CONTINUED

methylphenidate

- Advise patient to avoid using caffeine-containing beverages concurrently with this therapy.
- Advise patient to notify health care professional if nervousness, insomnia, palpitations, vomiting, skin rash, or fever occurs.
- Inform patient that health care professional may order periodic holidays from the drug to assess progress and to decrease dependence.
- Emphasize the importance of routine follow-up exams to monitor progress.
- **ADHD:** Advise parents to notify school nurse of medication regimen.

Evaluation/Desired Outcomes

- Decreased frequency of narcoleptic symptoms.
- Improved attention span and social interactions in ADHD.

Why was this drug prescribed for your patient?

metoclopramide (met-oh-**kloe**-pra-mide)

♣Apo-Metoclop, Clopra, ♣Emex, ♣Maxeran, Octamide, Octamide-PFS, Reclomide, Reglan

Classification

Therapeutic: antiemetics

Pregnancy Category B

Indications

Chemotherapy-induced emesis. Gastric stasis. Facilitated of intubation of small intestine allows radiographic examination of upper GI tract. Esophageal reflux.

Action

Blocks dopamine receptors in chemoreceptor trigger zone of the CNS. Stimulates motility of the upper GI tract and accelerates gastric emptying. **Therapeutic Effects:** Decreased nausea and vomiting. Decreased symptoms of gastric stasis. Easier passage of nasogastric tube.

Pharmacokinetics

Absorption: Well absorbed from the GI tract and from IM sites.
Distribution: Widely distributed into body tissues and fluids. Crosses blood-brain barrier and placenta. Enters breast milk in high concentrations.
Metabolism and Excretion: Partially metabolized by the liver; 25% eliminated unchanged in the urine.
Half-life: 2.5–5 hr.

TIME/ACTION PROFILE (effects on peristalsis)

ROUTE	ONSET	PEAK	DURATION
PO	30–60 min	unknown	1–2 hr
IM	10–15 min	unknown	1–2 hr
IV	1–3 min	immediate	1–2 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. GI obstruction/hemorrhage. History of seizures. Pheochromocytoma. Parkinson's disease.
Use Cautiously in: History of depression; Diabetes (may alter response to insulin); Pregnancy or lactation (safety not established); Children or geriatric patients (increased risk of extrapyramidal reactions).

Adverse Reactions/Side Effects

CNS: drowsiness, extrapyramidal reactions, restlessness, anxiety, depression, irritability, tardive dyskinesia. **CV:** arrhythmias (SVT, bradycardia), hypertension, hypotension. **GI:** constipation, diarrhea, dry mouth, nausea. **Endo:** gynecomastia.

Interactions

Drug-Drug: Additive CNS depression **alcohol**, **antidepressants**, **antihistamines**, **opioid analgesics**, and **sedative/hypnotics**. May increase absorption and risk of toxicity from **cyclosporine**. May affect oral absorption of other **orally administered drugs** due to effect on motility. May exaggerate hypotension during **general anesthesia.** Increased extrapyramidal reactions with **haloperidol** or **phenothiazines**. **Opioid analgesics** and **anticholinergics** may antagonize the GI effects of metoclopramide. May increase absorption and risk of toxicity from **cyclosporine**. Use cautiously with **MAO inhibitors**. May increase neuromuscular blockade from **succinylcholine**. May decrease the action of **levodopa**.

Route/Dosage

PO (Adults): *Diabetic gastroparesis*—10 mg 30 min before meals and at bedtime. *Gastroesophageal reflux*—10–15 mg 30 min before meals and at bedtime (not to exceed 0.5 mg/kg/day). Single 20 mg dose may be given preventively. Some patients may respond to doses as small as 5 mg.
IM (Adults): *Postoperative nausea/vomiting*—10–20 mg.
PO, IM (Adults): *Treatment of hiccups*—10–20 mg 4 times daily PO; may be preceded by a single 10-mg dose IM (unlabeled).

IV (Adults): *Chemotherapy-induced vomiting*—1–2 mg/kg 30 min before chemotherapy. Another 1–2 mg/kg may be given q 2 hr for 2 doses, then q 3 hr for 3 more doses. *Facilitation of GI intubation*—10 mg. May also be given as 3 mg/kg followed by 0.5 mg/kg/hr for 8 hr.
IV (Children 6–14 yr): *Facilitation of GI intubation*—2.5–5 mg (dose should not exceed 0.5 mg/kg).
IV (Children <6 yr): *Facilitation of GI intubation*—0.1 mg/kg.

NURSING IMPLICATIONS

Assessment

- Assess patient for nausea, vomiting, abdominal distention, and bowel sounds before and after administration.
- Assess patient for extrapyramidal side effects (difficulty speaking or swallowing, loss of balance control, pill-rolling, mask-like face, shuffling gait, rigidity, tremors; and *dystonic*—muscle spasms, twisting motions, twitching, inability to move eyes, weakness of arms or legs) periodically throughout course of therapy. May occur weeks to months after initiation of therapy and are reversible on discontinuation. Dystonic reactions may occur within minutes of IV infusion and stop within 24 hr of discontinuation of metoclopramide. May be treated with 50 mg of IM diphenhydramine, or diphenhydramine 1 mg/kg IV may be administered prophylactically 15 min before metoclopramide IV infusion.
- Monitor for tardive dyskinesia (uncontrolled rhythmic movement of mouth, face, and extremities, lip smacking or puckering, puffing of cheeks, uncontrolled chewing, rapid or worm-like movements of tongue). Usually occurs after a year or more of continued therapy. Report immediately; may be irreversible.
- Assess patient for signs of depression periodically throughout therapy.

Potential Nursing Diagnoses

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

Implementation

- **PO:** Also available as a syrup and concentrated oral solution.
- **IM:** For prevention of postoperative nausea and vomiting, inject IM near the end of surgery.
- **Direct IV:** Administer IV dose undiluted. ***Rate:*** Administer slowly over 1–2 min. Rapid administration causes a transient but intense anxiety and restlessness followed by drowsiness.
- **Intermittent Infusion:** May be diluted in 50 ml of D5W, 0.9% NaCl, D5/0.45% NaCl, Ringer's solution, or LR. Diluted solution is stable for 48 hr if protected from light or 24 hr under normal light. ***Rate:*** Infuse slowly over at least 15 min.

Patient/Family Teaching

- Instruct patient to take metoclopramide exactly as directed. If a dose is missed, take as soon as remembered if not almost time for next dose.
- May cause drowsiness. Caution patient to avoid driving or other activities requiring alertness until effects of medication are known.
- Advise patient to avoid concurrent alcohol and other CNS depressants.
- Advise patient to notify health care professional immediately if involuntary movement of eyes, face, or limbs occurs.

Evaluation/Desired Outcomes

- Relief of nausea and vomiting.
- Decreased symptoms of gastric stasis.
- Facilitation of small bowel intubation.
- Decrease in the symptoms of esophageal reflux.

Why was this drug prescribed for your patient?

metolazone (me-tole-a-zone)

Mykrox, Zaroxolyn

Classification

Therapeutic: antihypertensives, diuretics
Pharmacologic: thiazide-like diuretics

Pregnancy Category B

Indications

Management of mild or moderate hypertension. Edema associated with CHF or the nephrotic syndrome (Zaroxolyn only).

Action

Increases excretion of sodium and water by inhibiting sodium reabsorption in the distal tubule. Promotes excretion of chloride, potassium, magnesium, and bicarbonate. May produce arteriolar dilation. **Therapeutic Effects:** Lowering of blood pressure (BP) in hypertensive patients. Diuresis with subsequent mobilization of edema.

Pharmacokinetics

Absorption: Absorption is more rapid and more complete with prompt tablets (Mykrox) and more variable with extended tablets (Zaroxolyn).
Distribution: Unknown.
Metabolism and Excretion: Excreted mainly unchanged by the kidneys.
Half-life: Extended tablets—8 hr. Prompt tablets—14 hr.

TIME/ACTION PROFILE (diuretic effect†)

ROUTE	ONSET	PEAK	DURATION
PO	1 hr	2 hr	12–24 hr

†Full antihypertensive effect may take days–weeks

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Cross-sensitivity with other sulfonamides may exist. Anuria. Lactation.
Use Cautiously in: Severe hepatic impairment; Geriatric patients; Pregnancy or children (safety not established).

Adverse Reactions/Side Effects

CNS: drowsiness, lethargy. **CV:** chest pain, hypotension, palpitations. **GI:** anorexia, bloating, cramping, drug-induced hepatitis, nausea, vomiting. **Derm:** photosensitivity, rashes. **Endo:** hyperglycemia. **F and E:** hypokalemia, dehydration, hypercalcemia, hypochloremic alkalosis, hypomagnesemia, hyponatremia, hypophosphatemia, hypovolemia. **Hemat:** blood dyscrasias. **Metab:** hyperuricemia. **MS:** muscle cramps. **Misc:** chills, pancreatitis.

Interactions

Drug-Drug: ↑ hypotension with **nitrates**, acute ingestion of **alcohol**, **antihypertensives**. ↑ hypokalemia with **corticosteroids**, **amphotericin B**, **piperacillin**, or **ticarcillin**. By causing hypokalemia, may ↑ the risk of **digoxin** toxicity. ↓ the excretion of **lithium**; may cause toxicity. May ↓ the effectiveness of **methenamine**. **Stimulant laxatives** (including **aloe, cascara sagrada, senna**) may ↑ risk of potassium depletion. **Drug-Food: Food** may ↑ extent of absorption.

Route/Dosage

Mykrox

PO (Adults): *Hypertension*—0.5–1 mg/day.

Zaroxolyn

PO (Adults): *Hypertension*—2.5–5 mg/day; *edema*—5–20 mg/day.

NURSING IMPLICATIONS

Assessment

- Monitor BP, intake and output, and daily weight, and assess feet, legs, and sacral area for edema daily.

♣ = Canadian drug name.

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

metronidazole (me-troe-ni-da-zole)

♣Apo-Metronidazole, Flagyl, Flagyl ER, Metric 21, Metro IV, ♣Novonidazol, Noritate, Protostat, ♣Trikacide

Classification

Therapeutic: anti-infectives, antiprotozoals, antiulcer agents

Pregnancy Category B

Indications

PO, IV: Treatment of the following anaerobic infections: Intra-abdominal (may be used with cefepime), Gynecologic, Skin and skin structure, Lower respiratory tract, Bone and joint, CNS, Septicemia, Endocarditis. **IV:** Colorectal surgical prophylaxis. **PO:** Amebic dysentery, amebic liver abscess, and trichomoniasis. Peptic ulcer disease due to *H. pylori*. **Unlabeled uses:** Giardiasis. Anti-infective associated pseudomembranous colitis.

Action

Disrupts DNA and protein synthesis in susceptible organisms. **Therapeutic Effects:** Bactericidal, trichomonacidal, or amebicidal action. **Spectrum:** Notable for activity against anaerobic bacteria including: *Bacteroides*, *Clostridium*. Also active against: *Trichomonas vaginalis*, *Entamoeba histolytica*, *Giardia lamblia*, *H. pylori*, *Clostridium difficile*.

Pharmacokinetics

Absorption: 80% absorbed after oral administration.
Distribution: Widely distributed into most tissues and fluids, including CSF. Crosses the placenta; enters fetal circulation rapidly; enters breast milk in concentrations equal to plasma levels.
Metabolism and Excretion: Partially metabolized by the liver (30–60%); partially excreted unchanged in the urine; 6–15% eliminated in the feces.
Half-life: 6–8 hr.

TIME/ACTION PROFILE (PO, IV = blood levels; Topical = improvement in rosacea)

ROUTE	ONSET	PEAK	DURATION
PO	rapid	1–3 hr	8 hr
PO-ER	rapid	unknown	24 hr
IV	rapid	end of infusion	6 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Hypersensitivity mannitol (Flagyl IV). First trimester of pregnancy.
Use Cautiously in: History of blood dyscrasias; History of seizures or neurologic problems; Severe hepatic impairment (dosage reduction suggested); Pregnancy (although safety not established, has been used to treat trichomoniasis in second- and third-trimester pregnancy—but not as single-dose regimen); Lactation (if needed, use single dose and interrupt nursing for 24 hr thereafter); Children (safe use of IV form not established; safety of oral form for infections other than amebiasis in children not established).

Adverse Reactions/Side Effects

CNS: SEIZURES, dizziness, headache. **GI:** abdominal pain, anorexia, diarrhea, nausea, dry mouth, furry tongue, glossitis, unpleasant taste, vomiting. **Derm:** rashes, urticaria. **Hemat:** leukopenia. **Local:** phlebitis at IV site. **Neuro:** peripheral neuropathy. **Misc:** superinfection.

Interactions

Drug-Drug: Cimetidine may decrease the metabolism of metronidazole. **Phenobarbital** increases metabolism; may decrease effectiveness. Metronidazole increases effects of **warfarin**. Disulfiram-like reaction may occur with **alcohol** ingestion. May cause acute psychosis and confusion with **disulfiram**. Increased risk of leukopenia with **azathioprine** or **fluorouracil**.

♣ = Canadian drug name.

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

- Assess patient, especially if taking digoxin, for anorexia, nausea, vomiting, muscle cramps, paresthesia, and confusion. Notify physician or other health care professional if these signs of electrolyte imbalance occur. Patients taking digoxin are at risk of digoxin toxicity because of the potassium-depleting effect of the diuretic.
- Assess patient for allergy to sulfonamides.
- **Hypertension:** Monitor BP before and periodically during therapy.
- Monitor frequency of prescription refills to determine compliance.
- ***Lab Test Considerations:*** Monitor electrolytes (especially potassium), blood glucose, BUN, and serum creatinine and uric acid levels before and periodically throughout therapy. May cause increase in serum and urine glucose in diabetic patients. May cause an increase in serum bilirubin, calcium, creatinine, and uric acid, and a decrease in serum magnesium, potassium, and sodium and urinary calcium.
- May cause decreased serum protein-bound iodine (PBI) concentrations.
- May cause increased serum cholesterol, LDL, and triglyceride.

