. Do not administer rapidly or by bolus injection.
- **Y-Site Compatibility:** acyclovir, aldesleukin, allopurinol, amifostine, amphotericin B cholesteryl sulfate, atracurium, aztreonam, cefepime, cyclophosphamide, diltiazem, docetaxel, doxorubicin liposome, enalaprilat, esmolol, etoposide phosphate, filgrastim, fludarabine, gatifloxacin, gemcitabine, granisetron, hydromorphone, labetalol, lorazepam, magnesium sulfate, melphalan, meperidine, morphine, pancuronium, perphe-

CONTINUED

CONTINUED

trimethoprim/sulfamethoxazole

nazine, piperacillin/tazobactam, remifentanil, sargramostim, tacrolimus, teniposide, thiotepa, vecuronium, zidovudine.
- **Y-Site Incompatibility:** fluconazole, midazolam, vinorelbine.
- **Additive Incompatibility:** Manufacturer recommends that no other medication or solution be admixed with trimethoprim/sulfamethoxazole.

Patient/Family Teaching
- Instruct patient to take medication around the clock and to finish drug completely as directed, even if feeling well. Take missed doses as soon as remembered unless almost time for next dose. Advise patient that sharing of this medication may be dangerous.
- Caution patient to use sunscreen and protective clothing to prevent photosensitivity reactions.
- Advise patient to notify health care professional if skin rash, sore throat, fever, mouth sores, or unusual bleeding or bruising occurs.
- Instruct patient to notify health care professional if symptoms do not improve within a few days.
- Emphasize importance of regular follow-up exams to monitor blood counts in patients on prolonged therapy.
- **Home Care Issues:** Instruct family or caregiver on dilution, rate, and administration of drug and proper care of IV equipment.

Evaluation/Desired Outcomes
- Resolution of the signs and symptoms of infection. Length of time for complete resolution depends on organism and site of infection.
- Resolution of symptoms of traveler's diarrhea.
- Prevention of PCP in patients with HIV.

Why was this drug prescribed for your patient?

valacyclovir (val-ay-**sye**-kloe-veer)

Valtrex

Classification

Therapeutic: antivirals

Pregnancy Category B

Indications
Treatment of herpes zoster (shingles). Treatment/suppression of genital herpes. Reduction of transmission of genital herpes. Treatment of herpes labialis (cold sores).

Action
Rapidly converted to acyclovir. Acyclovir interferes with viral DNA synthesis.
Therapeutic Effects: Inhibited viral replication, decreased viral shedding, and reduced time to healing of lesions.

Action
Rapidly converted to acyclovir. Acyclovir interferes with viral DNA synthesis.
Therapeutic Effects: Inhibition of viral replication, decreased viral shedding and reduced time in healing of lesions.

Pharmacokinetics
Absorption: 54% bioavailable as acyclovir after oral administration of valacyclovir.
Distribution: CSF concentrations of acyclovir are 50% of plasma concentrations. Acyclovir crosses placenta, enters breast milk.
Metabolism and Excretion: Rapidly converted to acyclovir via intestinal/hepatic metabolism.
Half-life: 2.5–3.3 hr; up to 14 hr in renal impairment (acyclovir).

TIME/ACTION PROFILE (blood levels†)

ROUTE	ONSET	PEAK	DURATION
PO	unknown	1.5–2.5 hr	8–24 hr

†Acyclovir

Contraindications/Precautions
Contraindicated in: Hypersensitivity to valacyclovir or acyclovir.
Use Cautiously in: Renal impairment (dosage reduction/increased dosing interval recommended if CCr <50 ml/min); Geriatric patients (dosage reduction may be necessary); Pregnancy, lactation, or children (safety not established).

Adverse Reactions/Side Effects
CNS: headache, dizziness, weakness. **GI:** nausea, abdominal pain, anorexia, constipation, diarrhea. **Hemat:** THROMBOTIC THROMBOCYTOPENIC PURPURA/HEMOLYTIC UREMIC SYNDROME (very high doses in immunosuppressed patients).

Interactions
Drug-Drug: Probenecid and **cimetidine** ↑ blood levels; this interaction; only significant in renal impairment.

Route/Dosage

Herpes Zoster
PO (Adults): 1 g 3 times daily for 7 days.

Genital Herpes
PO (Adults): *Initial treatment*—1 g twice daily for 10 days. *Recurrence*—500 mg twice daily for 3 days. *Suppression of recurrence*—1 g once daily or 500 mg once daily in patients experiencing <10 recurrences/yr. *Suppression of recurrence in HIV-infected patients*—500 mg q 12 hr. *Reduction of transmission*—500 mg once daily for source partner.

Herpes Labialis
PO (Adults): 2 g then 2 g 12 hr later.

Renal Impairment
PO (Adults): *CCr 30–49 ml/min*—1 g q 12 hr for herpes zoster treatment, no reduction required for treatment of genital herpes; 1 g then 1 g 12 hr later for herpes labialis. *CCr 10–29 ml/min*—1 g q 24 hr for initial treatment of genital herpes, 500 mg q 24 hr for treatment of recurrent episodes of genital herpes, 500 mg q 48 hr for suppression of genital herpes in patients with 9 or fewer recurrences/yr, 500 mg q 24 hr for suppression of genital herpes in patients with ≥10 recurrences/yr or HIV-infected patients, 1 g q 24 hr for treatment of herpes zoster; 500 mg then 500 mg 12 hr later

for herpes labialis. *CCr < 10 ml/min*—500 mg q 24 hr for initial treatment of genital herpes, 500 mg q 24 hr for treatment of recurrent episodes of genital herpes, 500 mg q 48 hr for suppression of genital herpes in patients with 9 or fewer recurrences/yr, 500 mg q 24 hr for suppression of genital herpes in patients with ≥10 recurrences/yr or HIV-infected patients, 500 mg q 24 hr for treatment of herpes zoster; single 500 mg dose for herpes labialis.

NURSING IMPLICATIONS

Assessment

- Assess lesions before and daily during therapy.
- **Monitor patient for signs of thrombotic thrombocytic purpura/hemolytic uremic syndrome (thrombocytopenia, microangiopathic hemolytic anemia, neurologic findings, renal dysfunction, fever). Requires prompt treatment; may be fatal.**

Potential Nursing Diagnoses

Risk for impaired skin integrity (Indications)
Risk for infection (Indications, Patient/Family Teaching)

Implementation

- **PO:** May be administered without regard to meals.
- **Herpes Zoster:** Implement valacyclovir therapy as soon as possible after the onset of signs or symptoms of herpes zoster; most effective if started within 48 hr of the onset of zoster rash. Efficacy of treatment started >72 hr after rash onset is unknown.
- **Genital Herpes and Herpes Labialis:** Implement treatment for genital herpes as soon as possible after onset of symptoms.

Patient/Family Teaching

- Instruct patient to take valacyclovir exactly as directed for the full course of therapy. If a dose is missed, take as soon as remembered if not just before next dose.
- **Herpes Zoster:** Inform patient that valacyclovir does not prevent the spread of infection to others. Precautions should be taken around others who have not had chickenpox or varicella vaccine, or are immunosuppressed, until all lesions have crusted.
- **Genital Herpes and Herpes Labialis:** Inform patient that valacyclovir does not prevent the spread of herpes labialis to others. Advise patient to avoid contact with lesions while lesions or symptoms are present. Valacyclovir prevents transmission of genital herpes to others. Advise patient to practice safe sex (avoid sexual intercourse when lesions are present and wear a condom made latex or polyurethane during sexual contact).

Evaluation/Desired Outcomes

- Decrease in time to full crusting, loss of vesicles, loss of ulcers, and development of crusts in patients with acute herpes zoster (shingles).
- Decrease in time to full crusting, loss of vesicles, loss of ulcers, and development of crusts in patients with genital herpes.
- Decrease in frequency of outbreaks in patients with genital herpes.
- Decrease in time to full crusting, loss of vesicles, loss of ulcers, and development of crusts in patients with herpes labialis. Decrease in transmission of genital herpes.

Why was this drug prescribed for your patient?

VALPROATES

divalproex sodium (dye-val-**proe**-ex**soe**-dee-um)
Depakote, Depakote ER, ♣Epival

valproate sodium (val-**proe**-ate**soe**-dee-um)
Depacon

valproic acid (val-**proe**-ik**as**-id)
Depakene

Classification
Therapeutic: anticonvulsants, vascular headache suppressants

Pregnancy Category D

Indications

Simple and complex absence seizures. Partial seizures with complex symptomatology. **Divalproex only:** Manic episodes associated with bipolar disorder (delayed-release only). Prevention of migraine headache (delayed and extended release). **Unlabeled uses: IV:** Treatment of migraine headache.

Action

Increases levels of gamma-aminobutyric acid (GABA), an inhibitory neurotransmitter in the CNS. **Therapeutic Effects:** Suppression of absence seizures. Decreased manic behavior. Decreased frequency of migraine headaches.

Pharmacokinetics

Absorption: Well absorbed following oral administration; divalproex is enteric-coated and absorption is delayed. ER form produces lower blood levels. IV administration results in complete bioavailability.
Distribution: Rapidly distributed into plasma and extracellular water. Crosses blood-brain barrier and placenta; enters breast milk.
Metabolism and Excretion: Mostly metabolized by the liver.
Half-life: 5–20 hr.

TIME/ACTION PROFILE (onset = anticonvulsant effect; peak = blood levels)

ROUTE	ONSET	PEAK	DURATION
PO—liquid	2–4 days	15–120 min	6–24 hr
PO—capsules	2–4 days	1–4 hr	6–24 hr
PO—delayed-release products	2–4 days	5–5 hr	12–24 hr
PO—extended-release products	2–4 days	7–14 hr	24 hr
IV	2–4 days	end of infusion	6–24 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Hepatic impairment. Some products contain tartrazine; avoid in patients with known hypersensitivity. Known/suspected urea cycle disorders (may result in fatal hyperammonemic encephalopathy).
Use Cautiously in: Bleeding disorders; History of liver disease; Organic brain disease; Bone marrow depression; Renal impairment; Children (increased risk of hepatotoxicity); Pregnancy and lactation (safety not established).

Adverse Reactions/Side Effects

CNS: confusion, dizziness, headache, sedation. **EENT:** visual disturbances. **GI:** HEPATOTOXICITY, indigestion, nausea, vomiting, anorexia, constipation, diarrhea, hypersalivation, increased appetite, pancreatitis. **Derm:** rashes. **Hemat:** leukopenia, prolonged bleeding time, thrombocytopenia. **Metab:** hyperammonemia. **Neuro:** ataxia, paresthesia.

Interactions

Drug-Drug: ↑ risk of bleeding with **antiplatelet agents** (including **aspirin**, **NSAIDs**, **tirofiban**, **eptifibatide**, and **abciximab**), **cefoperazone**, **cefotetan**, **heparins** and **thrombolytic agents**, or **warfarin**. ↓

CONTINUED

VALPROATES

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

Implementation

- Do not confuse Depakote ER and regular dose forms; available in same strengths Depakote ER produces lower blood levels than Depakote dosing forms. If switching from Depakote to Depakote ER, increase dose by 8-20%.
- Single daily doses are usually administered at bedtime because of sedation.
- **PO:** Administer with or immediately after meals to minimize GI irritation. **Tell patient to swallow extended-release and delayed-release tablets whole, not to break or chew them, because this will cause irritation of the mouth or throat.** Do not administer tablets with milk, to prevent premature dissolution. Delayed-release divalproex sodium may cause less GI irritation than valproic acid capsules.
- Shake liquid preparations well before pouring. Use calibrated measuring device to ensure accurate dosage. Syrup may be mixed with food or other liquids to improve taste.
- Sprinkle capsules may be swallowed whole or opened and entire capsule contents sprinkled on a teaspoonful of soft, cool food (applesauce, pudding). **Tell patient to swallow drug/food mixture immediately, not to chew it.** Do not store for future use.
- To convert from valproic acid to divalproex sodium, initiate divalproex sodium at same total daily dose and dosing schedule as valproic acid. Once patient is stabilized on divalproex sodium, attempt administration 2–3 times daily.
- **Intermittent Infusion:** May be diluted in D5W, 0.9% NaCl, or LR. Solution is stable for 24 hr at room temperature. ***Rate:*** Infuse over 60 min (≤20 mg/min). Rapid infusion may cause increased side effects. Has been given as a one-time infusion of 1000 mg over 5-10 min @ 3 mg/kg/min up to 15 mg/kg in patients with no detectable levels.

Patient/Family Teaching

- Instruct patient to take medication as directed. If a dose is missed on a once-a-day schedule, take as soon as remembered that day. If on a multiple-dose schedule, take it within 6 hr of the scheduled time, then space remaining doses throughout the remainder of the day. Abrupt withdrawal may lead to status epilepticus.
- May cause drowsiness or dizziness. Caution patient to avoid driving or other activities requiring alertness until effects of medication are known. Tell patient not to resume driving until physician gives clearance based on control of seizure disorder.
- Caution patient to avoid taking alcohol, CNS depressants, OTC medications or herbal products concurrently with valproates without consulting health care professional.
- Instruct patient to notify health care professional of medication regimen prior to treatment or surgery.
- Advise patient to carry identification at all times describing medication regimen.
- Advise patient to notify health care professional if anorexia,abdominal pain severe nausea and vomiting, yellow skin or eyes, fever, sore throat, malaise, weakness, facial edema, lethargy, unusual bleeding or bruising, pregnancy, or loss of seizure control occurs. Children <2 yr of age are especially at risk for fatal hepatotoxicity.
- Emphasize the importance of routine exams to monitor progress.

Evaluation/Desired Outcomes

- Decrease or cessation of seizures without excessive sedation.
- Decreased incidence of mood swings in patients with bipolar disorders.
- Decreased frequency of migraine headaches.

metabolism of **barbiturates** and **primidone**, ↑ risk of toxicity. Blood levels and toxicity may be ↑ by **carbamazepine**, **cimetidine**, **erythromycin**, or **felbamate**. ↑ CNS depression with other **CNS depressants**, including **alcohol**, **antihistamines**, **antidepressants**, **opioid analgesics**, **MAO inhibitors**, and **sedative/hypnotics**. ↑ doses of **salicylates** (in children) increase the effects of valproic acid. May ↑ or ↓ effects and toxicity of **phenytoin**. **MAO inhibitors** and other **antidepressants** may ↓ seizure threshold and ↓ effectiveness of valproates. **Carbamazepine**, **rifampin**, or **lamotrigine** may ↓ valproic acid blood levels. Valproic acid may ↑ toxicity of **carbamazepine**, **ethosuximide**, **lamotrigine**, or **zidovudine**.

Route/Dosage

Doses expressed in mg of valproic acid.

Anticonvulsant

PO (Adults and children > 10 yr): *Single-agent therapy*—Initial dose of 5–15 mg/kg/day; increase by 5–10 mg/kg/day weekly until therapeutic levels are reached (not to exceed 60 mg/kg/day); when daily dosage exceeds 250 mg, give in 2 divided doses. *Polytherapy*—Initial dose of 10–30 mg/kg/day; increase by 5–10 mg/kg/day weekly until therapeutic levels are reached (not to exceed 60 mg/kg/day); when daily dosage exceeds 250 mg, give in 2 divided doses.
PO (Children): *Single-agent therapy*—Initial dose of 15–45 mg/kg/day; increase by 5–10 mg/kg/day weekly until therapeutic levels are reached. *Polytherapy*—Initial dose of 30–100 mg/kg/day.
IV (Adults and Children): Give same daily dose as was given orally; if daily dose >250 mg, give in divided doses q 6 hr. In patients with no detectable levels, may be given as a one-time infusion of 1000 mg over 5–10 min.

Antimanic

PO (Adults): *Divalproex*—750 mg/day in divided doses initially, titrated rapidly to desired clinical effect or trough plasma levels of 50–125 mcg/ml (not to exceed 60 mg/kg/day).

Migraine Prevention

PO (Adults): *Divalproex*—250 mg twice daily (up to 1000 mg/day) as delayed-release tablets (Depakote) *or* 500 mg once daily initially as extended-release tablets (Depakote ER), increased after one week to 1000 mg once daily.

NURSING IMPLICATIONS

Assessment

- **Seizures:** Assess location, duration, and characteristics of seizure activity. Institute seizure precautions.
- **Bipolar Disorder:** Assess mood, ideation, and behavior frequently.
- **Migraine Prophylaxis:** Monitor frequency of migraine headaches.
- ***Lab Test Considerations:*** Monitor CBC, platelet count, and bleeding time before and periodically during therapy. May cause leukopenia and thrombocytopenia.
- **Monitor hepatic function (LDH, AST, ALT, and bilirubin) and serum ammonia concentrations before and periodically during therapy. May cause hepatotoxicity; monitor closely, especially during initial 6 mo of therapy; fatalities have occurred. Therapy should be discontinued if hyperammonemia occurs.**
- May interfere with accuracy of thyroid function tests and decrease response to metyrapone tests.
- May cause false-positive results in urine ketone tests.
- ***Toxicity and Overdose:*** Therapeutic serum levels range from 50–100 mcg/ml. Doses are gradually increased until a predose serum concentration of at least 50 mcg/ml is reached. However, a good correlation between daily dose, serum level, and therapeutic effects has not been established. Patients receiving near the maximum recommended 60 mg/kg/day should be monitored for toxicity.

Potential Nursing Diagnoses

Risk for injury (Indications)

CONTINUED

Why was this drug prescribed for your patient?

vancomycin (van-koe-**mye**-sin)

Lyphocin, Vancocin, Vancoled

Classification

Therapeutic: anti-infectives

Pregnancy Category C

Indications

IV: Treatment of potentially life-threatening infections when less toxic antiinfectives are contraindicated: Endocarditis, Osteomyelitis, Pneumonia, Septicemia, Soft-tissue infections in patients who have allergies to penicillin or its derivatives or when sensitivity testing demonstrates resistance to methicillin. **PO:** Treatment of pseudomembranous colitis caused by *Clostridium difficile*. **IV:** Part of endocarditis prophylaxis in high-risk patients who are allergic to penicillin.

Action

Binds to bacterial cell wall, resulting in cell death. **Therapeutic Effects:** Bactericidal action against susceptible organisms. **Spectrum:** Active against gram-positive pathogens, including: Staphylococci (including methicillin-resistant strains of *Staphylococcus aureus*), Group A beta-hemolytic streptococci, *Streptococcus pneumoniae*, *Corynebacterium*, *Clostridium*, *Enterococcus faecalis*, *Enterococcus faecium*.

Pharmacokinetics

Absorption: Poorly absorbed from GI tract.
Distribution: Widely distributed. Some penetration (20–30%) of CSF; crosses placenta.
Metabolism and Excretion: Oral doses excreted primarily in the feces. IV form eliminated almost entirely by the kidneys.
Half-life: 6 hr (increased in renal impairment).

TIME/ACTION PROFILE (blood levels)

ROUTE	ONSET	PEAK	DURATION
IV	rapid	end of infusion	12–24 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity.
Use Cautiously in: Renal impairment (dosage reduction required if CCr ≤80 ml/min); Hearing impairment; GI obstruction or inflammation (increased absorption when given PO); Pregnancy and lactation (safety not established).

Adverse Reactions/Side Effects

Mainly associated with IV administration **EENT:** ototoxicity. **CV:** hypotension. **GI:** nausea, unpleasant taste, vomiting. **GU:** nephrotoxicity. **Derm:** rashes. **Hemat:** eosinophilia, leukopenia. **Local:** phlebitis. **MS:** back and neck pain. **Misc:** hypersensitivity reactions including ANAPHYLAXIS, fever, chills, "red man" syndrome, superinfection.

Interactions

Drug-Drug: May cause additive ototoxicity and nephrotoxicity with other **ototoxic** and **nephrotoxic drugs (aspirin, aminoglycosides, cyclosporine, cisplatin, loop diuretics)**. May enhance neuromuscular blockade from **nondepolarizing neuromuscular blocking agents.** Increased risk of histamine flush when used with **general anesthetics** in children.