Implementation

- Administer in the morning to prevent disruption of sleep.
- Intermittent dose schedule may be used for continued control of edema.
- Extended (Zaroxolyn) and prompt (Mykrox) metolazone tablets are not equal. Do not substitute.
- **PO:** May give with food or milk to minimize GI irritation.

Patient/Family Teaching

- Instruct patient to take this medication at the same time each day. If a dose is missed, take as soon as remembered, but not just before next dose is due. Do not double doses.
- Instruct patient to monitor weight biweekly and notify health care professional of significant changes.
- Caution patient to change position slowly to minimize orthostatic hypotension. This may be potentiated by alcohol.
- Advise patient to use sunscreen and protective clothing when in the sun to prevent photosensitivity reactions.
- Instruct patient to discuss dietary potassium requirements with health care professional.
- Instruct patient to notify health care professional of medication regimen before treatment or surgery (including dental). Advise patient to report muscle weakness, cramps, nausea, vomiting, diarrhea, or dizziness to health care professional.
- Emphasize the importance of routine follow-up exams.
- **Hypertension:** Advise patient to continue taking the medication even if feeling better. Medication controls but does not cure hypertension. Instruct patient and family in correct technique for monitoring weekly BP.
- Encourage patient to comply with additional interventions for hypertension (weight reduction, low-sodium diet, regular exercise, smoking cessation, moderation of alcohol consumption, and stress management).
- Advise patient to consult health care professional before taking concurrent OTC medication, especially cough or cold preparations.

Evaluation/Desired Outcomes

- Decrease in blood pressure.
- Increase in urine output.
- Decrease in edema.

Why was this drug prescribed for your patient?

Route/Dosage

PO (Adults): *Anaerobic infections*—7.5 mg/kg q 6 hr (not to exceed 4 g/day). *Trichomoniasis*—250 mg q 8 hr for 7 days or single 2-g dose or 1 g bid for 1 day. *Amebiasis*—500–750 mg q 8 hr for 5–10 days. *H. pylori*—250 mg 4 times daily or 500 mg twice daily for 1–2 wk (with other agents). *Bacterial vaginoses*—750 mg once daily as ER tablets for 7 days.
PO (Children): *Trichomoniasis*—5 mg/kg q 8 hr for 7–10 days. *Amebiasis*—11.6–16.7 mg/kg q 8 hr for 5–10 days (not to exceed 750 mg/dose).
IV (Adults): *Anaerobic infections*—Initial dose 15 mg/kg, then 7.5 mg/kg q 6–8 hr or 500 mg q 2–8 hr (not to exceed 4 g/day). *Perioperative prophylaxis*—Initial dose 15 mg/kg 1 hr before surgery, then 7.5 mg/kg 6 and 12 hr later. *Amebiasis*—500–750 mg q 8 hr for 5–10 days.

NURSING IMPLICATIONS

Assessment

- Assess patient for infection (vital signs; appearance of wound, sputum, urine, and stool; WBC) at beginning and throughout therapy.
- Obtain specimens for culture and sensitivity before initiating therapy. First dose may be given before receiving results.
- Monitor neurologic status during and after IV infusions. Inform physician if numbness, paresthesia, weakness, ataxia, or seizures occur.
- Monitor intake and output and daily weight, especially for patients on sodium restriction. Each 500 mg of Flagyl IV for dilution contains 5 mEq of sodium; each 500 mg of Flagyl RTU contains 14 mEq of sodium.
- **Giardiasis:** Monitor three stool samples taken several days apart beginning 3–4 wk after treatment.
- ***Lab Test Considerations:*** May alter results of serum AST, ALT, and LDH tests.

Potential Nursing Diagnoses

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

Implementation

- **PO:** Administer with food or milk to minimize GI irritation. Tablets may be crushed for patients with difficulty swallowing.
- **Intermittent Infusion:** Flagyl IV RTU is prediluted and ready to use (5 mg/ml). Prefilled plastic minibags should not be used with multiple connections, as air embolism may result. Crystals may form during refrigeration but will dissolve when warmed to room temperature.
- Preparation of Flagyl IV requires a specific process. Do not use aluminum needles or hubs; color will turn orange/rust. Add 4.4 ml of sterile or bacteriostatic sterile water, or 0.9% or bacteriostatic 0.9% NaCl for injection (100 mg/ml). Solution should be clear, pale yellow-green. Do not use cloudy or precipitated solution. Dilute further to at least 8 mg/ml with 0.9% NaCl, D5W, or LR. Neutralize solution with 5 mEq sodium bicarbonate for each 500 mg. Mix thoroughly. Carbon dioxide gas will be generated and may require venting. Do not refrigerate. Stable for 24 hr at room temperature. ***Rate:*** Administer IV doses as a slow infusion, each single dose over 1 hr.
- **Y-Site Compatibility:** acyclovir, allopurinol, amifostine, cefepime, cisatracurium, clarithromycin, cyclophosphamide, diltiazem, docetaxel, dopamine, doxorubicin liposome, enalaprilat, esmolol, etoposide, fluconazole, foscarnet, gatifloxacin, gemcitabine, granisetron, heparin, hydromorphone, labetalol, linezolid, lorazepam, magnesium sulfate, melphalan, meperidine, methylprednisolone, midazolam, morphine, perphenazine, piperacillin/tazobactam, remifentanil, sargramostim, tacrolimus, teniposide, theophylline, thiotepa, vinorelbine.
- **Y-Site Incompatibility:** Manufacturer recommends discontinuing primary IV during metronidazole infusion, amphotericin B cholesteryl sulfate, aztreonam, filgrastim.
- **Additive Incompatibility:** Do not admix with other medications.

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metronidazole

Patient/Family Teaching

- Instruct patient to take medication exactly as directed with evenly spaced times between doses, even if feeling better. Do not skip doses or double up on missed doses. If a dose is missed, take as soon as remembered if it is not almost time for next dose.
- Advise patient treated for trichomoniasis that sexual partners may be asymptomatic sources of reinfection and should be treated concurrently. Patient should also refrain from intercourse or use a condom to prevent reinfection.
- Caution patient to avoid intake of alcoholic beverages or preparations containing alcohol during and for at least 1 day after treatment with metronidazole. May cause a disulfiram-like reaction (flushing, nausea, vomiting, headache, abdominal cramps).
- May cause dizziness or light-headedness. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Inform patient that medication may cause an unpleasant metallic taste.
- Advise patient not to take OTC medications concurrently without consulting health care professional.
- Advise patient that frequent mouth rinses, good oral hygiene, and sugarless gum or candy may minimize dry mouth. Notify health care professional if dry mouth persists for more than 2 wk.
- Advise patient to inform health care professional if pregnancy is suspected before taking this medication.
- Inform patient that medication may cause urine to turn dark.
- Advise patient to consult health care professional if no improvement occurs in a few days or if signs and symptoms of superinfection (black, furry overgrowth on tongue; vaginal itching or discharge; loose or foul-smelling stools) develop.

Evaluation/Desired Outcomes

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

Why was this drug prescribed for your patient?

High Alert

midazolam (mid-**ay**-zoe-lam)

Versed

Classification

Therapeutic: antianxiety agents, sedative/hypnotics
Pharmacologic: benzodiazepines

Schedule IV

Pregnancy Category D

Indications

PO: Preprocedural sedation and anxiolysis in pediatric patients. **IM, IV:** Preoperative sedation/ anxiolysis/amnesia. **IV:** Provides sedation/anxiolysis/amnesia during therapeutic, diagnostic, or radiographic procedures (conscious sedation). Aids in the induction of anesthesia and as part of balanced anesthesia. As a continuous infusion, provides sedation of mechanically ventilated patients during anesthesia or in a critical care setting.

Action

Acts at many levels of the CNS to produce generalized CNS depression. Effects may be mediated by gamma-aminobutyric acid (GABA), an inhibitory neurotransmitter. **Therapeutic Effects:** Short-term sedation. Postoperative amnesia.

Pharmacokinetics

Absorption: Rapidly absorbed following oral administration; undergoes substantial intestinal and first-pass hepatic metabolism. Well absorbed following IM administration; IV administration results in complete bioavailability.
Distribution: Crosses the blood-brain barrier and placenta.
Metabolism and Excretion: Almost exclusively metabolized by the liver, resulting in conversion to hydroxymidazolam, an active metabolite and 2 other inactive metabolites (metabolized by cytochrome P450 3A4 enzyme system); metabolites are excreted in urine.
Half-life: 1–12 hr (increased in renal impairment or congestive heart failure [CHF]).

TIME/ACTION PROFILE (sedation)

ROUTE	ONSET	PEAK	DURATION
IM	15 min	30–60 min	2–6 hr
IV	1.5–5 min	rapid	2–6 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Cross-sensitivity with other benzodiazepines may occur. Shock. Comatose patients or those with pre-existing CNS depression. Uncontrolled severe pain. Products containing benzyl alcohol should not be used in neonates. Pregnancy. Acute narrow-angle glaucoma.
Use Cautiously in: Pulmonary disease; CHF; Renal impairment; Severe hepatic impairment; Obese pediatric patients (calculate dose on the basis of ideal body weight); Geriatric or debilitated patients (especially patients >70 yr) more susceptible to cardiorespiratory depressant effects; dosage reduction required); Lactation (safety not established).

Adverse Reactions/Side Effects

CNS: agitation, drowsiness, excess sedation, headache. **EENT:** blurred vision. **Resp:** APNEA, LARYNGOSPASM, RESPIRATORY DEPRESSION, bronchospasm, coughing. **CV:** CARDIAC ARREST, arrhythmias. **GI:** hiccups, nausea, vomiting. **Derm:** rashes. **Local:** pain at IM site, phlebitis at IV site.

Interactions

Drug-Drug: ↑ CNS depression with **alcohol, antihistamines, opioid analgesics**, and other **sedative/hypnotics** (↓ midazolam dose by 30–50% if used concurrently). ↑ risk of hypotension with **antihypertensives**, acute ingestion of **alcohol**, or **nitrates.** Midazolam is metabolized by the cytochrome P450 3A4 enzyme system; drugs that induce

or inhibit this system may be expected to alter the effects of midazolam. **Carbamazepine**, **phenytoin**, **rifampin**, **rifabutin**, and **phenobarbital** ↓ levels of midazolam. The following agents ↓ midazolam metabolism and may ↑ its effects: **erythromycin**, **cimetidine**, **ranitidine**, **diltiazem**, **verapamil**, **fluconazole**, **itraconazole**, and **ketoconazole**.
Drug-Natural Products: Concomitant use of **kava**, **valerian**, or **chamomile** can ↑ CNS depression.
Drug-Food: Grapefruit juice ↓ metabolism and may ↑ effects of midazolam.

Route/Dosage

Dosage must be individualized, taking caution to reduce dosage in geriatric patients and in those who are already sedated.

Preoperative Sedation/Anxiolysis/Amnesia

PO (Children 6 mo–16 yr): *Older (6–16 yr), more cooperative patients*—0.25–0.5 mg/kg; *younger, less cooperative patients*—may require up to 1 mg/kg (dose should not exceed 20 mg); *patients with cardiac/respiratory compromise or concurrent CNS depressants*—0.25/kg.
IM (Adults Otherwise Healthy and <60 yr): 70–80 mcg/kg 1 hr before surgery (usual dose 5 mg).
IM (Adults ≥60 yr, Debilitated, or Chronically Ill): 20–30 mcg/kg 1 hr before surgery (usual dose 1–3 mg).
IM (Children): 100–150 mcg (0.01–0.15 mg)/kg up to 500 mcg (0.5 mg)/kg; not to exceed 10 mg/dose.

Conscious Sedation for Short Procedures

IV (Adults and Children Otherwise Healthy, >12 yr, and <60 yr): 1–1.5 mg initially; dosage may be increased further as needed. Total doses >3.5 mg are rarely needed (reduce dose by 30% if other CNS depressants are used). Maintenance doses of 25% of the dose required for initial sedation may be given as necessary.
IV (Geriatric Patients ≥60 yr, Debilitated, or Chronically Ill): 1–2.5 mg initially; dosage may be increased further as needed. Total doses >5 mg are rarely needed (reduce dose by 50% if other CNS depressants are used). Maintenance doses of 25% of the dose required for initial sedation may be given as necessary.

Conscious Sedation for Short Procedures or Prior to Anesthesia

IV (Children 6–12 yr): 25–50 mcg/kg initially; up to 400 mcg/kg total dose may be required (not to exceed 10 mg total dose).
IV (Children 6 mo–5 yr): 50–100 mcg/kg (not to exceed 600 mcg/kg [or 6 mg] total dose).

Induction of Anesthesia (Adjunct) may give additional dose of 25% of initial dose if needed

IV (Adults Otherwise Healthy and <55 yr): 300–350 mcg/kg initially (up to 600 mcg/kg total). If patient is premedicated, initial dose should be further reduced.
IV (Geriatric Patients >55 yr): 150–300 mcg/kg as initial dose. If patient is premedicated, initial dose should be further reduced.
IV (Adults—Debilitated): 150–250 mcg/kg initial dose. If patient is premedicated, initial dose should be further reduced.

Sedation in Critical Care Settings

IV (Adults): 10–50 mcg/kg (0.5–4 mg in most adults) initially if a loading dose is required; may be followed by infusion at 20–100 mcg/kg/hr (1–7 mg/hr in most adults).
IV (Children): *Intubated patients only*—50–200 mcg/kg initially as a loading dose; follow with infusion at 60–120 mcg/kg/min (1–2 mcg/kg/min).
IV (Neonates >32 wk): *Intubated patients only*—60 mcg/kg/hr (1 mcg/kg/min).
IV (Neonates <32 wk): *Intubated patients only*—30 mcg/kg/hr (0.5 mcg/kg/min).