Route/Dosage

Serious Systemic Infections

IV (Adults): 500 mg (7.5 mg/kg) q 6 hr *or* 1 g (15 mg/kg) q 12 hr (up to 3–4 g/day).
IV (Children >1 mo): 10 mg/kg q 6 hr *or* 20 mg/kg q 12 hr.
IV (Neonates 1 wk–1 mo): 15 mg/kg initially, then 10 mg/kg q 8 hr.
IV (Neonates <1 wk): 15 mg/kg initially, then 10 mg/kg q 12 hr.

venlafaxine (ven-la-**fax**-een)

Effexor, Effexor XR

Classification

Therapeutic: antidepressants, antianxiety agents

Pregnancy Category C

Indications

Major depressive illness or relapse, often in conjunction with psychotherapy. Generalized anxiety disorder (Effexor XR only). Social anxiety disorder (Effexor XR only).

Action

Inhibits serotonin and norepinephrine reuptake in the CNS. **Therapeutic Effects:** Decrease in depressive symptomatology, with fewer relapses/recurrences. Decreased anxiety.

Pharmacokinetics

Absorption: 92–100% after oral administration.
Distribution: Extensive distribution into body tissues.
Metabolism and Excretion: Extensively metabolized on 1st pass through the liver. One metabolite, O-desmethylvenlafaxine (ODV), has antidepressant activity; 5% of venlafaxine is excreted unchanged in urine; 30% of the active metabolite is excreted in urine.
Half-life: *Venlafaxine*—3–5 hr; *ODV*—9–11 hr (both are increased in hepatic/renal impairment).

TIME/ACTION PROFILE (antidepressant action)

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

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Concurrent MAO inhibitor therapy.
Use Cautiously in: Cardiovascular disease, including hypertension; Hepatic/renal impairment (dosage reduction recommended); History of seizures or neurologic impairment; History of mania or of drug abuse; Pregnancy, lactation, or children <18 yr (use only if clearly required during pregnancy; safety not established).

Adverse Reactions/Side Effects

CNS: SEIZURES, abnormal dreams, anxiety, dizziness, headache, insomnia, nervousness, weakness, abnormal thinking, agitation, confusion, depersonalization, drowsiness, emotional lability, worsening depression. **EENT:** rhinitis, visual disturbances, tinnitus. **CV:** chest pain, hypertension, palpitations, tachycardia. **GI:** abdominal pain, altered taste, anorexia, constipation, diarrhea, dry mouth, dyspepsia, nausea, vomiting, weight loss. **GU:** sexual dysfunction, urinary frequency, urinary retention. **Derm:** ecchymoses, itching, photosensitivity, skin rash. **Neuro:** paresthesia, twitching. **Misc:** chills, yawning.

Interactions

Drug-Drug: Concurrent use with **MAO inhibitors** may result in serious, potentially fatal reactions (wait at least 2 wk after stopping MAO inhibitor before initiating venlafaxine; wait at least 1 wk after stopping venlafaxine before starting MAO inhibitors). Concurrent use with **alcohol** or other **CNS depressants**, including **sedative/hypnotics, antihistamines**, and **opioid analgesics**, in depressed patients is not recommended. ↑ risk of serotonin syndrome with **trazodone sibutramine** and **sumatriptan**. **Lithium** may have ↑ serotonergic effects with venlafaxine; use cautiously in patients receiving venlafaxine. ↑ blood levels and may ↑ effects of **desipramine** and **haloperidol**. **Cimetidine** may ↑ the effects of venlafaxine (may be more pronounced in geriatric patients, those with hepatic or renal impairment, or those with pre-existing hypertension).
Drug-Natural Products: Conco ↑ mitant use of **kava, valerian, skullcap, chamomile**, or **hops** can ↑ CNS depression. ↑ risk of serotinergic side effects including serotonin syndrome with **St. John's wort** and **SAMe.**

Route/Dosage

PO (Adults): *Tablets*—75 mg/day in 2–3 divided doses; may increase by up to 75 mg/day every 4 days, up to 225 mg/day (not to exceed 375 mg/day

Endocarditis Prophylaxis in Penicillin-Allergic Patients

IV (Adults and Adolescents): 1 g single dose 1 hr preprocedure.
IV (Children): 20 mg/kg single dose 1 hr preprocedure.

Pseudomembranous Colitis

PO (Adults): 125–500 mg q 6 hr.
PO (Children): 10 mg/kg q 6 hr (up to 125 mg/dose; not to exceed 2 g/day).

NURSING IMPLICATIONS

Assessment

- Assess patient for infection before and during therapy.
- Obtain specimens for culture and sensitivity before initiating therapy. First dose may be given before receiving results.
- Monitor IV site closely. Vancomycin is irritating to tissues and causes necrosis and severe pain with extravasation.
- Monitor blood pressure throughout IV infusion.
- Evaluate eighth cranial nerve function by audiometry and measuring serum vancomycin levels before and throughout course of therapy in patients with borderline renal function or >60 yr of age. Prompt recognition and intervention are essential in preventing permanent damage.
- Assess patient for signs of superinfection (black, furry overgrowth on tongue; vaginal itching or discharge; loose or foul-smelling stools).
- **Pseudomembranous Colitis:** Assess bowel status (bowel sounds, frequency and consistency of stools, presence of blood in stools) throughout therapy.
- ***Toxicity and Overdose:*** Peak serum vancomycin levels should not exceed 25 mcg/ml. Trough concentrations should not exceed 5–10 mcg/ml.

Potential Nursing Diagnoses

Risk for infection (Indications)
Disturbed sensory perception (auditory) (Side Effects)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- **PO:** IV dosage form may be diluted in 30 ml of water for oral or nasogastric tube administration. Resulting solution has a bitter, unpleasant taste. Stable for 14 days if refrigerated.
- **Intermittent Infusion:** Dilute each 500-mg vial with 10 ml of sterile water for injection. Dilute further with 100–200 ml of 0.9% NaCl, D5W, D10W, or LR. ***Rate:*** Administer over 60 min. To minimize risk of thrombophlebitis, hypotension, and "red-man (neck)" syndrome (sudden severe hypotension, flushing, or maculopapular rash of face, neck, chest, upper extremities), do not administer rapidly or as a bolus.
- **Continuous Infusion:** Should be used only if intermittent infusion is not feasible. May also be prepared as a continuous infusion with 1–2 g in sufficient volume to infuse over 24 hr.

Patient/Family Teaching

- Advise patient on oral vancomycin to take exactly as directed and to notify health care professional if no improvement is seen in a few days.
- Instruct patient to report signs of hypersensitivity, tinnitus, vertigo, or hearing loss.
- Inform patient with a history of heart disease or valve replacement of the importance of antimicrobial prophylaxis before invasive dental or medical procedures.

Evaluation/Desired Outcomes

- Resolution of the signs and symptoms of infection. Length of time for complete resolution depends on organism and site of infection.
- Endocarditis prophylaxis.

Why was this drug prescribed for your patient?

in 3 divided doses); *Extended-release (XR) capsules*—75 mg once daily (some patients may be started at 37.5 mg once daily) for 4–7 days; doses may then be increased at intervals of not less than 4 days up to 225 mg/day.

NURSING IMPLICATIONS

Assessment

- Assess mental status and mood changes. Inform physician or other health care professional if patient demonstrates significant increase in anxiety, nervousness, or insomnia.
- Assess suicidal tendencies, especially in early therapy. Restrict amount of drug available to patient.
- Monitor blood pressure before and periodically during therapy. Sustained hypertension may be dose related; decrease dose or discontinue therapy if this occurs.
- Monitor appetite and nutritional intake. Weigh weekly. Report continued weight loss. Adjust diet as tolerated to support nutritional status.
- ***Lab Test Considerations:*** Monitor CBC with differential and platelet count periodically during therapy. May cause anemia, leukocytosis, leukopenia, thrombocytopenia, basophilia, and eosinophilia.
- May cause an ↑ in serum alkaline phosphatase, bilirubin, AST, ALT, BUN, and creatinine.
- May also cause ↑ serum cholesterol.
- May cause electrolyte abnormalities (hyperglycemia or hypoglycemia, hyperkalemia or hypokalemia, hyperuricemia, hyperphosphatemia or hypophosphatemia, and hyponatremia).

Potential Nursing Diagnoses

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

Implementation

- **PO:** Administer venlafaxine with food.
- **Extended-release capsules should be swallowed whole; do not crush, break, or chew.**
- Extended-release capsules may also be opened and contents sprinkled on a spoonful of applesauce. Take immediately and follow with a glass of water. Do not store mixture for later use.

Patient/Family Teaching

- Instruct patient to take medication exactly as directedat the same time each day. Take missedoses as soon as possible unless almost time for next dose. Do not double doses or discontinue abruptly. Patients taking venlafaxine for >6 wk should have dose gradually decreased before discontinuation.
- May cause drowsiness or dizziness. Caution patient to avoid driving or other activities requiring alertness until response to the drug is known.
- Caution patient to avoid taking alcohol or other CNS-depressant drugs during therapy and not to take other Rx, OTC, or herbal products without consulting health care professional.
- Instruct female patients to inform health care professional if pregnancy is planned or suspected or if breastfeeding.
- Instruct patient to notify health care professional if signs of allergy (rash, hives) occur.
- 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. Need for therapy should be periodically reassessed. Therapy is usually continued for several months.
- Decreased anxiety.

Why was this drug prescribed for your patient?

High Alert

vinblastine (vin-blass-teen)

Velban, ♣Velbe

Classification

Therapeutic: antineoplastics
Pharmacologic: vinca alkaloids

Pregnancy Category D

Indications

Combination chemotherapy of Lymphomas, Nonseminomatous testicular carcinoma, Advanced breast cancer, Other tumors.

Action

Binds to proteins of mitotic spindle, causing metaphase arrest—cell replication is stopped as a result (cell cycle—specific for M phase). **Therapeutic Effects:** Death of rapidly replicating cells, particularly malignant ones. Has immunosuppressive properties.

Pharmacokinetics

Absorption: Administered IV only, resulting in complete bioavailability.
Distribution: Does not cross the blood-brain barrier well.
Metabolism and Excretion: Converted by the liver to an active antineoplastic compound; excreted in the feces via biliary excretion; some renal elimination.
Half-life: 24 hr.

TIME/ACTION PROFILE (effects on white blood cell counts)

ROUTE	ONSET	PEAK	DURATION
IV	5–7 days	10 days	7–14 days

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Pregnancy or lactation.

Use Cautiously in: Infections; Decreased bone marrow reserve; Other chronic debilitating illnesses; Patients with childbearing potential.

Adverse Reactions/Side Effects

CNS: SEIZURES, mental depression, neurotoxicity, weakness. **Resp:** BRONCHOSPASM. **GI:** nausea, vomiting, anorexia, constipation, diarrhea, stomatitis. **GU:** gonadal suppression. **Derm:** alopecia, dermatitis, vesiculation. **Endo:** syndrome of inappropriate antidiuretic hormone (SIADH). **Hemat:** anemia, leukopenia, thrombocytopenia. **Local:** phlebitis at IV site. **Metab:** hyperuricemia. **Neuro:** neuritis, paresthesia, peripheral neuropathy.

Interactions

Drug-Drug: Additive bone marrow depression with **other antineoplastics** or **radiation therapy**. Bronchospasm may occur in patients who have been previously treated with **mitomycin**. May decrease antibody response to **live-virus vaccines** and increase the risk of adverse reactions. May decrease **phenytoin** levels.

Route/Dosage

Many doses/regimens are used.
IV (Adults): *Initial*—3.7 mg/m² (100 mcg/kg), single dose; increase weekly as tolerated by 1.8 mg/m² (50 mcg/kg) to a maximum of 18.5 mg/m² (usual dose is 5.5–7.4 mg/m²). *Maintenance*—10 mg 1–2 times/mo or one increment less than last dose q 7–14 days.
IV (Children): *Initial*—2.5 mg/m², single dose; increase weekly as tolerated by 1.25 mg/m² to a maximum of 7.5 mg/m². *Maintenance*—one increment less than last dose q 7 days.

NURSING IMPLICATIONS

Assessment

- **Monitor blood pressure, pulse, and respiratory rate during course of therapy. Notify physician immediately if respiratory distress occurs. Bronchospasm can be life-threatening and may occur at time of infusion or several hours to weeks later.**

♣ = Canadian drug name.

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

Why was this drug prescribed for your patient?

CONTINUED

vinblastine

stool, or emesis occurs. Caution patient to avoid crowds and persons with known infections. Instruct patient to use soft toothbrush and electric razor. Caution patient not to drink alcoholic beverages or take products containing aspirin or NSAIDs.

- Instruct patient to inspect oral mucosa for redness and ulceration. If ulceration occurs advise patient to avoid spicy foods, use sponge brush, and rinse mouth with water after eating and drinking. Topical agents may be used if mouth pain interferes with eating. Stomatitis pain may require treatment with opioid analgesics.
- Instruct patient to report symptoms of neurotoxicity (paresthesia, pain, difficulty walking, persistent constipation).
- Advise patient that jaw pain, pain in organs containing tumor tissue, nausea, and vomiting may occur. Patient should avoid constipation and report other adverse reactions.
- Advise patient that this medication may have teratogenic effects. Contraception should be used during and for at least 2 mo after therapy is concluded.
- Discuss with patient the possibility of hair loss. Explore coping strategies.
- Instruct patient not to receive any vaccinations without advice of health care professional.
- Emphasize need for periodic lab tests to monitor for side effects.

Evaluation/Desired Outcomes

- Regression of malignancy without the appearance of detrimental side effects.

♣ = Canadian drug name.

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

- Monitor for bone marrow depression. Assess for bleeding (bleeding gums, bruising, petechiae; guaiac-test stools, urine, and emesis) and avoid IM injections and taking rectal temperatures if platelet count is low. Apply pressure to venipuncture sites for 10 min. Assess for signs of infection during neutropenia. Anemia may occur. Monitor for increased fatigue, dyspnea, and orthostatic hypotension.
- May cause nausea and vomiting. Monitor intake and output, appetite, and nutritional intake. Prophylactic antiemetics may be used. Adjust diet as tolerated.
- Assess injection site frequently for redness, irritation, or inflammation. If extravasation occurs, infusion must be stopped and restarted elsewhere to avoid damage to subcut tissue. Standard treatment includes infiltration with hyaluronidase and application of heat.
- Monitor for symptoms of gout (increased uric acid, joint pain, edema). Encourage patient to drink at least 2 L of fluid per day. Allopurinol or alkalinization of urine may be used to decrease uric acid levels.
- ***Lab Test Considerations:*** Monitor CBC before and routinely throughout therapy. If WBC <2000, subsequent doses are usually withheld until WBC is ≥4000. The nadir of leukopenia occurs in 5–10 days and recovery usually occurs 7–14 days later. Thrombocytopenia may also occur in patients who have received radiation or other chemotherapy agents.
- Monitor liver function studies (AST, ALT, LDH, bilirubin) and renal function studies (BUN, creatinine) before and periodically throughout therapy.
- May cause increased uric acid. Monitor periodically during therapy.

Potential Nursing Diagnoses

Risk for infection (Adverse Reactions)
Imbalanced nutrition: less than body requirements (Adverse Reactions)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- ***High Alert:*** Fatalities have occurred with 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, dose calculations and infusion pump settings. Do not administer subcut, IM, or intrathecally (IT). IT administration is fatal. Vinblastine must be dispensed in an overwrap stating, "For IV use only." Overwrap should remain in place until immediately before administration. Do not confuse vinblastine with vincristine.
- Solution should be prepared in a biologic cabinet. Wear gloves, gown, and mask while handling medication. Discard IV equipment in specially designated containers.
- Do not inject into extremities with impaired circulation; may cause thrombophlebitis.
- **Direct IV:** Dilute each 10 mg with 10 ml of 0.9% NaCl for injection with phenol or benzyl alcohol for a concentration of 1 mg/ml. Solution is clear. Reconstituted medication is stable for 28 days if refrigerated. ***Rate:*** Administer each single dose over 1 min through Y-site injection of a free-flowing infusion of 0.9% NaCl or D5W.
- **Intermittent Infusion:** Dilution in large volumes (100–250 ml) or prolonged infusion (≥30 min) increases chance of vein irritation and extravasation.
- **Y-Site Compatibility:** amifostine, aztreonam, bleomycin, cefepime, cisplatin, cyclophosphamide, doxorubicin, droperidol, filgrastim, fludarabine, fluorouracil, heparin, leucovorin calcium, melphalan, methotrexate, metoclopramide, mitomycin, ondansetron, paclitaxel, piperacillin/tazobactam, sargramostim, teniposide, thiotepa, vincristine, vinorelbine.
- **Y-Site Incompatibility:** furosemide.

Patient/Family Teaching

- Advise patient to notify health care professional if fever; chills; sore throat; signs of infection; bleeding gums; bruising; petechiae; or blood in urine,

CONTINUED

High Alert

vincristine (vin-**kriss**-teen)

Oncovin, Vincasar PFS

Classification

Therapeutic: antineoplastics
Pharmacologic: vinca alkaloids

Pregnancy Category D

Indications

Used alone and in combination with other treatment modalities (antineoplastics, surgery, or radiation therapy) in the treatment of Hodgkin's disease, Leukemias, Neuroblastoma, Malignant lymphomas, Rhabdomyosarcoma, Wilms' tumor, Other tumors.

Action

Binds to proteins of mitotic spindle, causing metaphase arrest. Cell replication is stopped as a result (cell cycle–specific for M phase). Has little or no effect on bone marrow. **Therapeutic Effects:** Death of rapidly replicating cells, particularly malignant ones.

Pharmacokinetics

Absorption: Administered IV only, resulting in complete bioavailability.
Distribution: Rapidly and widely distributed; extensively bound to tissues.
Metabolism and Excretion: Metabolized by the liver and eliminated in the feces via biliary excretion.
Half-life: 10.5–37.5 hr.

TIME/ACTION PROFILE (effects on blood counts†)

ROUTE	ONSET	PEAK	DURATION
IV	unknown	4 days	~ days

†Usually mild

♣ = Canadian drug name.

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Pregnancy or lactation.
Use Cautiously in: Infections; Decreased bone marrow reserve; Other chronic debilitating illnesses; Hepatic impairment (50% dosage reduction recommended if serum bilirubin >3 mg/dl); Patients with childbearing potential.

Adverse Reactions/Side Effects

CNS: agitation, insomnia, mental depression, mental status changes. **EENT:** cortical blindness, diplopia. **Resp:** bronchospasm. **GI:** nausea, vomiting, abdominal cramps, anorexia, constipation, ileus, stomatitis. **GU:** gonadal suppression, nocturia, oliguria, urinary retention. **Derm:** alopecia. **Endo:** syndrome of inappropriate antidiuretic hormone (SIADH). **Hemat:** anemia, leukopenia, thrombocytopenia (mild and brief). **Local:** phlebitis at IV site, tissue necrosis (from extravasation). **Metab:** hyperuricemia. **Neuro:** ascending peripheral neuropathy.

Interactions

Drug-Drug: Bronchospasm may occur in patients who have been previously treated with **mitomycin**. L **-asparaginase** may decrease hepatic metabolism of vincristine (give vincristine 12–24 hr prior to asparaginase). May decrease antibody response to **live-virus vaccines** and increase the risk of adverse reactions.

Route/Dosage

Many other protocols used.
IV (Adults): 10–30 mcg/kg (0.4–1.4 mg/m²); may repeat weekly (not to exceed 2 mg each dose).
IV (Children >10 kg): 1.5–2 mg/m² single dose; may repeat weekly.
IV (Children <10 kg): 50 mcg/kg single dose; may repeat weekly.

NURSING IMPLICATIONS

Assessment

- Monitor blood pressure, pulse, and respiratory rate during course of therapy. Report significant changes.

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

CONTINUED

vincristine

- Advise patient that this medication may have teratogenic effects. Contraception should be used during and for at least 2 mo after therapy is concluded.
- Discuss with patient the possibility of hair loss. Explore coping strategies.
- Instruct patient not to receive any vaccinations without advice of health care professional.
- Emphasize need for periodic lab tests to monitor for side effects.

Evaluation/Desired Outcomes

- Regression of malignancy without the appearance of detrimental side effects.

Why was this drug prescribed for your patient?