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midazolam

NURSING IMPLICATIONS

Assessment

- Assess level of sedation and level of consciousness throughout and for 2–6 hr following administration.
- Monitor blood pressure, pulse, and respiration continuously during IV administration. Oxygen and resuscitative equipment should be immediately available.
- ***Toxicity and Overdose:*** If overdose occurs, monitor pulse, respiration, and blood pressure continuously. Maintain patent airway and assist ventilation as needed. If hypotension occurs, treatment includes IV fluids, repositioning, and vasopressors: The effects of midazolam can be reversed with flumazenil (Romazicon).

Potential Nursing Diagnoses

Ineffective breathing pattern (Adverse Reactions)
Risk for injury (Side Effects)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- ***High Alert:*** Accidental overdosage of oral midazolam syrup to children has resulted in serious harm and death. Do not accept orders prescribed by volume (5 mL, or 1 tsp); request dosage be expressed in milligrams. Have second practitioner independently check original order and dose calculations. Midazolam syrup should only be administered by health care professionals authorized to administer conscious sedation. Do not confuse Versed (midazolam) with VePesid (etoposide).
- **PO:** To use the *Press-in Bottle Adaptor (PIBA)*, remove the cap and push bottle adaptor into neck of bottle. Close bottle tightly with cap. Solution is a clear red to purplish-red cherry-flavored syrup. Then remove cap and insert tip of oral dispenser in bottle adaptor. Push the plunger completely down toward tip of oral dispenser and insert firmly into bottle adaptor. Turn entire unit (bottle and oral dispenser) upside down. Pull plunger out slowly until desired amount of medication is withdrawn into oral dispenser. Turn entire unit right side up and slowly remove oral dispenser from the bottle. Tip of dispenser may be covered with tip of cap until time of use. Close bottle with cap after each use.
- Dispense directly into mouth. Do not mix with any liquid prior to dispensing.
- **IM:** Administer IM doses deep into muscle mass.
- **Direct IV:** Administer undiluted or diluted with D5W, 0.9% NaCl, or lactated Ringer's injection through Y-site.
- When administered concurrently with opioid analgesics, dose should be reduced by 30–50%. ***Rate:*** Administer each dose slowly over at least 2 min. Monitor IV site closely to avoid extravasation. Titrate dose to patient response. Rapid injection, especially in neonates, has caused severe hypotension.
- **Continuous Infusion:** Dilute 5 mg/ml to a concentration of 0.5 mg/ml with 0.9% NaCl or D5W. ***Rate:*** Usual infusion rate is 0.02–0.1 mg/kg/hr (1–7 mg/hr). Titrate to desired level of sedation. Assess sedation at regular intervals and adjust rate up or down by 25–50% as needed. Dose should also be decreased by 10–25% every few hours to find minimum effective infusion rate, which prevents accumulation of midazolam and provides more rapid recovery upon termination.
- In pediatric patients, rate of 0.06–0.12 mg/kg/hr (1–2 mcg/kg/min) can be increased or decreased by 25% based on assessment of sedation.
- In neonates, rate of 0.03 mg/kg/hr (0.5 mcg/kg/min) is used for neonates <32 weeks and rate of 0.06 mg/kg/hr (1 mcg/kg/min) is used for neonates >32 weeks of age.

miglitol (mi-gli-tole)

Glyset

Classification

Therapeutic: antidiabetics
Pharmacologic: alpha-glucosidase inhibitors

Pregnancy Category B

Indications

Management of non–insulin-dependent diabetes mellitus (type 2) in conjunction with dietary therapy; may be used concurrently with sulfonylurea oral hypoglycemic agents.

Action

Lowers blood glucose by inhibiting the enzyme alpha glucosidase in the GI tract, resulting in delayed glucose absorption. **Therapeutic Effects:** Lowering of blood glucose in diabetic patients, especially postprandial hyperglycemia.

Pharmacokinetics

Absorption: Completely absorbed at lower doses (25 mg); 50–70% absorbed at higher doses (100 mg).
Distribution: Distributes primarily into extracellular fluid; small amounts enter breast milk.
Metabolism and Excretion: Not metabolized; action is primarily local in the GI tract; amounts that are absorbed are excreted mostly unchanged in urine.
Half-life: 2 hr.

TIME/ACTION PROFILE (effect on glucose absorption)

ROUTE	ONSET	PEAK	DURATION
PO	rapid	within 1 hr	unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Diabetic ketoacidosis. Inflammatory bowel disease or other chronic intestinal conditions resulting in impaired absorption or predisposition to obstruction. Lactation.
Use Cautiously in: Patients with: fever, infection, trauma, stress (may cause hyperglycemia requiring alternate therapy); Renal impairment (use not recommended if creatinine >2 mg/dL); Pregnancy or children (safety not established).

Adverse Reactions/Side Effects

GI: abdominal pain, diarrhea, flatulence. **Hemat:** low serum iron.

Interactions

Drug-Drug: May decrease absorption of **ranitidine** and **propranolol**. Effects may be decreased by **intestinal adsorbents** (such as **charcoal**) and **digestive enzyme products**;concurrent use should be avoided.
Drug-Food: Concurrent **carbohydrates** may increase diarrhea.

Route/Dosage

PO (Adults): 25 mg 3 times daily; may begin with 25 mg once daily; may be increased up to 100 mg 3 times daily.

NURSING IMPLICATIONS

Assessment

- Observe patient for signs and symptoms of hypoglycemic reactions (sweating, hunger, weakness, dizziness, tremor, tachycardia, anxiety), especially when taking concurrently with other oral hypoglycemic agents.
- ***Lab Test Considerations:*** Serum glucose and glycosylated hemoglobin should be monitored periodically throughout therapy to evaluate effectiveness of therapy.
- ***Toxicity and Overdose:*** Symptoms of overdose are transient increase in flatulence, diarrhea, and abdominal discomfort. Miglitol alone does not cause hypoglycemia; however other concurrently administered hypo-

- **Syringe Compatibility:** alfentanilatracurium, atropine, buprenorphine, butorphanol, chlorpromazine, cimetidine, diphenhydramine, droperidol, fentanyl, glycopyrrolate, hydromorphone, hydroxyzine, meperidine, metoclopramide, morphine, nalbuphine, ondansetron, promethazine, scopolamine, sufentanil, thiethylperazine, trimethobenzamide.
- **Syringe Incompatibility:** prochlorperazine, ranitidine.
- **Y-Site Compatibility:** amikacin, amiodarone, atracurium, calcium gluconate, cefazolin, cefotaxime, cimetidine, ciprofloxacin, cisatracurium, clindamycin, digoxin, diltiazem, dopamine, epinephrine, erythromycin lactobionate, esmolol, etomidate, famotidine, fentanyl, fluconazole, gatifloxacin, gentamicin, haloperidol, heparin, hydromorphone, insulin, labetalol, linezolid, lorazepam, methylprednisolone, metronidazole, morphine, nitroglycerin, nitroprusside, norepinephrine, pancuronium, piperacillin, potassium chloride, ranitidine, remifentanil, sufentanil, theophylline, tobramycin, vancomycin, vecuronium.
- **Y-Site Incompatibility:** albumin, amphotericin B cholesteryl sulfate, ampicillin, bumetanide, butorphanol, ceftazidime, cefuroxime, clonidine, floxacillin, foscarnet, fosphenytoin, furosemide, hydrocortisone, imipenem/cilastatin, methotrexate, nafcillin, omeprazole, sodium bicarbonate, thiopental, trimethoprim/sulfamethoxazole.

Patient/Family Teaching

- Inform patient that this medication will decrease mental recall of the procedure.
- May cause drowsiness or dizziness. Advise patient to request assistance before ambulation and transfer and to avoid driving or other activities requiring alertness for 24 hr following administration.
- Instruct patient to inform health care professional before administration if pregnancy is suspected.
- Advise patient to avoid alcohol or other CNS depressants for 24 hr following administration of midazolam.

Evaluation/Desired Outcomes

- Sedation during and amnesia following surgical, diagnostic, and radiologic procedures.
- Sedation and amnesia for mechanically ventilated patients in a critical care setting.

Why was this drug prescribed for your patient?

glycemic agents may produce hypoglycemia requiring treatment. Mild hypoglycemia may be treated with administration of oral glucose.

Potential Nursing Diagnoses

Imbalanced nutrition: more than body requirements (Indications)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)
Noncompliance (Patient/Family Teaching)

Implementation

- Patients stabilized on a diabetic regimen who are exposed to stress, fever, trauma, infection, or surgery may require administration of insulin.
- Does not cause hypoglycemia when taken while fasting, but may increase hypoglycemic effect of other hypoglycemic agents.
- **PO:** Administer miglitol 3 times daily with the first bite of each meal. Dose may be started lower and increased gradually to minimize GI effects.

Patient/Family Teaching

- Instruct patient to take miglitol at the same time each day, exactly as directed.
- Explain to patient that miglitol helps control hyperglycemia but does not cure diabetes. Therapy is usually long-term.
- Encourage patient to follow prescribed diet, medication, and exercise regimen to prevent hyperglycemic or hypoglycemic episodes.
- Review signs of hypoglycemia and hyperglycemia with patient. If hypoglycemia occurs, advise patient to take a glass of orange juice, 2–3 tsp of sugar, honey, or corn syrup dissolved in water, and notify health care professional.
- Instruct patient in proper testing of blood glucose or urine ketones. These tests should be monitored closely during periods of stress or illness and health care professional notified of significant changes.
- Insulin is the recommended method of controlling blood glucose during pregnancy. Counsel female patient to use a form of contraception other than oral contraceptives and to notify health care professional promptly if pregnancy is planned or suspected.
- Advise patient to inform health care professional of medication regimen before treatment or surgery.
- Advise patient to carry a form of oral glucose (dextrose, D -glucose) and identification describing disease process and medication regimen at all times.
- Emphasize the importance of routine follow-up exams and regular testing of blood glucose and glycosylated hemoglobin.

Evaluation/Desired Outcomes

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

Why was this drug prescribed for your patient?

mirtazapine (meer-taz-a-peen)

Remeron, Remeron Soltabs

Classification

Therapeutic: antidepressants
Pharmacologic: tetracyclic antidepressants

Pregnancy Category C

Indications

Depression (with psychotherapy).

Action

Potentiates the effects of norepinephrine and serotonin. **Therapeutic Effects:** Antidepressant action, which may develop only over several weeks.

Pharmacokinetics

Absorption: Well absorbed, but rapidly metabolized, resulting in 50% bioavailability.
Distribution: Unknown.
Metabolism and Excretion: Extensively metabolized by the liver (P450 enzymes); metabolites excreted in urine (75%) and feces (15%).
Half-life: 20–40 hr.

TIME/ACTION PROFILE (antidepressant effect)

ROUTE	ONSET	PEAK	DURATION
PO	1–2 wk	6 wk or more	unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Concurrent MAO inhibitor therapy.
Use Cautiously in: History of seizures; History of suicide attempt; May ↑ risk of suicide attempt/ideation especially during dose early treatment or dose adjustment; risk may be greater in children or adolescents; History of mania/hypomania; Geriatric patients or patients with hepatic or renal impairment (may need lower doses); Pregnancy, lactation, or children (safety not established).

Adverse Reactions/Side Effects

CNS: drowsiness, abnormal dreams, abnormal thinking, agitation, anxiety, apathy, confusion, dizziness, malaise, weakness. **EENT:** sinusitis. **Resp:** dyspnea, increased cough. **CV:** edema, hypotension, vasodilation. **GI:** constipation, dry mouth, increased appetite, abdominal pain, anorexia, elevated liver enzymes, nausea, vomiting. **GU:** urinary frequency. **Derm:** pruritus, rash. **F and E:** increased thirst. **Hemat:** AGRANULOCYTOSIS. **Metab:** weight gain, hypercholesterolemia, increased triglycerides. **MS:** arthralgia, back pain, myalgia. **Neuro:** hypesthesia, hyperkinesia, twitching. **Misc:** flu-like syndrome.

Interactions

Drug-Drug: May cause hypertension, seizures, and death when used with **MAO inhibitors**; do not use within 14 days of MAO inhibitor therapy. ↑ CNS depression with other **CNS depressants,** including **alcohol** and **benzodiazepines. Drugs affecting P450 enzymes, CYP2D6, CYP1A2,** and **CYP3A4** may alter the effects of mirtazapine.
Drug-Natural Products: Concomitant 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): 15 mg/day as a single bedtime dose initially; may be increased q 1–2 wk up to 45 mg/day.

NURSING IMPLICATIONS

Assessment

- Assess mental status frequently. Assess for suicidal tendencies, especially during early therapy. Restrict amount of drug available to patient.

montelukast (mon-te-loo-kast)

Singulair

Classification

Therapeutic: allergy, cold, and cough remedies, bronchodilators
Pharmacologic: leukotriene antagonists

Pregnancy Category B

Indications

Prevention and chronic treatment of asthma. Management of seasonal allergic rhinitis.

Action

Antagonizes the effects of leukotrienes, which mediate the following: Airway edema, Smooth muscle constriction, Altered cellular activity. Result is decreased inflammatory process, which is part of asthma and allergic rhinitis. **Therapeutic Effects:** Decreased frequency and severity of acute asthma attacks. Decreased severity of allergic rhinitis.

Pharmacokinetics

Absorption: Rapidly absorbed (63–73%) after oral administration.
Distribution: Unknown.
Metabolism and Excretion: Mostly metabolized by the liver; metabolites eliminated in feces via bile; negligible renal excretion.
Half-life: 2.7–5.5 hr.

TIME/ACTION PROFILE (improved symptoms of asthma)

ROUTE	ONSET	PEAK†	DURATION
PO (swallow)	within 24 hr	3–4 hr	24 hr
PO (chew)	within 24 hr	2–2.5 hr	24 hr

†Blood levels

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Lactation.
Use Cautiously in: Acute attacks of asthma; Phenylketonuria (chewable tablets contain aspartame); Hepatic impairment (may need lower doses); Reduction of corticosteroid therapy (may increase the risk of eosinophilic conditions; Pregnancy, lactation or children <2 yr (safety not established).