♣ = Canadian drug name.

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

- Monitor neurologic status. Assess for paresthesia (numbness, tingling, pain); loss of deep tendon reflexes (Achilles reflex is usually first involved); weakness (wrist or foot drop, gait disturbances); cranial nerve palsies (jaw pain, hoarseness, ptosis, visual changes); autonomic dysfunction (ileus, difficulty voiding, orthostatic hypotension; impaired sweating); and CNS dysfunction (decreased level of consciousness, agitation, hallucinations). Notify physician if these symptoms develop; they may persist for months.
- Monitor intake and output ratios and daily weight; report significant discrepancies. Decreased urine output with concurrent hyponatremia may indicate SIADH, which usually responds to fluid restriction.
- Assess infusion site frequently for redness, irritation, or inflammation. If extravasation occurs, infusion must be stopped and restarted elsewhere to avoid damage to subcut tissue. Cellulitis and discomfort may be minimized by infiltration with hyaluronidase and application of moderate heat, or by application of cold compresses.
- Assess nutritional status. An antiemetic may be used to minimize nausea and vomiting.
- Monitor for symptoms of gout (increased uric acid, joint pain, edema). Encourage patient to drink at least 2 liters of fluid per day. Allopurinol or alkalinization of urine may be used to decrease uric acid levels.
- ***Lab Test Considerations:*** Monitor CBC before and periodically throughout therapy. May cause slight leukopenia 4 days after therapy, which resolves within 7 days. Platelet count may increase or decrease.
- Monitor liver function studies (AST, ALT, LDH, bilirubin) and renal function studies (BUN, creatinine) before and periodically throughout therapy.
- May cause increased uric acid. Monitor periodically during therapy.

Potential Nursing Diagnoses

Risk for injury (Adverse Reactions)
Imbalanced nutrition: less than body requirements (Adverse Reactions)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- ***High Alert:*** Fatalities have occurred with 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, dose calculations, and infusion pump settings. Do not administer subcut, IM, or intrathecally (IT). IT administration is fatal. Vincristine must be dispensed in an overwrap stating "For IV use only." Overwrap should remain in place until immediately before administration. Do not confuse vincristine with vinblastine.
- Solution should be prepared in a biologic cabinet. Wear gloves, gown, and mask while handling medication. Discard IV equipment in specially designated containers.
- **Direct IV:** Reconstitute by adding 5 ml of sterile water for injection to each vial for a concentration of 1 mg/ml. Administer undiluted. ***Rate:*** Administer each single dose over 1 min through Y-site injection of a free-flowing infusion of 0.9% NaCl or D5W.

Patient/Family Teaching

- Instruct patient to notify health care professional immediately if redness, swelling, or pain at injection site occurs.
- Instruct patient to report symptoms of neurotoxicity (paresthesia, pain, difficulty walking, persistent constipation). Inform patient that increased fluid intake, dietary fiber, and exercise may minimize constipation. Stool softeners or laxatives may be used. Patient should inform health care professional if severe constipation or abdominal discomfort occurs; this may be a sign of neuropathy.
- Advise patient to notify health care professional if fever, chills, sore throat, signs of infection, bleeding gums, bruising, petechiae; blood in urine, stool, or emesis; or mouth sores occur. Caution patient to avoid crowds and persons with known infections.

CONTINUED

High Alert

vinorelbine (vi-nor-el-been)

Navelbine

Classification

Therapeutic: antineoplastics
Pharmacologic: vinca alkaloids

Pregnancy Category D

Indications

Inoperable non–small-cell cancer of the lung in ambulatory patients (alone or with cisplatin).

Action

Binds to a protein (tubulin) of cellular microtubules, where it interferes with microtubule assembly. Cell replication is stopped as a result (cell cycle–specific for M phase). **Therapeutic Effects:** Death of rapidly replicating cells, particularly malignant ones.

Pharmacokinetics

Absorption: IV administration results in complete bioavailability.
Distribution: Highly bound to platelets and lymphocytes.
Metabolism and Excretion: Mostly metabolized by the liver. At least one metabolite is active. Large amounts eliminated in feces; 11% excreted unchanged by the kidneys.
Half-life: 28–44 hr.

TIME/ACTION PROFILE (effect on WBCs)

ROUTE	ONSET	PEAK	DURATION
IV	unknown	7–10 days	7–15 days

🍁 = Canadian drug name.

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Active infections. Decreased bone marrow reserve. Other chronic debilitating illnesses. Pregnancy or lactation.

Use Cautiously in: Childbearing potential; Impaired hepatic function (dosage reduction recommended if total bilirubin >2 mg/dl); Debilitated patients (increased risk of hyponatremia); Granulocytopenic patients (temporarily discontinue or reduce dose); Children (safe use not established).

Adverse Reactions/Side Effects

CNS: fatigue. **Resp:** shortness of breath. **CV:** chest pain. **GI:** constipation, nausea, abdominal pain, anorexia, diarrhea, transient increase in liver enzymes, vomiting. **Derm:** alopecia, rashes. **F and E:** hyponatremia. **Hemat:** anemia, neutropenia, thrombocytopenia. **Local:** irritation at IV site, skin reactions, phlebitis. **MS:** arthralgia, back pain, jaw pain, myalgia. **Neuro:** neurotoxicity. **Misc:** pain in tumor-containing tissue.

Interactions

Drug-Drug: ↑ bone marrow depression with other **antineoplastics** or **radiation therapy.** Concurrent use with **cisplatin** ↑ risk and severity of bone marrow depression. Concurrent use with **mitomycin** or **chest radiation** ↑ risk of pulmonary reactions.

Route/Dosage

IV (Adults): 30 mg/m² once weekly.

NURSING IMPLICATIONS

Assessment

- Monitor blood pressure, pulse, and respiratory rate during therapy. Note significant changes. Acute shortness of breath and severe bronchospasm may occur infrequently shortly after administration. Treatment with corticosteroids, bronchodilators, and supplemental oxygen may be required, especially in patients with a history of pulmonary disease.

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

CONTINUED

vinorelbine

comfort, because this may be a sign of ileus, which may occur as a consequence of neuropathy.

- Advise patient to notify health care professional if fever; chills; sore throat; signs of infection; bleeding gums; bruising; petechiae; blood in urine, stool, or emesis; or mouth sores occur.
- Caution patient to avoid crowds and persons with known infections.
- Advise patient that this medication may have teratogenic effects. Contraception should be used during and for at least 2 mo after therapy is concluded.
- Discuss with patient the possibility of hair loss and explore coping strategies.
- 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

- Decrease in the size or spread of malignancy without detrimental side effects.

Why was this drug prescribed for your patient?

- Assess frequently for signs of infection (sore throat, temperature, cough, mental status changes), especially when nadir of granulocytopenia is expected.
- Monitor neurologic status. Assess for paresthesia (numbness, tingling, pain), loss of deep tendon reflexes (Achilles reflex is usually first involved), weakness (wrist drop or footdrop, gait disturbances), cranial nerve palsies (jaw pain, hoarseness, ptosis, visual changes), autonomic dysfunction (constipation, ileus, difficulty voiding, orthostatic hypotension, impaired sweating), and CNS dysfunction (decreased level of consciousness, agitation, hallucinations). These symptoms may persist for months. The incidence of neurotoxicity associated with vinorelbine is less than that of other vinca alkaloids.
- Monitor intake and output and daily weight for significant discrepancies.
- Assess nutritional status. Mild to moderate nausea is common. An antiemetic may be used to minimize nausea and vomiting.
- Monitor for symptoms of gout (increased uric acid, joint pain, edema). Encourage patient to drink at least 2 L of fluid/day. Allopurinol and alkalinization of urine may decrease uric acid levels.
- ***Lab Test Considerations:*** Monitor CBC prior to each dose and routinely during therapy. The nadir of granulocytopenia usually occurs 7–10 days after vinorelbine administration and recovery usually follows within 7–15 days. If granulocyte count is $<1500/mm^3$, dosage reduction or temporary interruption of vinorelbine may be warranted. If repeated episodes of fever and/or sepsis occur during granulocytopenia, future dosage of vinorelbine should be modified. May also cause mild to moderate anemia. Thrombocytopenia rarely occurs.
- Monitor liver function studies (AST, ALT, LDH, bilirubin) and renal function studies (BUN, creatinine) prior to and periodically during therapy. May cause ↑ uric acid; monitor periodically during therapy.

Potential Nursing Diagnoses

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

Implementation

- ***High Alert:*** Fatalities have occurred with 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, dose calculations, and infusion pump settings.
- Solution should be prepared in a biologic cabinet. Wear gloves, gown, and mask while handling medication. Discard IV equipment in specially designated containers.
- Assess infusion site frequently for redness, irritation, or inflammation. Vinorelbine is a vesicant. If extravasation occurs, infusion must be stopped and restarted elsewhere to avoid damage to subcut tissue.
- **Direct IV:** Dilute vinorelbine to a concentration of 1.5–3 mg/ml with 0.9% NaCl or D5W.
- Flush vein with at least 75–125 ml of 0.9% NaCl or D5W administered over 10 min or more following administration. ***Rate:*** Administer via slow IV push, over at least 1 min.
- **Intermittent Infusion:** Dilute vinorelbine to a concentration of 0.5–2 mg/ml with 0.9% NaCl, D5W, 0.45% NaCl, D5/0.45% NaCl, Ringer's or lactated Ringer's injection. Solution should be colorless to pale yellow. Do not administer solutions that are discolored or contain particulate matter. Diluted solution is stable for 24 hr at room temperature. ***Rate:*** Infuse over 6–10 min into Y-site closest to bag of a free-flowing IV or into a central line.

Patient/Family Teaching

- Instruct patient to report symptoms of neurotoxicity (paresthesia, pain, difficulty walking, persistent constipation).
- Inform patient that increased fluid intake, dietary fiber, and exercise may minimize constipation. Stool softeners or laxatives may be necessary. Patient should be advised to report severe constipation or abdominal dis-

CONTINUED

379 **High Alert**

warfarin (war-fa-rin)

Coumadin, ♣Warfilone

Classification

Therapeutic: anticoagulants
Pharmacologic: coumarins

Pregnancy Category X

Indications

Prophylaxis/treatment of venous thrombosis, pulmonary embolism, atrial fibrillation with embolization. Management of MI: Decreases risk of death, subsequent myocoardial infarction, and future thromboembolism. Prevents thrombus formation/embolization after prosthetic valve placement.

Action

Interferes with hepatic synthesis of vitamin K–dependent clotting factors (II, VII, IX, and X). **Therapeutic Effects:** Prevention of thromboembolism.

Pharmacokinetics

Absorption: Well absorbed.
Distribution: Crosses the placenta; does not enter breast milk.
Metabolism and Excretion: Metabolized by the liver.
Half-life: 0.5–3 days.

TIME/ACTION PROFILE (effects on coagulation tests)

ROUTE	ONSET	PEAK	DURATION
PO, IV	several hr	0.5–3 days	2–5 days

Contraindications/Precautions

Contraindicated in: Pregnancy. Uncontrolled bleeding. Open wounds. Active ulcer disease. Recent brain, eye, or spinal cord injury or surgery. Severe liver disease. Uncontrolled hypertension.

Use Cautiously in: Malignancy; History of ulcer, liver disease or poor compliance; Women with childbearing potential.

Adverse Reactions/Side Effects

GI: cramps, nausea. **Derm:** dermal necrosis. **Hemat:** BLEEDING. **Misc:** fever.

Interactions

Drug-Drug: Abciximab, **capecitabine**, **androgens**, **cefoperazone**, **cefotetan**, **chloral hydrate**, **chloramphenicol**, **clopidogrel**, **disulfiram**, **fluconazole**, **fluoroquinolones**, **itraconazole**, **metronidazole** (including vaginal use), **thrombolytics**, **eptifibatide**, **tirofiban**, **ticlopidine**, **sulfonamides**, **quinidine**, **quinine**, **NSAIDs**, **valproates**, chronic use of **acetaminophen**, and **aspirin** may ↑ the risk of bleeding. Chronic **alcohol** ingestion may decrease action of warfarin; if chronic **alcohol** abuse results in significant liver damage, action of warfarin may be ↑ due to ↓ production of clotting factor. **Barbiturates** and **hormonal contraceptives containing estrogen** may decrease the anticoagulant response to warfarin. Acute **alcohol** ingestion may ↑ action of warfarin. **Many other drugs** may affect the activity of **warfarin**.
Drug-Natural Products: St. John's wort decreases effect. Increased bleeding risk with **anise**, **arnica**, **chamomile**, **clove**, **dong quai**, **fenugreek**, **feverfew**, **garlic**, **ginger**, **ginkgo**, **Panax ginseng**, **licorice**, and others.

Route/Dosage

PO (Adults): 2.5–10 mg/day for 2–4 days, then adjust ***(see Lab Test Considerations)*** Many drugs affect the activity of warfarin. Start with lower doses in geriatric/debilitated patients (range 2–10 mg/day).

NURSING IMPLICATIONS

Assessment

- **Assess patient for signs of bleeding and hemorrhage (bleeding gums, nosebleed, unusual bruising, tarry black stools, hematu-**

♣ = Canadian drug name.

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

378

voriconazole (vor-i-kon-a-zole)

VFEND

Classification

Therapeutic: antifungals

Pregnancy Category D

Indications

Serious systemic fungal infections including candidemia, eosphageal candidiasis, candidal deep tissue and skin infections, abdominal, kidney, bladder wall and wound infections and aspergillosis.

Action

Inhibits fungal ergosterol synthesis leading to production of abnormal fungal cell wall. **Therapeutic Effects:** Antifungal activity.

Pharmacokinetics

Absorption: Well absorbed following oral administration (96%); IV administration results in complete bioavailability.
Distribution: Extensive tissue distribution.
Metabolism and Excretion: Highly metabolized by the hepatic P450 enzymes (CYP2C19, CYP2C9, CYP3A4); <2% excreted unchanged in urine. Much individual variation in metabolism; metabolites are inactive.
Half-life: Dose-dependent; increased in hepatic impairment.

TIME/ACTION PROFILE (blood levels)

ROUTE	ONSET	PEAK	DURATION
PO	rapid	1–2 hr	12 hr
IV	rapid	end of infusion	12 hr

Contraindications/Precautions

Contraindicated in: Concurrent use of efavirenz, rifampin, carbamazepine, phenobarbital, mephobarbital (decrease antifungal activity). Concurrent use of sirolimus, pimozide, quinidine, ergotamine, and dihydroergotamine (increased risk of toxicity of these agents). Tablets contain lactose and should be avoided in patients with galactose intolerance, Lapp lactase deficiency, or glucose-galactose malabsorption.
Use Cautiously in: Mild to moderate liver disease (Child-Pugh Class A and B); maintenance dose reduction recommended; Renal impairment (CCr <50 ml/min); use only if justified by risk/benefit assessment (IV form should be avoided, use oral form only); Pregnancy or lactation (use only if benefits justify risk); Children <12 yr (safety not established).

Adverse Reactions/Side Effects

CNS: dizziness, hallucinations, headache. **EENT:** visual disturbances, eye hemorrhage. **CV:** changes in blood pressure, tachycardia, peripheral edema, tachycardia. **GI:** HEPATOXICITY, abdominal pain, diarrhea, nausea, vomiting. **Derm:** photosensitivity, rash. **F and E:** hypokalemia, Hypomagnesemia. **Misc:** allergic reactions including STEVENS-JOHNSON SYNDROME, chills, fever, infusion reactions.

Interactions

Drug-Drug: Carbamazepine, **efavirenz mephobarbital**, **phenobarbital**, and **rifampim** ↑ metabolism and ↓ antifungal activity of voriconazole; concurrent use is contraindicated. ↓ metabolism and ↑ risk of toxicity from **dihydroergotamine**, **ergotamine**, **pimozide**, **quinidine**, and **sirolimus**; concurrent use is contraindicated. ↓ metabolism and ↑ risk of toxicity from **cyclosporine**, **efavirenz**, **HMG-CoA reductase inhibitors**, some **benzodiazepines** (**alprazolam**, **midazolam**, **triazolam**), some **calcium channel blockers**, **sulfonylureas** (**glipizide**, **glyburide**, **tolbutamine**), **tacrolimus**, **warfarin**, **vinca alkaloids** (**vincristine**, **vinblastine**); careful monitoring required during concurrent use. **Phenytoin** ↑ metabolism and ↓ antifungal activity of voriconazole; voriconazole ↑ **phenytoin** levels and may cause toxicity; careful monitoring required during concurrent use. ↑ blood levels of **omeprazole**; ↓ omeprazole dose by 50% during concurrent use. Similar effects may occur with other **proton-pump inhibitors**. May ↓ metabolism and ↑ blood levels and effects of **protease-inhibitor antiretrovirals** and **non-nucleoside reverse transcriptase inhibitor antiretrovirals**; frequent monitoring recommended. **Non-nucleoside reverse transcriptase inhibitor antiretrovirals**; may induce or inhibit the metabolism of voriconazole; frequent monitoring recommended.

♣ = Canadian drug name.

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

ria, fall in hematocrit or blood pressure, guaiac-positive stools, urine, or nasogastric aspirate).

- Assess patient for evidence of additional or increased thrombosis. Symptoms will depend on area of involvement.
- ***Lab Test Considerations:*** Prothrombin time (PT) and other clotting factors should be monitored frequently during therapy. Therapeutic PT ranges from 1.3–1.5 times greater than control. May also be reported as INR, a standardized system that provides a common basis for communicating and interpreting PT results. PT values of 1.3–1.5 times the control are equivalent to INR values of 2–3 times the control value. PT of 1.5–2 or INR of 3–4.5 may be used for patients with high risk of embolization.
- Hepatic function and CBC should be monitored before and periodically throughout therapy.
- Stool and urine should be monitored for occult blood before and periodically throughout therapy.
- ***Toxicity and Overdose:*** Withholding 1 or more doses of medication is usually sufficient if PT is excessively prolonged or minor bleeding occurs. If overdose occurs or anticoagulation needs to be immediately reversed, the antidote is vitamin K (phytonadione, AquaMEPHYTON). Administration of whole blood or plasma also may be required in severe bleeding because of the delayed onset of vitamin K.

Potential Nursing Diagnoses

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

Implementation

- ***High Alert:*** Medication errors involving anticoagulants have resulted in serious harm and death from internal or intracranial bleeding. Before administering, evaluate recent INR or PT results and have second practitioner independently check original order.
- Because of the large number of medications capable of significantly altering warfarin's effects, careful monitoring is recommended when new agents are started or other agents are discontinued. Interactive potential should be evaluated for all new medications (Rx, OTC, and natural products).
- Administer medication at same time each day.
- **PO:** Medication requires 3–5 days to reach effective levels. It is usually begun while patient is still on heparin.
- Do not interchange brands; potencies may not be equivalent.
- **Direct IV:** Reconstitute with 2.7 ml of sterile water for injection. Do not use solutions that are discolored or contain particulate matter. Stable for 4 hr at room temperature. ***Rate:*** Administer as low bolus injection over 1–2 min into a peripheral vein.

Patient/Family Teaching

- Instruct patient to take medication exactly as directed. If a dose is missed, tell patient to take it as soon as remembered that day. Patient should not double doses. Health care professional should be informed of missed doses at time of checkup or lab tests.
- Review foods high in vitamin K. Patient should have consistent limited intake of these foods, as vitamin K is the antidote for warfarin, and alternating intake of these foods will cause PT levels to fluctuate.
- **Caution patient to avoid IM injections and activities leading to injury. Instruct patient to use a soft toothbrush, not to floss, and to shave with an electric razor during warfarin therapy. Advise patient that venipunctures and injection sites require application of pressure to prevent bleeding or hematoma formation.**
- **Advise patient to report any symptoms of unusual bleeding or bruising (bleeding gums; nosebleed; black, tarry stools; hematuria; excessive menstrual flow). Notify health care professional if these occur.**
- ***High Alert:*** Instruct patient not to drink alcohol or take OTC medications, especially those containing aspirin or NSAIDs, or to start or stop any

CONTINUED

Route/Dosage

IV (Adults and children >12 yr): *Loading dose*—6 mg/kg every 12 hour for 2 doses, followed by *maintenance dosing*—3–4 mg/kg every 12 hours. IV then switched to oral dosing when possible. If intolerance occurs, dose may be decreased to 3 mg/kg every 12 hr. If phenytoin is coadministered, increase maintenance dose to 5 mg/kg every 12 hr.
PO (Adults and children >12 yr and >40 kg): *Most infections*—(following IV loading dose) 200 mg every 12 hr; may be increased to 300 mg every 12 hr if response if inadequate. If phenytoin is coadministered, increase maintenance dose to 400 mg every 12 hr; *esophageal candidiasis*—200 mg every 12 hr for 14 days or 7 days following symptom resolution.
PO (Adults and children >12 yr and <40 kg): *Most infections*—(following IV loading dose) 100 mg every 12 hr; may be increased to 150 mg every 12 hr if response is inadequate. If phenytoin is coadministered, increase maintenance dose to 200 mg every 12 hr; *esophageal candidiasis*—100 mg every 12 hr for 14 days or 7 days following symptom resolution.