Adverse Reactions/Side Effects

CNS: fatigue, headache, weakness. **EENT:** otitis (children), sinusitis (children). **Resp:** cough. **GI:** abdominal pain, diarrhea (children), dyspepsia, nausea (children), increased liver enzymes. **Derm:** rash. **Misc:** eosinophilic conditions (including CHURG-STRAUSS SYNDROME), fever.

Interactions

Drug-Drug: Drugs which induce the CYP450 enzyme system (**phenobarbital rifampin**) may decrease the effects of monteleukast.

Route/Dosage

PO (Adults and Children ≥15 yr): 10 mg once daily.
PO (Children 6–14 yr): 5 mg once daily (as chewable tablet).
PO (Children 2–5 yr): 4 mg once daily (as chewable tablet).
PO (Children 12–23 mo): *Asthma only*—4 mg once daily (as oral granules).

NURSING IMPLICATIONS

Assessment

- Assess lung sounds and respiratory function before and periodically throughout therapy.
- Assess allergy symptoms (rhinitis, conjunctivitis, hives) before and periodically throughout course of therapy.
- ***Lab Test Considerations:*** May cause ↑ AST and ALT concentrations.

Potential Nursing Diagnoses

Ineffective airway clearance (Indications)

- Monitor blood pressure and pulse rate periodically during initial therapy. Report significant changes.
- Monitor for seizure activity in patients with a history of seizures or alcohol abuse. Institute seizure precautions.
- ***Lab Test Considerations:*** Assess CBC and hepatic function before and periodically during therapy.

Potential Nursing Diagnoses

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

Implementation

- May be given as a single dose at bedtime to minimize excessive drowsiness or dizziness.
- May be taken without regard to food.
- For *orally disintegrating tablets*, do not attempt to push through foil backing; with dry hands, peal back backing and remove tablet. Immediately place tablet on tongue; tablet will dissolve in seconds, then swallow with saliva. Administration with liquid is not necessary.

Patient/Family Teaching

- Instruct patient to take mirtazapine exactly as directed. If a dose is missed, take as soon as remembered; if almost time for next dose, skip missed dose and return to regular schedule. If single bedtime dose regimen is used, do not take missed dose in morning, but consult health care professional. Do not discontinue abruptly; gradual dosage reduction may be required.
- May cause drowsiness and dizziness. Caution patient to avoid driving and other activities requiring alertness until response to drug is known.
- Caution patient to change positions slowly to minimize orthostatic hypotension.
- Advise patient to avoid alcohol or other CNS depressant drugs during and for at least 3–7 days after therapy has been discontinued.
- Advise patient to notify health care professional if dry mouth, urinary retention, or constipation occurs. Frequent rinses, good oral hygiene, and sugarless candy or gum may diminish dry mouth. An increase in fluid intake, fiber, and exercise may prevent constipation.
- Inform patient of need to monitor dietary intake. Increase in appetite may lead to undesired weight gain.
- Advise patient to consult health care professional before taking any OTC cold remedies or herbal products with this medication.
- Advise patient to notify health care professional of medication regimen before treatment or surgery.
- Therapy for depression may be prolonged. Emphasize the importance of follow-up exam to monitor effectiveness and side effects.

Evaluation/Desired Outcomes

- Resolution of the symptoms of depression:
- Increased sense of well-being.
- Renewed interest in surroundings.
- Increased appetite.
- Improved energy level.
- Improved sleep.
- Therapeutic effects may be seen within 1 wk, although several wks are usually necessary before improvement is observed.

Why was this drug prescribed for your patient?

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

Implementation

- Doses of inhaled corticosteroids may be gradually decreased with supervision of health care professional; do not discontinue abruptly.
- **PO:** For asthma, administer once daily in the evening. For allergic rhinitis, may be administered at any time of day.
- Administer granules directly into mouth or mixed in a spoonful of cold or room temperature foods (use only applesauce, mashed carrots, rice, or ice cream). Do not open packet until ready to use. After opening packet, administer full dose within 15 min. Do not store mixture. Discard unused portion. Do not dissolve granules in fluid, but fluid may be taken following administration. Granules may be administered without regard to meals.

Patient/Family Teaching

- Instruct patient to take medication daily in the evening, even if not experiencing symptoms of asthma. Do not double doses. Do not discontinue therapy without consulting health care professional.
- Instruct patient not to discontinue or reduce other asthma medications without consulting health care professional.
- Advise patient that montelukast is not used to treat acute asthma attacks, but may be continued during an acute exacerbation. Patient should carry rapid-acting therapy for bronchospasm at all times. Advise patient to notify health care professional if more than the maximum number of short-acting bronchodilator treatments prescribed for a 24-hr period are needed.

Evaluation/Desired Outcomes

- Prevention of and reduction in symptoms of asthma.
- Decrease in severity of allergic rhinitis.

Why was this drug prescribed for your patient?

High Alert

morphine (mor-feen)

Astramorph, Avinza, DepoDur, Duramorph, ♣Epimorph, Infumorph, Kadian, ♣M-Eslon, ♣Morphine H.P, ♣Morphitec, ♣M.O.S, ♣M.O.S.-S.R, MS, MS Contin, MSIR, MSO$_4$, OMS Concentrate, Oramorph SR, RMS, Roxanol, ♣Statex

Classification

Therapeutic: opioid analgesics
Pharmacologic: opioid agonists

Schedule II

Pregnancy Category C

Indications

Severe pain. Pulmonary edema. Pain due to MI.

Action

Binds to opiate receptors in the CNS. Alters perception of and response to painful stimuli while producing generalized CNS depression. **Therapeutic Effects:** Decrease in severity of pain.

Pharmacokinetics

Absorption: Variably absorbed (about 30%) after oral administration. More reliably absorbed from rectal, subcut, and IM sites. Following epidural administration, systemic absorption and absorption into the intrathecal space via the meninges occurs.
Distribution: Widely distributed. Crosses the placenta; enters breast milk in small amounts.
Metabolism and Excretion: Mostly metabolized by the liver.
Half-life: 2–3 hr.

TIME/ACTION PROFILE (analgesia)

ROUTE	ONSET	PEAK	DURATION
PO	unknown	60–120 min	4–5 hr
PO-ER or SR	unknown	variable	8–24 hr
IM	10–30 min	30–60 min	4–5 hr
Subcut	20 min	50–90 min	4–5 hr
Rect	unknown	20–60 min	4–5 hr
IV	rapid	20 min	4–5 hr
Epidural	15–60 min	unknown	up to 24 hr (48 hr for liposomal injection)

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Some products contain tartrazine, sulfites or alcohol; avoid in patients with known hypersensitivity.
Use Cautiously in: Head trauma; Increased intracranial pressure; Severe renal, hepatic, or pulmonary disease; Hypothyroidism; Adrenal insufficiency; Alcoholism; Geriatric/debilitated patients (dosage reduction suggested); Undiagnosed abdominal pain; Prostatic hypertrophy; Patients undergoing procedures that rapidly decrease pain (cordotomy, radiation); long-acting agents should be discontinued 24 hr before and replaced with short-acting agent; Pregnancy or lactation (avoid chronic use; has been used during labor; can may cause respiratory depression in the newborn); Children <18 yr (epidural liposomal injection only-not recommended).

Adverse Reactions/Side Effects

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

Interactions

Drug-Drug: Use with **extreme caution** in patients receiving **MAO inhibitors** within 14 days prior (may result in unpredictable, severe reactions—↓ initial dose of morphine to 25% of usual dose). ↑ CNS depression with **alcohol, sedative/hypnotics, clomipramine, barbiturates, tricyclic antidepressants,** and **antihistamines.** Administration of **partial-antagonist opioid analgesics** may precipitate opioid withdrawal in physically dependent patients. **Buprenorphine, nalbuphine, butorphanol,** or **pentazocine** may ↓ analgesia. May ↑ the anticoagulant effect of **warfa-**

♣ = Canadian drug name.

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

CONTINUED

morphine

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

Potential Nursing Diagnoses

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

Implementation

- ***High Alert:*** Do not confuse morphine with hydromorphone or meperidine—errors have resulted in death. Other errors associated with morphine include overdose and infusion pump miscalculations. Consider patients' previous analgesic use and current requirements, but clarify doses that greatly exceed normal range. Have second practitioner independently check original order, dose calculations and infusion pump settings.
- Explain therapeutic value of medication prior to administration to enhance the analgesic effect.
- Regularly administered doses may be more effective than prn administration. Analgesic is more effective if given before pain becomes severe.
- Coadministration with nonopioid analgesics may have additive analgesic effects and may permit lower doses.
- When transferring from other opioids or other forms of morphine to extended-release tablets, administer a total daily dose of oral morphine equivalent to previous daily dose (see Appendix B) and divided every 8 hr (MS Contin), every 12 hr (Kadian, MS Contin, Oramorph SR), every 24 hr (Kadian or Avinza).
- Morphine should be discontinued gradually to prevent withdrawal symptoms after long-term use.
- **PO:** Doses may be administered with food or milk to minimize GI irritation.
- Administer oral solution with properly calibrated measuring device; may be diluted in a glass of fruit juice just prior to administration to improve taste.
- Extended-release and controlled-release tablets should be swallowed whole; **do not crush, break, or chew.**
- *Kadian and Avinza* capsules may be opened and the pellets sprinkled onto applesauce immediately prior to administration. Patients should rinse mouth and swallow to assure ingestion of entire dose. Pellets should not be chewed, crushed, or dissolved *Kadian* capsules may also be opened and sprinkled on approximately 10 ml of water and flushed while swirling through a pre-wetted 16 French gastrostomy tube fitted with a funnel at the port end. Additional water should be used to transfer and flush any remaining pellets. *Kadian* should not be administered via a nasogastric tube.
- **Rect:** *MS Contin* and *Oramorph SR* have been administered rectally.
- **IM Subcut:** Use IM route for repeated doses because morphine is irritating to subcut tissues.
- **IV:** Solution is colorless; do not administer discolored solution.
- **Direct IV:** Dilute with at least 5 ml of sterile water or 0.9% NaCl for injection. ***Rate: High Alert:*** Administer 2.5–15 mg over 4–5 min. Rapid administration may lead to increased respiratory depression, hypotension, and circulatory collapse.
- **Continuous Infusion:** May be added to D5W, D10W, 0.9% NaCl, 0.45% NaCl, Ringer's or LR, dextrose/saline solution, or dextrose/Ringer's or LR in a concentration of 0.1–1 mg/ml or greater for continuous infusion. ***Rate:*** Administer via infusion pump to control the rate. Dose should be titrated to ensure adequate pain relief without excessive sedation, respira-

♣ = Canadian drug name.

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

rin. Cimetidine ↓ metabolism and may ↑ effects. Epidural test dose of lidocaine/epinephrine may alter release of liposomal injection.
Drug-Natural Products: Concomitant use of **kava, valerian** or **chamomile** can ↑ CNS depression.

Route/Dosage

Larger doses may be required during chronic therapy.
PO, Rect (Adults ≥50 kg): *Usual starting dose for moderate to severe pain in opioid-naive patients*—30 mg q 3–4 hr initially *or* once 24-hr opioid requirement is determined, convert to controlled, extended *or* sustained-release morphine by administering total daily oral morphine dose every 24 hr (as *Kadian* or *Avinza*), 50% of the total daily oral morphine dose every 12 hr (as *Oramorph SR, Kadian, MS Contin*), or 33% of the total daily oral morphine dose every 8 hr (as *MS Contin*). See equianalgesic chart Appendix B. *Avinza* dose should not exceed 1600 mg/day because of fumaric acid in formulation.
PO, Rect (Adults and Children <50 kg): *Usual starting dose for opioid-naive patients*—0.3 mg/kg q 3–4 hr initially.
IM, IV, Subcut: (Adults ≥50 kg): *Usual starting dose for opioid-naive patients*—4–10 mg q 3–4 hr. *MI—8–15 mg, for very severe pain additional smaller doses may be given every 3–4 hr.*
IM, IV, Subcut: (Adults and Children <50 kg): *Usual starting dose for moderate to severe pain in opioid-naive patients*—0.1 mg/kg q 3–4 hr.
IV, Subcut: (Adults): *Continuous infusion*—0.8–10 mg/hr; may precede a 15 mg bolus (up to 400 mg/hr have been used).
Epidural: (Adults): *Intermittent injection*—5 mg/day (initially); if relief is not obtained at 60 min, 1–2 mg increments may be made; additional 1–2 mg may be given if pain relief is inadequate *Continuous infusion*—2–4 mg/24 hr; may increase by 1–2 mg/day (up to 30 mg/day); *single dose extended-release liposomal injection*— lower extremity orthopedic surgery—15 mg, lower abdominal/pelvic surgery 0 10–15 mg, cesarean section—10 mg.
IT (Adults): 0.2–1 mg.

NURSING IMPLICATIONS

Assessment

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

CONTINUED

tory depression, or hypotension. May be administered via patient-controlled analgesia (PCA) pump.

- **Syringe Compatibility:** atropine, bupivacaine, cimetidine, dimenhydrinate, diphenhydramine, droperidol, glycopyrrolate, hydroxyzine, ketamine, metoclopramide, midazolam, milrinone, ondansetron, perphenazine, ranitidine, scopolamine.
- **Y-Site Compatibility:** allopurinol, amifostine, amikacin, aminophylline, amiodarone, ampicillin, ampicillin/sulbactam, argatroban, atenolol, atracurium, atropine, aztreonam, bivalirudin, bumetanide, calcium chloride, cefazolin, cefoperazone, cefotaxime, cefotetan, cefoxitin, ceftazidime, ceftizoxime, ceftriaxone, cefuroxime, chloramphenicol, cisatracurium, cisplatin, cladribine, clindamycin, cyclophosphamide, cytarabine, dexamethasone sodium phosphate, diazepam, digoxin, diltiazem, diphenhydramine, dobutamine, docetaxel, dopamine, doxorubicin, doxycycline, enalaprilat, epinephrine, erythromycin lactobionate, esmolol, etomidate, etoposide, famotidine, fenoldopam, filgrastim, fluconazole, fludarabine, foscarnet, gatifloxacin, gemcitabine, gentamicin, granisetron, haloperidol, heparin, hydrocortisone sodium succinate, insulin, kanamycin, ketorolac, labetalol, levofloxacin, lidocaine, linezolid, lorazepam, magnesium sulfate, melphalan, meropenem, methotrexate, methyldopate, methylprednisolone, metoclopramide, metoprolol, metronidazole, midazolam, milrinone, nafcillin, nitroglycerin, nitroprusside, norepinephrine, ondansetron, oxacillin, oxytocin, paclitaxel, pancuronium, penicillin G potassium, phenobarbital, piperacillin, piperacillin/tazobactam, potassium chloride, propranolol, ranitidine, scopolamine, sodium bicarbonate, tacrolimus, teniposide, thiotepa, ticarcillin, ticarcillin/clavulanate, tirofiban, tobramycin, trimethoprim/sulfamethoxazole, vancomycin, vecuronium, vinorelbine, vitamin B complex with C, warfarin, zidovudine.
- **Y-Site Incompatibility:** amphotericin B cholesteryl sulfate, azithromycin, cefepime, doxorubicin liposome, minocycline, phenytoin, sargramostim. **Epidural:** Invert vial gently to re-suspend liposomal product immediately prior to administration; do not shake. Administer undiluted. If a lidocaine test dose is administered, flush catheter with 0.9% NaCl and wait 15 min before administration of *DepoDur*. Do not use an in-lint filter. Do not admix or administer other medications in epidural space for 48 hr after administration. Administer with 4 hr after removing from vial. Store in refrigerator; do not freeze.

Patient/Family Teaching

- Instruct patient how and when to ask for pain medication.
- ***High Alert:*** Instruct family not to administer PCA doses to the sleeping patient. Overmedication, sedation, and respiratory depression can result.
- May cause drowsiness or dizziness. Caution patient to call for assistance when ambulating or smoking and to avoid driving or other activities requiring alertness until response to medication is known.
- Advise patient to change positions slowly to minimize orthostatic hypotension.
- Caution patient to avoid concurrent use of alcohol or other CNS depressants with this medication.
- Encourage patients who are immobilized or on prolonged bedrest to turn, cough, and breathe deeply every 2 hr to prevent atelectasis.
- **Home Care Issues:** ***High Alert:*** Explain to patient and family how and when to administer morphine and how to care for infusion equipment properly.
- Emphasize the importance of aggressive prevention of constipation with the use of morphine.

Evaluation/Desired Outcomes

- Decrease in severity of pain without a significant alteration in level of consciousness or respiratory status.
- Decrease in symptoms of pulmonary edema.

Why was this drug prescribed for your patient?

mycophenolate mofetil (mye-koe-**fee**-noe-late)

CellCept

mycophenolic acid

Myfortic

Classification

Therapeutic: immunosuppressants

Pregnancy Category C

Indications

Prevention of rejection in allogenic renal, hepatic, or cardiac transplantation (used concurrently with cyclosporine and corticosteroids).

Action

Inhibits the enzyme inosine monophosphate dehydrogenase, which is involved in purine synthesis. This inhibition results in suppression of T- and B-lymphocyte proliferation. **Therapeutic Effects:** Prevention of kidney transplant rejection.

Pharmacokinetics

Absorption: After oral and IV administration, mycophenolate is rapidly hydrolyzed to mycophenolic acid (MPA), its active metabolite. Oral absorption of mycophenolic acid enteric-tablets is delayed.

Distribution: Unknown.

Protein Binding: *MPA*—97%.

Metabolism and Excretion: MPA is extensively metabolized; <1% excreted unchanged in urine. Some enterohepatic recirculation of MPA occurs.

Half-life: *MPA*—17.9 hr.

TIME/ACTION PROFILE (blood levels of MPA)

ROUTE	ONSET	PEAK	DURATION
mycophenolate mofetil-PO	rapid	0.25–1.25 hr	NA
mycophenolic acid	rapid	1.5–2.75 hr	NA

Contraindications/Precautions

Contraindicated in: Hypersensitivity, Pregnancy or lactation.

Use Cautiously in: History of ulcer disease or GI bleeding; Phenylketonuria (oral suspension contains aspartame); Severe renal impairment (dosage not to exceed 1 g twice daily if CCr <25 ml/min); Delayed graft function after transplantation (observe for increased toxicity); Childbearing potential; Children (safety not established).

Adverse Reactions/Side Effects

GI: GI BLEEDING, diarrhea, vomiting. **Hemat:** leukopenia. **Misc:** sepsis, increased risk of malignancy.

Interactions

Drug-Drug: Combined use with **azathioprine** is not recommended (effects unknown). **Acyclovir** and **ganciclovir** compete with MPA for renal excretion and, in patients with renal failure, may ↑ each other's toxicity. **Magnesium and aluminum hydroxide** antacids ↓ the absorption of MPA (avoid simultaneous administration). **Cholestyramine** and **colestipol** ↓ the absorption of MPA (avoid concurrent use). Toxicity may be ↑ by **salicylates**. May interfere with the action of **oral contraceptives** (additional contraceptive method should be used). May ↓ the antibody response to and ↑ risk of adverse reactions from **live-virus vaccines**, although influenza vaccine may be useful.

Drug-Food: When administered with food, peak blood levels of MPA are significantly ↓.

CONTINUED

mycophenolate mofetil

Why was this drug prescribed for your patient?

Patient/Family Teaching

- Instruct patient to take medication as directed, at the same time each day. Do not skip or double up on missed doses. Do not discontinue without consulting health care professional.
- Reinforce the need for lifelong therapy to prevent transplant rejection. Review symptoms of rejection for the transplanted organ, and stress need to notify health care professional immediately if signs of rejection or infection occur.
- Inform female patients of the importance of simultaneously using two reliable forms of contraception, unless abstinence is the chosen method, before beginning, during, and for 6 wk after discontinuation of therapy.
- Advise patient to avoid contact with persons with contagious diseases.
- Inform patient of the increased risk of lymphoma and other malignancies. Advise patient to use sunscreen and wear protective clothing to decrease risk of skin cancer.
- Advise patient to consult health care professional before taking other medications concurrently with mycophenolate.
- Emphasize the importance of routine follow-up laboratory tests.

Evaluation/Desired Outcomes

- Prevention of rejection of transplanted organs.

Route/Dosage

Mycophenolate mofetil (CellCept)

Renal Transplantation

PO, IV (Adults): 1 g twice daily; IV can be started ≤24 hr after transplantation and switched to PO as soon as possible (IV not recommended for ≥14 days).

Hepatic Transplantation

PO, IV (Adults): 1 g twice daily IV, or 1.5 g twice daily PO.

Cardiac Transplantation

PO, IV (Adults): 1.5 g twice daily; IV may be started ≤24 hr after transplantation and switched to PO as soon as possible (IV not recommended for ≥14 days).

Renal Impairment

PO, IV (Adults): *GFR <25 ml/min*—daily dose should not exceed 2 g.

Mycophenolic acid

Renal Transplantation

PO (Adults): 720 mg twice daily.
PO (Children 5–16 yr and ≥ 1.19 m^2): 400 mg/m^2 twice daily (up to 720 mg twice daily).

NURSING IMPLICATIONS

Assessment

- Assess for symptoms of organ rejection throughout therapy.
- ***Lab Test Considerations:*** Monitor CBC with differential weekly during the 1st mo, twice monthly for the 2nd and 3rd mo of therapy, and then monthly during the 1st yr. Neutropenia occurs most frequently from 31–180 days post-transplant. If ANC is <1000/mm^3, dose should be reduced or discontinued.
- Monitor hepatic and renal status and electrolytes periodically during therapy. May cause ↑ serum alkaline phosphatase, AST, ALT, LDH, and creatinine. May also cause hypercalcemia, hypocalcemia, hyperuricemia, hyperlipidemia, hypoglycemia, and hypoproteinemia.

Potential Nursing Diagnoses

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

Implementation

- The initial dose of mycophenolate should be given within 72 hr of transplant.
- Women of childbearing age should have a negative serum or urine pregnancy test within 1 wk before initiation of therapy.
- Myfortic delayed release tablets and mycophentolate mofetil tablets and capsules are not interchangeable.
- **PO:** Administer on an empty stomach, 1 hr before or 2 hr after meals. **Capsules should be swallowed whole; do not open, crush, or chew. Mycophenolate may be teratogenic; contents of capsules should not be inhaled or come in contact with skin or mucous membranes.**
- Do not administer mycophenolate concurrently with antacids containing magnesium or aluminum.
- **IV:** IV route should be used only for patients unable to take oral medication and should be switched to oral dose form as soon as patient can tolerate capsules or tablets.
- **Intermittent Infusion:** Reconstitute each vial with 14 ml of D5W. Shake gently to dissolve. Solution is slightly yellow; discard if solution is discolored or contains particulate matter. Dilute contents of 2 vials (1-g dose) further with 140 ml of D5W or 3 vials (1.5-g dose) with 210 ml of D5W for a concentration of 6 mg/ml. Solution is stable for 4 hr. ***Rate:*** Administer via slow IV infusion over 2 hr.
- **Y-Site Incompatibility:** Do not admix or administer mycophenolate in same catheter as other medications.

CONTINUED

nabumetone (na-**byoo**-me-tone)

Relafen

Classification

Therapeutic: antirheumatics, nonsteroidal anti-inflammatory agents

Pregnancy Category C

Indications

Symptomatic management of rheumatoid arthritis and osteoarthritis.

Action

Inhibits prostaglandin synthesis. **Therapeutic Effects:** Suppression of pain and inflammation.

Pharmacokinetics

Absorption: Nabumetone (a prodrug) is 80% absorbed after oral administration; 35% is rapidly converted to 6-methoxy-2-naphthylacetic acid (6-MNA), which is the active drug.
Distribution: Unknown.
Metabolism and Excretion: 6-MNA is metabolized by the liver to inactive compounds.
Half-life: 24 hr (increased in severe renal impairment).

TIME/ACTION PROFILE (analgesia/anti-inflammatory effects)

ROUTE	ONSET	PEAK	DURATION
PO	1–2 days	few days–2 wk	12–24 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Use with other NSAIDs, including aspirin; cross-sensitivity may occur. Active GI bleeding or ulcer disease. Perioperative pain from coronary artery bypass graft (CABG) surgery.

Use Cautiously in: Cardiovascular disease or risk factors for cardiovascular disease (may ↑ risk of serious cardiovascular thrombotic events, myocardial infarction, and stroke, especially with prolonged use); Severe renal or hepatic disease; History of ulcer disease; Geriatric patients (increased risk of bleeding); Pregnancy, lactation, or children (safety not established; avoid using during second half of pregnancy).

Adverse Reactions/Side Effects

CNS: agitation, anxiety, confusion, depression, dizziness, drowsiness, fatigue, headache, insomnia, malaise, weakness. **EENT:** abnormal vision, tinnitus. **Resp:** dyspnea, hypersensitivity pneumonitis. **CV:** edema, fluid retention, vasculitis. **GI:** GI BLEEDING, abdominal pain, diarrhea, abnormal liver function tests, anorexia, constipation, dry mouth, dyspepsia, flatulence, gastritis, gastroenteritis, increased appetite, nausea, stomatitis, vomiting. **GU:** albuminuria, azotemia, interstitial nephritis. **Derm:** EXFOLIATIVE DERMATITIS, STEVENS-JOHNSON SYNDROME, TOXIC EPIDERMAL NECROLYSIS, increased sweating, photosensitivity, pruritus, rash. **Hemat:** prolonged bleeding time. **Metab:** weight gain. **Neuro:** paresthesia, tremor. **Misc:** allergic reactions including ANAPHYLAXIS, ANGIONEUROTIC EDEMA.

Interactions

Drug-Drug: ↑ adverse GI effects with **alcohol**, **aspirin**, **corticosteroids**, **other NSAIDs**, or **potassium supplements**. Chronic use with **acetaminophen** may ↑ risk of adverse renal reactions. May ↓ effectiveness of **antihypertensive therapy** or **diuretics**. May ↑ hypoglycemic effects of **insulin** or **oral hypoglycemic agents**. ↑ risk of toxicity from **methotrexate**. ↑ risk of bleeding with **anticoagulants**, **cefoperazone**, **cefotetan**, **thrombolytic agents**, or **valproic acid**. ↑ risk of adverse hematologic reactions with **antineoplastics** or **radiation therapy**. Concurrent use with **cyclosporine** may ↑ risk of renal toxicity.

Route/Dosage

PO (Adults): 1000 mg/day as a single dose or divided dose twice daily; may be increased up to 2000 mg/day; use lowest effective dose during chronic therapy.

naloxone (nal-**ox**-one)

Narcan

Classification

Therapeutic: antidotes (for opioids)
Pharmacologic: opioid antagonists

Pregnancy Category B

Indications

Reversal of CNS depression and respiratory depression caused by suspected opioid overdosage.

Action

Competitively blocks the effects of opioids, including CNS and respiratory depression, without producing any agonist (opioid-like) effects. **Therapeutic Effects:** Reversal of signs of opioid excess.

Pharmacokinetics

Absorption: Well absorbed after IM or subcut administration.
Distribution: Rapidly distributed to tissues. Crosses the placenta.
Metabolism and Excretion: Metabolized by the liver.
Half-life: 60–90 min (up to 3 hr in neonates).

TIME/ACTION PROFILE (reversal of opioid effects)

ROUTE	ONSET	PEAK	DURATION
IV	1–2 min	unknown	45 min
IM, subcut	2–5 min	unknown	>45 min

Contraindications/Precautions

Contraindicated in: Hypersensitivity.
Use Cautiously in: Cardiovascular disease; Patients physically dependent on opioid analgesics (may precipitate severe withdrawal); Pregnancy (may cause withdrawal in mother and fetus if mother is opioid-dependent); Lactation (safety not established); Neonates of opioid-dependent mothers.

Adverse Reactions/Side Effects

CV: hypertension, hypotension, ventricular fibrillation/tachycardia. **GI:** nausea, vomiting.