Hepatic Impairment

IV (Adults and Children >12 yr): Use standard loading dose, decrease maintenance dose by 50%.

NURSING IMPLICATIONS

Assessment

- Monitor for signs and symptoms of fungal infections prior to and during therapy.
- Obtain specimens for culture and histopathology prior to therapy to isolate and identify organism. Therapy may be started before results are received.
- Monitor visual function including visual acuity, visual field, and color perception in patients receiving more than 28 days of therapy. Vision usually returns to normal within 14 days after discontinuation of therapy.
- Monitor for allergic reactions during infusion of voriconazole (flushing, fever, sweating, tachycardia, chest tightness, dyspnea, faintness, nausea, pruritus, rash). Symptoms occur immediately upon start of infusion. May require discontinuation.
- ***Lab Test Considerations:*** Monitor liver function tests prior to and during therapy. If abnormal liver function tests occur, monitor for development of severe hepatic injury. Discontinue therapy if clinical signs and symptoms of liver disease develop.
- Monitor renal function (serum creatinine) during therapy.

Potential Nursing Diagnoses

Risk for infection (Indications)

Implementation

- Once patient can tolerate oral medication, PO voriconazole may be used.
- **PO:** Administer 1 hr before or 1 hr after a meal.
- **Intermittent Infusion:** Reconstitute voriconazole with 19 ml of sterile water for injection for a volume of 20 ml with a concentration of 10 mg/ml. Discard vial if vacuum does not pull diluent into vial. Shake vial until all powder is dissolved. Solution should be clear without particulate matter. Dilute further with 0.9% NaCl, LR, D5/LR, D5/0.45% NaCl, D5W, D5/20 mEq potassium chloride, 0.45% NaCl, or D5/0.9% NaCl by calculating volume of 10 mg/ml concentrate required for patient dose. Withdraw and discard equal volume of diluent from infusion bag. Concentration in bag after adding voriconazole should be not <0.5 mg/ml and not >5 mg/ml. Withdraw required volume of voriconazole concentrate from appropriate number of vials and add to infusion bag. Use reconstituted solution within 24 hr. Discard partially used vials. ***Rate:*** Infuse over 1–2 hr at a rate not to exceed 3 mg/kg/hr.
- **Y-Site Incompatibility:** Do not infuse with other drugs including parenteral nutrition, blood products or other medications.

Patient/Family Teaching

- May cause blurred vision, photophobia, and dizziness. Caution patient to avoid driving and other activities requiring alertness until response to medication is known. Also advise patient to avoid driving at night during voriconazole therapy.
- Advise patient to avoid direct sunlight during voriconazole therapy.

Evaluation/Desired Outcomes

- Resolution of fungal infections.

Why was this drug prescribed for your patient?

CONTINUED

warfarin

new medications during warfarin therapy without advice of health care professional.
- ***High Alert:*** Emphasize the importance of frequent lab tests to monitor coagulation factors.
- Instruct patient to carry identification describing medication regimen at all times and to inform all health care personnel caring for patient on anticoagulant therapy before lab tests, treatment, or surgery.

Evaluation/Desired Outcomes
- Prolonged PT (1.3–2.0 times the control; may vary with indication) or INR of 2–4.5 without signs of hemorrhage.

Why was this drug prescribed for your patient?

zaleplon (za-lep-lon)
Sonata

Classification
Therapeutic: sedative/hypnotics

Schedule IV

Pregnancy Category C

Indications
Short-term management of insomnia in patients unable to get at least 4 hours of sleep; especially useful in sleep initiation disorders.

Action
Produces CNS depression by binding to gamma-aminobutyric acid (GABA) receptors in the CNS. Has no analgesic properties. **Therapeutic Effects:** Sedation and induction of sleep.

Pharmacokinetics
Absorption: Rapidly absorbed following oral administration.
Distribution: Enters breast milk.
Metabolism and Excretion: Extensively metabolized in the liver (mostly by aldehyde oxidase and some by CYP 450 3A4 enzymes).
Half-life: Unknown.

TIME/ACTION PROFILE

ROUTE	ONSET	PEAK	DURATION
PO	within minutes	unknown	3–4 hr

Contraindications/Precautions
Contraindicated in: Hypersensitivity. Not recommended for use during pregnancy, lactation, or in patients with severe hepatic impairment.

Use Cautiously in: Mild to moderate hepatic impairment, age ≥65 yr or weight ≤50 kg or concurrent cimetidine therapy (initiate therapy at lowest dose); Impaired respiratory function; History of suicide attempt; Children <18 yr (safety not established).

Adverse Reactions/Side Effects
CNS: amnesia, anxiety, depersonalization, dizziness, drowsiness, hallucinations, headache, impaired memory (briefly following dose), impaired psychomotor function (briefly following dose), malaise, vertigo, weakness. **EENT:** abnormal vision, ear pain, epistaxis, hearing sensitivity, ocular pain, altered sense of smell. **CV:** peripheral edema. **GI:** abdominal pain, anorexia, colitis, dyspepsia, nausea. **GU:** dysmenorrhea. **Derm:** photosensitivity. **Neuro:** hyperesthesia, paresthesia, tremor. **Misc:** fever.

Interactions
Drug-Drug: Cimetidine decreases metabolism and increases effects (initiate therapy at a lower dose). Additive CNS depression with other **CNS depressants** including **alcohol, antihistamines, opioid analgesics**, other **sedative/hypnotics, phenothiazines**, and **tricyclic antidepressants**. Effects may be decreased by drugs that induce the CYP 450 3A4 enzyme system including **rifampin, phenytoin, carbamazepine**, and **phenobarbital**.
Drug-Natural Products: Concomitant use of **kava, valerian, skullcap, chamomile**, or **hops** can increase CNS depression.
Drug-Food: Concurrent ingestion of a **high-fat meal** slows the rate of absorption.

Route/Dosage
PO (Adults <65 yr): 5–20mg at bedtime.
PO (Geriatric Patients or Patients <50 kg): Initiate therapy at 5 mg at bedtime (not to exceed 10 mg at bedtime).

NURSING IMPLICATIONS

Assessment

- Assess mental status, sleep patterns, and potential for abuse prior to administering this medication. Prolonged use of >7–10 days may lead to physical and psychological dependence. Limit amount of drug available to the patient.
- Assess alertness at time of peak effect. Notify physician or other health care professional if desired sedation does not occur.
- Assess patient for pain. Medicate as needed. Untreated pain decreases sedative effects.

Potential Nursing Diagnoses

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

Implementation

- Before administering, reduce external stimuli and provide comfort measures to increase effectiveness of medication.
- Protect patient from injury. Supervise ambulation and transfer of patients after administration. Remove cigarettes. Side rails should be raised and call bell within reach at all times.
- **PO:** Tablets should be swallowed whole with full glass of water immediately before bedtime or after going to bed and experiencing difficulty falling asleep. Do not administer with or immediately after a high-fat or heavy meal.

Patient/Family Teaching

- Instruct patient to take zaleplon exactly as directed. Do not take more than the amount prescribed because of the habit-forming potential. Not recommended for use longer than 7–10 days. Rebound insomnia (1–2 nights) may occur when stopped. If used for 2 wk or longer, abrupt withdrawal may result in dysphoria, insomnia, abdominal or muscle cramps, vomiting, sweating, tremors, and seizures.
- Because of rapid onset, advise patient to go to bed immediately after taking zaleplon.
- May cause daytime drowsiness or dizziness. Advise patient to avoid driving or other activities requiring alertness until response to this medication is known.
- Inform patient that amnesia may occur, but can be avoided if zaleplon is only taken when patient is able to get >4 hr sleep.
- Caution patient to avoid concurrent use of alcohol or other CNS depressants.

Evaluation/Desired Outcomes

- Relief of insomnia.

Why was this drug prescribed for your patient?

zidovudine (zye-**doe**-vue-deen)

♣Apo-Zidovudine, azidothymidine, AZT, ♣Novo-AZT, Retrovir

Classification

Therapeutic: antiretrovirals
Pharmacologic: nucleoside reverse transcriptase inhibitors

Pregnancy Category C

Indications

HIV infection (with other antiretrovirals). Reduction of maternal/fetal transmission of HIV virus.

Action

After intracellular conversion to its active form, inhibits viral RNA synthesis by inhibiting the enzyme DNA polymerase (reverse transcriptase). Prevents viral replication. **Therapeutic Effects:** Virustatic action against selected retroviruses. Slowed progression and decreased sequelae of HIV infection. Decreased viral load and improved CD4 cell counts. Decreased transmission of HIV to infants born to HIV-infected mothers.

Pharmacokinetics

Absorption: Well absorbed after oral administration.
Distribution: Widely distributed; enters the CNS. Crosses the placenta.
Metabolism and Excretion: Mostly (75%) metabolized by the liver; 15–20% excreted unchanged by the kidneys.
Half-life: 1 hr.

TIME/ACTION PROFILE (blood levels)

ROUTE	ONSET	PEAK	DURATION
PO	unknown	0.5–1.5 hr	4 hr
IV	rapid	end of infusion	4 hr

♣ = Canadian drug name

Contraindications/Precautions

Contraindicated in: Hypersensitivity, Lactation.
Use Cautiously in: Decreased bone marrow reserve (dosage reduction is required for anemia or granulocytopenia); Severe hepatic or renal disease (dosage modification may be required).