Interactions

Drug-Drug: Can precipitate withdrawal in patients physically dependent on **opioid analgesics**. Larger doses may be required to reverse the effects of **buprenorphine**, **butorphanol**, **nalbuphine**, **pentazocine**, or **propoxyphene**. Antagonizes postoperative **opioid analgesics**.

Route/Dosage

Postoperative Opioid-induced Respiratory Depression

IV (Adults): 0.02–0.2 mg q 2–3 min until response obtained; repeat q 1–2 hr if needed.
IV (Children): 5–10 mcg, may repeat q 2–3 min until response obtained. Additional doses may be given q 1–2 hr if needed.
IM, IV, Subcut: (Neonates): 10 mcg (0.01 mg)/kg; may repeat q 2–3 min until response obtained. Additional doses may be given q 1–2 hr.

Opioid-induced Respiratory Depression during Chronic (>1 wk) Opioid Use

IV, IM, Subcut: (Adults >40 kg): 20–40 mcg (0.02–0.04 mg) given as small frequent (q min) boluses or as an infusion titrated to improve respiratory function without reversing analgesia.
IV, IM, Subcut: (Adults and Children <40 kg): 0.5–2 mcg/kg given as small frequent (q min) boluses or as an infusion titrated to improve respiratory function without reversing analgesia.

Overdose of Opioids

IV, IM, Subcut: (Adults): *Patients not suspected of being opioid-dependent*—0.4 mg (10 mcg/kg) may repeat q 2–3 min (IV route is preferred); 2 mg may be needed. *Patients suspected of being opioid-dependent*—Decrease initial dose to 0.1–0.2 mg q 2–3 min. May also be given by IV infusion at rate adjusted to response.
IV, IM, Subcut: (Children): 10 mcg (0.01 mg)/kg q 2–3 min; if no response occurs, dose may be increased to 100 mcg (0.1 mg)/kg.

NURSING IMPLICATIONS

Assessment

- Patients who have asthma, aspirin-induced allergy, and nasal polyps are at increased risk for developing hypersensitivity reactions. Monitor for rhinitis, asthma, and urticaria.
- Assess pain and range of motion before and periodically during therapy.
- ***Lab Test Considerations:*** BUN, serum creatinine, CBC, and liver function should be evaluated periodically in patients receiving prolonged courses of therapy.
- Serum potassium, BUN, serum creatinine, alkaline phosphatase, LDH, AST, and ALT tests may show increased levels. Blood glucose, hemoglobin, and hematocrit concentrations; leukocyte and platelet counts; and creatinine clearance may be decreased.
- **May cause prolonged bleeding time.**

Potential Nursing Diagnoses

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

Implementation

- Administration in higher than recommended doses does not provide increased effectiveness but may cause increased side effects. Use lowest effective dose for shortest period of time.
- **PO:** Administer with meals or antacids to decrease GI irritation and increase absorption.

Patient/Family Teaching

- Advise patient to take this medication with a full glass of water and to remain in an upright position for 15–30 min after administration.
- Instruct patient to take medication exactly as directed. If a dose is missed, it should be taken as soon as remembered but not if it is almost time for the next dose. Do not double doses.
- May cause drowsiness, dizziness, or visual disturbances. Advise patient to avoid driving or other activities requiring alertness until response to the medication is known.
- Advise patient to use sunscreen and protective clothing to prevent photosensitivity reactions.
- Caution patient to avoid the concurrent use of alcohol, aspirin, acetaminophen, or other OTC medications without consulting health care professional.
- Advise patient to inform health care professional of medication regimen before treatment or surgery.
- Advise patient to consult health care professional if rash, itching, visual disturbances, tinnitus, weight gain, edema, black stools, persistent headache, or influenza-like syndrome (chills, fever, muscle aches, pain) occurs.

Evaluation/Desired Outcomes

- Decreased pain and improved joint mobility. Partial arthritic relief is usually seen within 1 wk, but maximum effectiveness may require 2 wk or more of continuous therapy. Patients who do not respond to one NSAID may respond to another.

Why was this drug prescribed for your patient?

NURSING IMPLICATIONS

Assessment

- Monitor respiratory rate, rhythm, depth, pulse, ECG, blood pressure, and level of consciousness frequently for 3–4 hr after the expected peak of blood concentrations. After a moderate overdose of a short half-life opioid, physical stimulation may be enough to prevent significant hypoventilation. The effects of some opioids may last longer than the effects of naloxone, and repeat doses may be necessary.
- Patients who have been receiving opioids for longer than 1 wk are extremely sensitive to the effects of naloxone. Dilute and administer carefully.
- Assess for pain after administration for treating postoperative respiratory depression. Decreases respiratory depression but also reverses analgesia.
- Assess patient for signs and symptoms of opioid withdrawal (vomiting, restlessness, abdominal cramps, increased blood pressure, and fever). Symptoms may occur within a few minutes to 2 hr. Severity depends on dose of naloxone, opioid involved, and degree of physical dependence.
- Lack of improvement indicates that symptoms are caused by a disease process or other nonopioid CNS depressants not affected by naloxone.
- ***Toxicity and Overdose:*** Naloxone is a pure antagonist with no agonist properties and minimal toxicity.

Potential Nursing Diagnoses

Ineffective breathing pattern (Indications)
Ineffective coping (Indications)
Acute pain

Implementation

- Resuscitation equipment, oxygen, vasopressors, and mechanical ventilation should be available to supplement naloxone therapy.
- **Direct IV:** Administer undiluted for *suspected opioid overdose.*
- For patients with *opioid-induced respiratory depression,* dilute 0.4 mg of naloxone in 10 ml of sterile water or 0.9% NaCl for injection.
- For children or others weighing <40 kg, dilute 0.1 mg of naloxone in 10 ml sterile water or 0.9% NaCl for injection for a concentration of 10 mcg/ml. ***Rate:*** Administer at a rate of 0.1–0.4 mg over 15 seconds in patients with *suspected opioid overdose.*
- For patients who develop *opioid-induced respiratory depression,* administer dilute solution of 0.4 mg/10 ml at a rate of 0.5 ml (0.02 mg) by direct IV push every 2 min. Titrate dose to avoid withdrawal and severe pain. Excessive dose in postoperative patients may cause excitement, pain, hypotension, hypertension, pulmonary edema, ventricular tachycardia and fibrillation, and seizures.
- For children and others weighing <40 kg, administer 10 mcg/ml solution at a rate of 0.5 mcg/kg every 1–2 min. Titrate dose to avoid withdrawal, seizures, and severe pain.
- **Continuous Infusion:** Dilute in D5W or 0.9% NaCl for injection. Naloxone 2 mg in 500 ml equals a concentration of 4 mcg/ml. Mixture is stable for 24 hr; discard unused solution. ***Rate:*** Titrate dose to patient response. Supplemental doses administered subcut or IM, or a continuous infusion may provide longer-lasting effects.
- Doses should be titrated carefully in postoperative patients to avoid interference with control of postoperative pain.

Patient/Family Teaching

- As medication becomes effective, explain purpose and effects of naloxone.

Evaluation/Desired Outcomes

- Adequate ventilation
- Alertness without significant pain or withdrawal symptoms.

Why was this drug prescribed for your patient?

naproxen (na-**prox**-en)

♣Apo-Naproxen, EC-Naprosyn, Naprelan, Napron X, Naprosyn, ♣Naxen, ♣Novo-Naprox, ♣Nu-Naprox

naproxen sodium (na-**prox**-en**soe**-dee-um)

Aleve, Anaprox, ♣Apo-Napro-Na, Naprelan, ♣Novo-Naprox Sodium, ♣Synflex, ♣Synflex DS

Classification

Therapeutic: nonopioid analgesics, nonsteroidal anti-inflammatory agents

Pregnancy Category B (first trimester)

Indications

Mild to moderate pain. Dysmenorrhea. Fever. Inflammatory disorders, including Rheumatoid arthritis, Osteoarthritis.

Action

Inhibits prostaglandin synthesis. **Therapeutic Effects:** Decreased pain. Reduction of fever. Suppression of inflammation.

Pharmacokinetics

Absorption: Completely absorbed from the GI tract. Sodium salt (Anaprox) is more rapidly absorbed.

Distribution: Crosses the placenta; enters breast milk in low concentrations.

Metabolism and Excretion: Mostly metabolized by the liver.

Half-life: 10–20 hr.

TIME/ACTION PROFILE

ROUTE	ONSET	PEAK	DURATION
PO (analgesic)	1 hr	unknown	up to 7 hr
PO (anti-inflammatory)	1–4 days	2–4 wk	unknown

♣ = Canadian drug name.

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Cross-sensitivity may occur with other NSAIDs, including aspirin. Active GI bleeding. Ulcer disease. Lactation.

Use Cautiously in: Severe cardiovascular, renal, or hepatic disease; History of ulcer disease or any other history of gastrointestinal bleeding (may increase the risk of GI bleeding); Underlying cardiovascular disease (may increase the risk of MI or stroke); Chronic alcohol use/abuse; Increased risk of adverse reactions; Avoid using during third trimester of pregnancy; Children <2 yr (safety not established).

Adverse Reactions/Side Effects

CNS: dizziness, drowsiness, headache. **EENT:** tinnitus. **Resp:** dyspnea. **CV:** edema, palpitations, tachycardia. **GI:** DRUG-INDUCED HEPATITIS, GI BLEEDING, constipation, dyspepsia, nausea, abdominal discomfort, anorexia, diarrhea, flatulence, vomiting. **GU:** cystitis, hematuria, renal failure. **Derm:** photosensitivity, rashes, sweating. **Hemat:** blood dyscrasias, prolonged bleeding time. **Misc:** allergic reactions including ANAPHYLAXIS and STEVENS-JOHNSON SYNDROME.

Interactions

Drug-Drug: Concurrent use with **aspirin** and may decrease effectiveness. Increased risk of bleeding with **anticoagulants**, **thrombolytic agents** **eptifibatide**, **tirofiban**, **valproic acid**, **clopidogrel**, and **ticlopidine**. Additive adverse GI side effects with **aspirin**, **corticosteroids**, and other **NSAIDs. Probenecid** increases blood levels and may increase toxicity. Increased risk of photosensitivity with other **photosensitizing agents.** May increase the risk of toxicity from **antineoplastics**, or **radiation therapy.** May increase serum levels and risk of toxicity from **lithium**. Increased risk of adverse renal effects with **cyclosporine** or chronic use of **acetaminophen**. May decrease response to **antihypertensives** or **diuretics.** May increase risk of hypoglycemia with **antidiabetic agents.**

* CAPITALS indicates life-threatening, underlines indicate most frequent

CONTINUED

naproxen

- Instruct patient to take medication exactly as directed. If a dose is missed, it should be taken as soon as remembered but not if it is almost time for the next dose. Do not double doses.
- May cause drowsiness or dizziness. Advise patient to avoid driving or other activities requiring alertness until response to the medication is known.
- Caution patient to avoid the concurrent use of alcohol, aspirin, acetaminophen, or other OTC medications without consulting health care professional. **Use of naproxen with 3 or more glasses of alcohol per day may increase risk of GI bleeding.**
- Advise patient to inform health care professional of medication regimen before treatment or surgery.
- Caution patient to wear sunscreen and protective clothing to prevent photosensitivity reactions.
- Instruct patient not to take OTC naproxen preparations for more than 3 days for fever and to consult health care professional if symptoms persist or worsen.
- Advise patient to consult health care professional if rash, itching, visual disturbances, tinnitus, weight gain, edema, black stools, persistent headache, or influenza-like syndrome (chills, fever, muscle aches, pain) occur.

Evaluation/Desired Outcomes

- Relief of pain.
- Improved joint mobility. Partial arthritic relief is usually seen within 2 wk, but maximum effectiveness may require 2–4 wk of continuous therapy. Patients who do not respond to one NSAID may respond to another.
- Reduction of fever.

Why was this drug prescribed for your patient?

♣ = Canadian drug name.

* CAPITALS indicates life-threatening, underlines indicate most frequent

Drug-Natural Products: Increased anticoagulant effect and bleeding risk with **anise, arnica, chamomile, clove, dong quai, feverfew, garlic, ginger, ginkgo, Panax ginseng, licorice,** and others.

Route/Dosage

275 mg naproxen sodium is equivalent to 250 mg naproxen.

Anti-inflammatory/Analgesic/Antidysmenorrheal

PO (Adults): *Naproxen*—250–500 mg naproxen bid (up to 1.5 g/day). *Delayed-release naproxen*—375–500 mg twice daily. *Naproxen sodium*—275–550 mg twice daily (up to 1.65 g/day).
PO (Children >2 yr): 5 mg/kg/day twice daily as naproxen suspension.

Antigout

PO (Adults): *Naproxen*—750 mg naproxen initially, then 250 mg q 8 hr. *Naproxen sodium*—825 mg initially, then 275 mg q 8 hr.

OTC Use

PO (Adults): 200 mg q 8–12 hr or 400 mg followed by 200 mg q 12 hr (not to exceed 600 mg/24 hr).
PO (Geriatric Patients >65 yr): Not to exceed 200 mg q 12 hr.

NURSING IMPLICATIONS

Assessment

- **Patients who have asthma, aspirin-induced allergy, and nasal polyps are at increased risk for developing hypersensitivity reactions.** Assess for rhinitis, asthma, and urticaria.
- **Pain:** Assess pain (note type, location, and intensity) before and 1–2 hr after administration.
- **Arthritis:** Assess pain and range of motion before and 1–2 hr after administration.
- **Fever:** Monitor temperature; note signs associated with fever (diaphoresis, tachycardia, malaise).
- ***Lab Test Considerations:*** BUN, serum creatinine, CBC, and liver function tests should be evaluated periodically in patients receiving prolonged courses of therapy.
- Serum potassium, BUN, serum creatinine, alkaline phosphatase, LDH, AST, and ALT tests may show increased levels. Blood glucose, hemoglobin, and hematocrit concentrations, leukocyte and platelet counts, and creatinine clearance may be decreased.
- Bleeding time may be prolonged up to 4 days following discontinuation of therapy.