Adverse Reactions/Side Effects

CNS: SEIZURES, headache, weakness, anxiety, confusion, decreased mental acuity, dizziness, insomnia, mental depression, restlessness, syncope. **GI:** abdominal pain, diarrhea, nausea, anorexia, drug-induced hepatitis, dyspepsia, oral mucosa pigmentation, vomiting. **Derm:** nail pigmentation. **Endo:** gynecomastia. **Hemat:** anemia, granulocytopenia, pure red-cell aplasia, thrombocytosis. **MS:** back pain, myopathy. **Neuro:** tremor.

Interactions

Drug-Drug: ↑ bone marrow depression with other **agents having bone marrow–depressing properties, antineoplastics, radiation therapy,** or **ganciclovir**. ↑ neurotoxicity may occur with **acyclovir**. Toxicity may be ↑ by concurrent administration of **probenecid** or **fluconazole**. Zidovudine levels are ↓ by **clarithromycin**.

Route/Dosage

Treatment of HIV Infection

PO (Adults and Children >13 yr): 100 mg q 4 hr (500–600 mg/day), 200 mg 3 times daily, or 300 mg twice daily; depends on combination regimen.
PO (Children 3 mo–12 yr): 90–180 mg/m² every 6 hr (not to exceed 200 mg q 6 hr).
IV (Adults and Children >12 yr): 1 mg/kg infused over 1 hr q 4 hr. Change to oral therapy as soon as possible.
IV (Children): 120 mg/m² q 6 hr (not to exceed 160 mg/dose).

Asymptomatic HIV Infection

PO (Adults): 100 mg q 4 hr while awake (500 mg/day).

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

CONTINUED

zidovudine

Why was this drug prescribed for your patient?

- Zidovudine may cause dizziness or fainting. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Inform patient that zidovudine does not cure HIV and does not reduce the risk of transmission of HIV to others through sexual contact or blood contamination. Caution patient to use a condom during sexual contact and avoid sharing needles or donating blood to prevent spreading the AIDS virus to others.
- Instruct patient to notify health care professional promptly if fever, sore throat, or signs of infection occur. Caution patient to avoid crowds and persons with known infections. Instruct patient to use soft toothbrush, to use caution when using toothpicks or dental floss, and to have dental work done prior to therapy or deferred until blood counts return to normal. Patient should also notify health care professional if shortness of breath, muscle aches, symptoms of hepatitis or pancreatitis, or other unexpected reactions occur.
- Advise patient to avoid taking any RX or OTC medications or herbal products without consulting health care professional.
- Emphasize the importance of regular follow-up exams and blood counts to determine progress and monitor for side effects.

Evaluation/Desired Outcomes

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

♣ = Canadian drug name.

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

Prevention of Maternal/Fetal Transmission of HIV Infection

PO (Adults >14 wk pregnant): 100 mg 5 times daily until onset of labor.
IV (Adults During Labor and Delivery): 2 mg/kg over 1 hr; then continuous infusion of 1 mg/kg/hr until umbilical cord is clamped.
IV (Infants): 1.5 mg/kg q 6 hr until able to take PO.
PO (Infants): 2 mg/kg q 6 hr started within 12 hr of birth and continued for 6 wk.

NURSING IMPLICATIONS

Assessment

- Assess patient for change in severity of symptoms of HIV and for symptoms of opportunistic infections during therapy.
- ***Lab Test Considerations:*** Monitor viral load and CD4 counts prior to and periodically during therapy.
- Monitor CBC every 2 wk during the first 8 wk of therapy in patients with advanced HIV disease, and decrease to every 4 wk after the first 2 mo if zidovudine is well tolerated or monthly during the first 3 mo and every 3 mo thereafter unless indicated in patients who are asymptomatic or have early symptoms. Commonly causes granulocytopenia and anemia. Anemia may occur 2–4 wk after initiation of therapy. Anemia may respond to epoetin administration (see epoetin monograph). Granulocytopenia usually occurs after 6–8 wk of therapy. Consider dose reduction, discontinuation of therapy, or blood transfusions if hemoglobin is <7.5 g/dl or reduction of >25% from baseline and/or granulocyte count is <750/mm^3 or reduction of >50% from baseline. Treatment with sargramostim may be necessary (see sargramostim monograph). Therapy may be gradually resumed when bone marrow recovery is evident.

Potential Nursing Diagnoses

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

Implementation

- **Do not confuse Retonavir (zidovudine) with Ritonavir.**
- Administer doses around the clock.
- **IV:** Patient should receive the IV infusion only until oral therapy can be administered.
- **Intermittent Infusion:** Remove the calculated dose from the vial and dilute with D5W or 0.9% NaCl for concentration of <4 mg/ml. Do not use solutions that are discolored. Stable for 8 hr at room temperature or 24 hr if refrigerated. ***Rate:*** Infuse at a constant rate over 1 hr. Avoid rapid infusion or bolus injection.
- **Y-Site Compatibility:** acyclovir, allopurinol, amifostine, amikacin, amphotericin B, amphotericin B cholesteryl sulfate, aztreonam, cefepime, ceftazidine, ceftriaxone, cimetidine, cisatracurium, clindamycin, dobutamine, docetaxel, dopamine, doxorubicin liposome, erythromycin lactobionate, etoposide phosphate, filgrastim, fluconazole, fludarabine, gatifloxacin, gemcitabine, gentamicin, granisetron, heparin, imipenem/cilastatin, linezolid, lorazepam, melphalan, metoclopramide, morphine, nafcillin, ondansetron, oxacillin, paclitaxel, pentamidine, phenylephrine, piperacillin, piperacillin/tazbactam, potassium chloride, ranitidine, remifentanil, sargramostim, teniposide, thiotepa, tobramycin, trimethoprim/sulfamethoxazole, trimetrexate, vancomycin, vinorelbine.
- **Additive Incompatibility:** blood products or protein solutions.

Patient/Family Teaching

- Instruct patient to take zidovudine as directed, around the clock, even if sleep is interrupted. Emphasize the importance of compliance with therapy, not taking more than prescribed amount, and not discontinuing without consulting health care professional. Take missed doses as soon as remembered unless almost time for next dose; do not double doses. Inform patient that long-term effects of zidovudine are unknown at this time.
- Instruct patient that zidovudine should not be shared with others.

CONTINUED

zolpidem (zole-pi-dem)

Ambien, Ambien CR

Classification

Therapeutic: sedative/hypnotics

Schedule IV

Pregnancy Category B

Indications

Insomnia.

Action

Produces CNS depression by binding to gamma-aminobutyric acid (GABA) receptors. Has no analgesic properties. **Therapeutic Effects:** Sedation and induction of sleep.

Pharmacokinetics

Absorption: Rapidly absorbed following oral administration. Controlled release formulation releases 10 mg immediately, then another 2.5 mg.
Distribution: Minimal amounts enter breast milk; remainder of distribution not known.
Metabolism and Excretion: Converted to inactive metabolites, which are excreted by the kidneys.
Half-life: 2.5–2.6 hr (increased in geriatric patients and patients with hepatic impairment).

TIME/ACTION PROFILE (sedation)

ROUTE	ONSET	PEAK*	DURATION
PO	rapid	30 min–2 hr	6–8 hr
PO-ER	rapid	2–4 hr	6–8 hr

* food delays peak levels and effects

Contraindications/Precautions

Contraindicated in: Hypersensitivity, Sleep apnea.
Use Cautiously in: Patients with a history of previous psychiatric illness, suicide attempt, drug or alcohol abuse; Patients with pulmonary disease; Geriatric patients and patients with impaired hepatic function (initial dosage reduction recommended); Pregnancy, lactation, or children (safety not established).

Adverse Reactions/Side Effects

CNS: amnesia, daytime drowsiness, dizziness, "drugged" feeling. **GI:** diarrhea, nausea, vomiting. **Misc:** hypersensitivity reactions, physical dependence, psychological dependence, tolerance.

Interactions

Drug-Drug: ↑ CNS depression may with **sedative/hypnotics**, **alcohol**, **phenothiazines**, **tricyclic antidepressants**, **opioid analgesics**, or **antihistamines**.
Drug-Natural Products: Concomitant use of **kava**, **valerian** or **chamomile** can ↑ CNS depression.
Drug-Food: Food ↓ and delays absorption.

Route/Dosage

PO (Adults): *Tablets*- 10 mg at bedtime; *extended-release tablets*— 12.5 mg at bedtime.
PO (Geriatric Patients, Debilitated Patients, or Patients with Hepatic Impairment): *Tablets*- 5 mg at bedtime initially, may be increased to 10 mg; *extended-release tablets*— 6.25 mg at bedtime.

NURSING IMPLICATIONS

Assessment

- Assess mental status, sleep patterns, 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.

- Assess alertness at time of peak effect. Notify physician or other health care professional if desired sedation does not occur.
- Assess patient for pain. Medicate as needed. Untreated pain decreases sedative effects.

Potential Nursing Diagnoses

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

Implementation

- Before administering, reduce external stimuli and provide comfort measures to increase effectiveness of medication.
- Protect patient from injury. Place bed side rails up. Assist with ambulation. Take patient's cigarettes.
- **PO:** Tablets should be swallowed whole with a full glass of water. For faster onset of sleep, do not administer with or immediately after a meal.
- Swallow extended-release tablets whole; **do not crush, break, or chew.**

Patient/Family Teaching

- Instruct patient to take zolpidem as directed. Do not take more than the amount prescribed because of the habit-forming potential. Not recommended for use longer than 7–10 days. If used for 2 wk or longer, abrupt withdrawal may result in fatigue, nausea, flushing, light-headedness, uncontrolled crying, vomiting, GI upset, panic attack, or nervousness.
- Because of rapid onset, advise patient to go to bed immediately after taking zolpidem.
- May cause daytime drowsiness or dizziness. Advise patient to avoid driving or other activities requiring alertness until response to this medication is known.
- Caution patient to avoid concurrent use of alcohol or other CNS depressants.

Evaluation/Desired Outcomes

- Relief of insomnia.

Why was this drug prescribed for your patient?