Potential Nursing Diagnoses

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

Implementation

- Administration in higher than recommended doses does not provide increased effectiveness but may cause increased side effects.
- Coadministration with opioid analgesics may have additive analgesic effects and may permit lower opioid doses.
- Analgesic is more effective if given before pain becomes severe.
- Available in combination with lansoprazole (Prevacid NapraPac).
- **PO:** For rapid initial effect, administer 30 min before or 2 hr after meals. May be administered with food, milk, or antacids to decrease GI irritation. Food slows but does not reduce the extent of absorption. Do not mix suspension with antacid or other liquid before administration.
- **Dysmenorrhea:** Administer as soon as possible after the onset of menses. Prophylactic treatment has not been shown to be effective.

Patient/Family Teaching

- Advise patient to take this medication with a full glass of water and to remain in an upright position for 15–30 min after administration.

CONTINUED

nefazodone (neff-a-zoe-done)

Serzone

Classification

Therapeutic: antidepressants

Pregnancy Category C

Indications

Initial and maintenance treatment of major depression (in conjunction with psychotherapy).

Action

Inhibits the reuptake of serotonin and norepinephrine by neurons. Antagonizes alpha-adrenergic receptors. **Therapeutic Effects:** Antidepressant action, which may develop only over several weeks.

Pharmacokinetics

Absorption: Well absorbed, but undergoes extensive and variable first-pass hepatic metabolism (bioavailability about 20%).
Distribution: Widely distributed, enters the CNS.
Metabolism and Excretion: Extensively metabolized. One metabolite (hydroxynefazodone) has antidepressant activity.
Half-life: *nefazodone* 2–4 hr; *hydroxynefazodone* 1.5–4 hr.

TIME/ACTION PROFILE (antidepressant action)

ROUTE	ONSET	PEAK	DURATION
PO	days–wks	several wks	unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Concurrent MAO inhibitor therapy. Active liver disease or baseline elevated serum transaminases.

Use Cautiously in: Geriatric patients (initiate therapy at lower doses); History of suicide attempt or drug abuse; Underlying cardiovascular or cerebrovascular disease; History of mania; Pregnancy, lactation, or children <18 yr (safety not established).

Adverse Reactions/Side Effects

CNS: dizziness, insomnia, somnolence, agitation, confusion, weakness. **EENT:** abnormal vision, blurred vision, eye pain, tinnitus. **Resp:** dyspnea. **CV:** bradycardia, hypotension. **GI:** HEPATIC FAILURE, HEPATOTOXICITY, constipation, dry mouth, nausea, gastroenteritis. **GU:** impotence. **Derm:** rashes. **Hemat:** decreased hematocrit.

Interactions

Drug-Drug: Serious, potentially fatal reactions may occur during concurrent use with **MAO inhibitors** (do not use concurrently or within 2 wk of MAO inhibitors; discontinue nefazodone at least 7 days before starting MAO inhibitor therapy). Additive CNS depression with other CNS depressants including **alcohol**, **antihistamines**, **opioid analgesics**, and **sedative/hypnotics**. May increase blood levels and effects of **alprazolam** or **triazolam**. May increase serum **digoxin** levels. Additive hypotension may occur with **antihypertensives**, **nitrates**, or acute ingestion of **alcohol**. May increase the risk of myopathy with **HMG-CoA reductase inhibitors**.
Drug-Natural Products: Increased risk of serotinergic side effects including serotonin syndrome with **St. John's wort** and **SAMe. Kava, valerian,** or **chamomile** can increase CNS depression.

Route/Dosage

PO (Adults): 100 mg twice daily initially; may be increased weekly up to 600 mg/day in two divided doses.
PO (Geriatric Patients): 50 mg twice daily initially; may be increased weekly as tolerated.

nelfinavir (nell-finn-a-veer)

Viracept

Classification

Therapeutic: antiretrovirals
Pharmacologic: protease inhibitors

Pregnancy Category B

Indications

HIV infection (with other antiretrovirals).

Action

Inhibits HIV protease and prevents cleavage of viral polyproteins. **Therapeutic Effects:** Increased CD4 cell count and decreased viral load. Slowed progression of HIV infection and lesssequelae.

Pharmacokinetics

Absorption: Well absorbed after oral administration.
Distribution: Unknown.
Metabolism and Excretion: Mostly metabolized (CYP 3A4 enzyme system) and excreted in feces as metabolites (78%) or unchanged drug (22%); minimal renal excretion.
Half-life: 3.5–5 hr.

TIME/ACTION PROFILE

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

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Concurrent use of amiodarone, ergot derivatives, midazolam, quinidine, rifampin,pimozide, simvastatin, lovastatin, rifampin, St. John's wort, or triazolam. Lactation (breast-feeding should be avoided by HIV-infected patients).

Use Cautiously in: Hemophiliacs (increased risk of bleeding); Diabetes mellitus (may exacerbate condition); Hepatic impairment.

Adverse Reactions/Side Effects

CNS: SEIZURES, anxiety, depression, dizziness, drowsiness, emotional lability, headache, hyperkinesia, insomnia, malaise, migraine headache, sleep disorders, suicidal ideation, weakness. **EENT:** acute iritis, pharyngitis, rhinitis, sinusitis. **Resp:** dyspnea. **GI:** diarrhea, anorexia, dyspepsia, elevated liver function studies, epigastric pain, flatulence, GI bleeding, hepatitis, nausea, oral ulcerations, pancreatitis, vomiting. **GU:** nephrolithiasis, sexual dysfunction. **Derm:** pruritus, rash, sweating, urticaria. **Endo:** hyperglycemia. **F and E:** dehydration. **Hemat:** anemia, leukopenia, thrombocytopenia. **Metab:** hyperlipidemia, hyperuricemia. **MS:** arthralgia, arthritis, back pain, myalgia, myopathy. **Neuro:** myasthenia, paresthesia. **Misc:** allergic reactions, fever, redistribution of body fat.

Interactions

Drug-Drug: Concurrent **amiodarone**, **dihydroergotamine**, **ergotamine**, **midazolam**, **quinidine ergonovine**, **methylergonovine**, **pimozide**, **simvastatin**, **lovastatin**, or **triazolam** should be avoided;nelfinavir inhibits and the CYP3A4 enzyme system and concurrent use may result in excess sedation, vasoconstriction, rhabdomyolysis or serious cardiac arrhythmias. Since nelfinavir is also metabolized by the CYP3A4 enzyme system, potent inducers of the enzyme such as **rifampin** may ↓ blood levels of nelfinavir and promote resistance to its effects; concurrent use should be avoided. ↓ metabolism and may ↑ effects of **rifabutin** (dosage of rifabutin should be ↓ by 50%), **carbamazepine**, **phenobarbital**, **rifampin**, or **phenytoin** (concurrent use with rifampin should be avoided). Plasma levels and effectiveness may be ↑ by **ketoconazole**, **indinavir**, **delavirdine** or **ritonavir**. ↑ plasma levels of **indinavir saquinavir**, **cyclosporine tacrolimus sirolimus** and **azithromycin**. ↑ levels and effects of **sildenafil** (sildenafil dose should not exceed 25 mg in 48 hr). Blood levels may be ↓ by **nevirapine**. ↑ levels and risk of toxicity from **atorvastatin** (use lowest dose of atorvastatin or consider fluvastatin). May ↓ plasma levels and effectiveness of **hormonal contraceptives** or

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 and pulse before and periodically during therapy.
- Monitor liver function tests prior to and routinely during therapy. Obtain LFTs at first sign of hepatic dysfunction (nausea, vomiting, abdominal pain, fatigue, anorexia, dark urine).
- ***Lab Test Considerations:*** May cause decrease in hematocrit and leukopenia.
- **Monitor liver function periodically. If serum AST or ALT levels are >3 times the upper limit of normal discontinue nefazodone.**
- May also cause hypercholesterolemia and hypoglycemia.

Potential Nursing Diagnoses

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

Implementation

- Do not confuse Serzone (nefazodone) with Seroquel (quetiapine).
- **PO:** Administer doses twice daily.

Patient/Family Teaching

- Instruct patient to take medication as directed. Several weeks may be required to obtain a full antidepressant response. Once response is obtained, therapy should be continued for at least 6 mo. If a dose is missed, take as soon as possible unless almost time for next dose. Do not double doses.
- May cause drowsiness or dizziness. Caution patient to avoid driving or other activities requiring alertness until response to the drug is known.
- Advise patient to make position changes slowly to minimize orthostatic hypotension.
- Caution patient to avoid taking alcohol or other CNS depressant drugs during therapy and not to take other prescription, OTC medications, or herbal products without consulting health care professional.
- Advise patient to notify health care professional immediately if signs of liver dysfunction (jaundice, anorexia, GI complaints, malaise) occur.
- Inform patient that frequent mouth rinses, good oral hygiene, and sugarless gum or candy may minimize dry mouth. If dry mouth persists for more than 2 wk, consult health care professional regarding use of saliva substitute.
- Instruct female patient to inform health care professional if pregnancy is planned or suspected or if breastfeeding.
- Instruct patient to notify health care professional of signs of allergy (rash, hives) or if agitation, blurred or other changes in vision, confusion, dizziness, unsteadiness, difficult or frequent urination, difficulty concentrating, or memory problems occur.
- Emphasize the importance of follow-up examinations to monitor progress. Encourage patient participation in psychotherapy.

Evaluation/Desired Outcomes

- Increased sense of well-being
- Renewed interest in surroundings. May require several weeks of therapy to obtain full response. Need for therapy should be periodically reassessed. Therapy is usually continued for 6 months or more.

Why was this drug prescribed for your patient?

delavirdine. May ↓ levels of **methadone**; doage of methadone may need to be ↑. Should not be given at the same time as **didanosine**.
Drug-Natural Products: St. John's wort induces metabolism of nelfinavir, decreasing blood levels and may promote resistance to its effects.
Drug-Food: Food ↑ absorption.

Route/Dosage

PO (Adults and Children >13 yr): 750 mg 3 times daily or 1250 mg twice daily.
PO (Children 2–13 yr): 20–30 mg/kg 3 times daily (not to exceed 750 mg 3 times daily).

NURSING IMPLICATIONS

Assessment

- Assess patient for change in severity of HIV symptoms and opportunistic infections throughout therapy.
- ***Lab Test Considerations:*** Monitor viral load and CD4 cell counts regularly during therapy.
- ***Lab Test Considerations:*** May cause hyperglycemia.
- ***Lab Test Considerations:*** May cause elevated serum AST, ALT, total bilirubin, alkaline phosphatase, LDH, and CPK concentrations.
- ***Lab Test Considerations:*** May cause anemia, leukopenia, thrombocytopenia, hyperlipidemia, and hyperuricemia.

Potential Nursing Diagnoses

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

Implementation

- **Do not confuse nelfinavir (Viracept) with nevirapine (Viramine).**
- **PO:** Administer with a meal.
- Oral powder may be mixed with a small amount of water, milk, formula, soy formula, soy milk, or dietary supplements. Do not mix with acid, food, or juice (orange juice, apple juice, applesauce); results in a bitter taste. Do not reconstitute powder with water in its original container. Once mixed, the entire contents must be consumed to obtain the full dose. Mixture is stable for up to 6 hr if refrigerated.

Patient/Family Teaching

- Emphasize the importance of taking nelfinavir exactly as directed at evenly spaced times throughout the day. 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 nelfinivir 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 nelfinavir does not cure AIDS or prevent associated or opportunistic infections. Nelfinavir does not reduce the risk of transmission of HIV to others through sexual contact or blood contamination. Caution patient to avoid sexual contact or to use a condom and to avoid sharing needles or donating blood to prevent spreading the AIDS virus to others. Advise patient that the long-term effects of nelfinavir are unknown at this time.
- Inform patient that nelfinavir 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 patient that if diarrhea occurs, it can usually be controlled with OTC antidiarrheals, such as loperamide, which slow GI motility.
- Advise patient taking oral contraceptives to use a nonhormonal method of birth control during nelfinavir therapy.
- Emphasize the importance of regular follow-up 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.
- Improvement in CD4 cell count and decrease in viral load.

Why was this drug prescribed for your patient?

nitrofurantoin (nye-troe-fyoor-**an**-toyn)

♣Apo-Nitrofurantoin, Furadantin, Macrobid, Macrodantin

Classification

Therapeutic: anti-infectives

Pregnancy Category B

Indications

Treatment of urinary tract infections caused by susceptible organisms only; not effective in systemic bacterial infections. Chronic suppressive therapy for urinary tract infections.

Action

Interferes with bacterial enzymes. **Therapeutic Effects:** Bactericidal or bacteriostatic action against susceptible organisms. **Spectrum:** Many gram-negative and some gram-positive organisms, specifically: *Citrobacter*, *Corynebacterium*, *Enterobacter*, *Enterococcus*, *Escherichia coli*, *Klebsiella*, *Neisseria*, *Salmonella*, *Shigella*, *Staphylococcus aureus*, *Staphylococcus epidermidis*.

Pharmacokinetics

Absorption: Readily absorbed after oral administration. Absorption is slower but more complete with macrocrystals (Macrodantin).
Distribution: Crosses the placenta and enters breast milk.
Metabolism and Excretion: Partially metabolized by the liver; 30–50% excreted unchanged by the kidneys.
Half-life: 20 min (increased in patients with renal impairment).

TIME/ACTION PROFILE (urine levels)

ROUTE	ONSET	PEAK	DURATION
PO	unknown	30 min	6–12 hr

♣ Canadian drug name.

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Hypersensitivity to parabens (suspension). Oliguria or anuria. Glucose-6-phosphate dehydrogenase (G6PD) deficiency. Infants <1 mo and pregnancy near term (increased risk of hemolytic anemia in newborns).
Use Cautiously in: Patients with diabetes or debilitated patients (neuropathy may be more common); Pregnancy and lactation (safety not established, but has been used safely in pregnant women; breastfeeding may cause hemolysis in G6PD-deficient infants).

Adverse Reactions/Side Effects

CNS: dizziness, drowsiness, headache. **EENT:** nystagmus. **Resp:** pneumonitis. **CV:** chest pain. **GI:** PSEUDOMEMBRANOUS COLITIS, anorexia, nausea, vomiting, abdominal pain, diarrhea, drug-induced hepatitis. **GU:** rust/brown discoloration of urine. **Derm:** photosensitivity. **Hemat:** blood dyscrasias, hemolytic anemia. **Neuro:** peripheral neuropathy. **Misc:** hypersensitivity reactions.

Interactions

Drug-Drug: Probenecid and **sulfinpyrazone** prevent high urinary concentrations; may ↓ effectiveness. **Antacids** may decrease absorption. ↑ risk of neurotoxicity with **neurotoxic drugs**. ↑ risk of hepatotoxicity with **hepatotoxic drugs**. ↑ risk of pneumonitis with **drugs having pulmonary toxicity**.

Route/Dosage

PO (Adults): *Treatment of active infection*—50–100 mg q 6–8 hr or 100 mg q 12 hr as extended-release product. *Chronic suppression*—50–100 mg, single evening dose.
PO (Children >1 mo): *Treatment of active infection*—0.75–1.75 mg/kg q 6 hr. *Chronic suppression*—1 mg/kg/day as a single dose at bedtime (unlabeled).

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

NITROGLYCERIN (nye-tro-**gli**-ser-in)

extended-release capsules

Nitrocot, NitroglynE-R, Nitro-par, Nitro-Time

extended-release tablets

Nitrong

extended-release buccal tablets

Nitrogard, ♣Nitrogard SR

intravenous

Nitro-Bid IV, Tridil

lingual spray

Nitrolingual

ointment

Nitro-Bid, Nitrol

sublingual

Nitrostat, NitroQuick

transdermal system

Deponit, Minitran, Nitrek, Nitrodisc, Nitro-Dur, Transderm-Nitro

Classification

Therapeutic: antianginals
Pharmacologic: nitrates

Pregnancy Category C

Indications

Acute (**translingual and SL**) and long-term prophylatic (**oral, buccal, transdermal**) management of angina pectoris. Congestive heart failure associated with acute myocardial infarction. Controlled hypotension during surgical procedures.

♣ = Canadian drug name.

Action

↑ coronary blood flow by dilating coronary arteries and ↑ collateral flow. Vasodilation (venous more than arterial). ↓ left ventricular end-diastolic pressure and left ventricular end-diastolic volume (preload). ↓ myocardial oxygen consumption. **Therapeutic Effects:** Relief/prevention of angina. ↑ cardiac output. ↓ of blood pressure.

Pharmacokinetics

Absorption: Well absorbed following PO, buccal, and SL administration. Also absorbed through skin. Oral nitroglycerin is rapidly metabolized, leading to ↓ bioavailability.
Distribution: Unknown.
Metabolism and Excretion: Rapid and almost complete hepatic metabolism; Also metabolized in bloodstream.
Half-life: 1–4 min.

TIME/ACTION PROFILE (cardiovascular effects)

ROUTE	ONSET	PEAK	DURATION
SL	1–5 min	unknown	30–60 min
Buccal-ER	unknown	unknown	5 hr
PO-ER	40–60 min	unknown	8–12 hr
transdermal ointment	20–60 min	unknown	4–8 hr
transdermal patch	40–60 min	unknown	8–24 hr
IV	immediate	unknown	several min

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Severe anemia. Pericardial tamponade/Constrictive pericarditis. Alcohol intolerance (↑ IV doses). Concurrent sildenafil.
Use Cautiously in: Head traumacerebral hemorrhage; Glaucoma; Hypertrophic cardiomyopathy; Severe liver impairment; **PO:** Malabsorption/hypermotility; **IV:** Hypovolemia; Normal ↓ pulmonary capillary wedge pressure; Pregnancy (may compromise maternal/fetal circulation); Children or lactation (safety not established).

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

NURSING IMPLICATIONS

Assessment

- Assess for signs and symptoms of urinary tract infection (frequency, urgency, pain, and burning on urination; fever; cloudy or foul-smelling urine) before and periodically during therapy.
- Obtain specimens for culture and sensitivity before and during drug administration.
- Monitor intake and output ratios. Report significant discrepancies in totals.
- ***Lab Test Considerations:*** Monitor CBC routinely with patients on prolonged therapy.
- May cause ↑ serum glucose, bilirubin, alkaline phosphatase, BUN, and creatinine.

Potential Nursing Diagnoses

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

Implementation

- **PO:** Administer with food or milk to minimize GI irritation and to delay and increase absorption, increase peak concentration, and prolong duration of therapeutic concentration in the urine.
- **Do not crush tablets or open capsules.**
- Administer liquid preparations with calibrated measuring device. Shake well before administration. Oral suspension may be mixed with water, milk, fruit juices, or infants' formula. Rinse mouth with water after administration of oral suspension to avoid staining teeth.

Patient/Family Teaching

- Instruct patient to take medication around the clock, as directed. Take missed doses as soon as remembered and space next dose 2–4 hr apart. Do not skip or double up on missed doses.
- May cause dizziness or drowsiness. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Inform patient that medication may cause a rust-yellow to brown discoloration of urine, which is not significant.
- Advise patient to notify health care professional if fever, chills, cough, chest pain, dyspnea, skin rash, numbness or tingling of the fingers or toes, or intolerable GI upset occurs. Signs of superinfection (milky, foul-smelling urine; perineal irritation; dysuria) should also be reported.
- **Instruct patient to notify health care professional if fever and diarrhea develop, especially if stool contains blood, pus, or mucus. Advise patient not to treat diarrhea without consulting health care professional.**
- Instruct patient to consult health care professional if no improvement is seen within a few days after initiation of therapy.

Evaluation/Desired Outcomes

- Resolution of the signs and symptoms of infection. Therapy should be continued for a minimum of 7 days and for at least 3 days after urine has become sterile.
- Decrease in the frequency of infections in chronic suppressive therapy.

Why was this drug prescribed for your patient?

Adverse Reactions/Side Effects

CNS: dizziness, headache, apprehension, restlessness, weakness. **EENT:** blurred vision. **CV:** hypotension, tachycardia, syncope. **GI:** abdominal pain, nausea, vomiting. **Derm:** contact dermatitis (transdermal /ointment). **Misc:** alcohol intoxication (↑ IV doses), cross-tolerance, flushing, tolerance.

Interactions

Drug-Drug: Concurrent use of nitrates in any form with **sildenafil, tadalafil,** and **vardenafil** increases the risk of serious and potentially fatal hypotension; concurrent use is contraindicated. Additive hypotension with **antihypertensives,** acute ingestion of **alcohol, beta blockers, calcium channel blockers, haloperidol,** or **phenothiazines.** Agents having **anticholinergic properties (tricyclic antidepressants, antihistamines, phenothiazines)** may decrease absorption of lingual, sublingual, or buccal nitroglycerin.

Route/Dosage

SL (Adults): 0.3–0.6 mg, may repeat q 5 min for 15 min for acute attack.
translingual Spray (Adults): 1–2 sprays (0.4 mg/spray), may be repeated q 5 min for 15 min.
Buccal (Adults): 1 mg q 5 hr; dosage and frequency may be increased as needed.
PO (Adults): *Extended-release capsules*—2.5–9 mg q 8–12 hr. *Extended-release tablets*—1.3–6.5 mg q 8–12 hr.
IV (Adults): 5 mcg/min; increase by 5 mcg/min q 3–5 min to 20 mcg/min, then increase by 10–20 mcg/min q 3–5 min (dosing determined by hemodynamic parameters).
Transdermal (Adults): *Ointment*—(1 in.= 15 mg) 1–2 in. q 8 hr (up to 5 in. q 4 hr). *Transdermal patch*—0.1–0.6 mg/hr, up to 0.8 mg/hr. Patch should be worn 12–14 hr/day.

NURSING IMPLICATIONS

Assessment

- Assess location, duration, intensity, and precipitating factors of patient's anginal pain.
- Monitor BP and pulse before and after administration. Patients receiving IV nitroglycerin require continuous ECG and BP monitoring. Measurement of additional hemodynamic parameters may be monitored.
- ***Lab Test Considerations:*** May cause increased urine catecholamine and urine vanillylmandelic acid concentrations.
- Excessive doses may cause increased methemoglobin concentrations.
- May cause false elevations of serum cholesterol level.

Potential Nursing Diagnoses

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

Implementation

- Available in controlled-release buccal tablets, translingual spray, sustained-release tablets and capsules, SL tablets, ointment, transdermal systems, and IV forms.
- **PO:** Administer 1 hr before or 2 hr after meals with a full glass of water for faster absorption. **Sustained-release preparations should be swallowed whole; do not crush, break, or chew. SL:** SL tablets should be held under tongue until dissolved. Avoid eating, drinking, or smoking until tablet is dissolved. **Buccal:** Place tablet under upper lip or between gum and cheek. Onset of action may be increased by touching the tablet with the tongue or by drinking hot liquids.
- **IV:** Must be diluted and administered as an infusion. Standard infusion sets made of polyvinyl chloride (PVC) plastic may absorb up to 80% of the nitroglycerin in solution. Use glass bottles only and special tubing provided by manufacturer.

CONTINUED

CONTINUED

NITROGLYCERIN

- **Continuous Infusion:** Dilute in D5W or 0.9% NaCl in a concentration of 25–40 mcg/ml, depending upon patient fluid tolerance. Solution is stable for 48 hr at room temperature. Solution is not explosive either before or after dilution. ***Rate:*** Administer via infusion pump to ensure accurate rate. Titrate rate according to patient response.
- **Y-Site Compatibility:** amiodarone, atracurium, diltiazem, dobutamine, dopamine, esmolol, famotidine, haloperidol, heparin, inamrinone, insulin, labetalol, lidocaine, midazolam, nitroprusside, pancuronium, ranitidine, streptokinase, tacrolimus, theophylline, vecuronium.
- **Y-Site Incompatibility:** alteplase.
- **Additive Incompatibility:** Manufacturer recommends that nitroglycerin not be admixed with other medications.
- **Topical:** Sites should be rotated to prevent skin irritation. Remove patch or ointment from previous site before application.
- Dose may be increased to the highest dose that does not cause symptomatic hypotension.
- Apply ointment by using dose-measuring application papers supplied with ointment. Squeeze ointment onto measuring scale printed on paper. Use paper to spread ointment onto nonhairy area of skin (chest, abdomen, thighs; avoid distal extremities) in a thin, even layer, covering a 2- or 3-in. area. Do not allow ointment to come in contact with hands. Do not massage or rub in ointment because this will increase absorption and interfere with sustained action. Apply occlusive dressing if ordered.
- Transdermal patches may be applied to any hairless site (avoid distal extremities or areas with cuts or calluses). Apply firm pressure over patch to ensure contact with skin, especially around edges. Apply a new dosage unit if the first one becomes loose or falls off. Units are waterproof and not affected by showering or bathing. Do not cut or trim system to adjust dosage. Do not alternate between brands of transdermal products; dosage may not be equivalent. Remove patches before cardioversion or defibrillation to prevent patient burns. Patch may be worn for 12–14 hr and removed for 10–12 hr at night to prevent development of tolerance.

Patient/Family Teaching

- Instruct patient to take medication exactly as directed, even if feeling better. If a dose is missed, take as soon as remembered unless next dose is scheduled within 2 hr (6 hr with extended-release preparations). Do not double doses. Do not discontinue abruptly; gradual dosage reduction may be necessary to prevent rebound angina.
- Caution patient to change position slowly to minimize orthostatic hypotension. First dose should be taken while in a sitting or reclining position, especially in geriatric patients.
- Advise patient to avoid concurrent use of alcohol with this medication. Patient should also consult health care professional before taking OTC medications while taking nitroglycerin.
- Inform patient that headache is a common side effect that should decrease with continuing therapy. Aspirin or acetaminophen may be ordered to treat headache. Notify health care professional if headache is persistent or severe.
- Advise patient to notify health care professional if dry mouth or blurred vision occurs.
- **Acute Anginal Attacks:** Advise patient to sit down and use medication at first sign of attack. Relief usually occurs within 5 min. Dose may be repeated if pain is not relieved in 5–10 min. Call health care professional or go to nearest emergency room if anginal pain is not relieved by 3 tablets in 15 min.
- **SL:** Inform patient that tablets should be kept in original glass container or in specially made metal containers, with cotton removed to prevent absorption. Tablets lose potency in containers made of plastic or cardboard

nitroprusside (nye-troe-**pruss**-ide)

Nitropress

Classification

Therapeutic: antihypertensives
Pharmacologic: vasodilators

Pregnancy Category C

Indications

Management of hypertensive crises. Production of controlled hypotension during anesthesia. Treatment of cardiac pump failure or cardiogenic shock (alone or with dopamine).

Action

Produces peripheral vasodilation by a direct action on venous and arteriolar smooth muscle. **Therapeutic Effects:** Rapid lowering of blood pressure. Decreased cardiac preload and afterload.

Pharmacokinetics

Absorption: IV administration results in complete bioavailability.
Distribution: 2 min.
Metabolism and Excretion: Rapidly metabolized in RBCs and tissues to cyanide and subsequently by the liver to thiocyanate.
Half-life: Unknown.

TIME/ACTION PROFILE (hypotensive effect)

ROUTE	ONSET	PEAK	DURATION
IV	immediate	rapid	1–10 min

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Decreased cerebral perfusion.

Use Cautiously in: Renal disease (increased risk of thiocyanate accumulation); Hepatic disease (increased risk of cyanide accumulation); Hypothyroidism; Hyponatremia; Vitamin B deficiency; Geriatric patients (increased sensitivity); Pregnancy or lactation (safety not established).

Adverse Reactions/Side Effects

CNS: dizziness, headache, restlessness. **EENT:** blurred vision, tinnitus. **CV:** dyspnea, hypotension, palpitations. **GI:** abdominal pain, nausea, vomiting. **F and E:** acidosis. **Local:** phlebitis at IV site. **Misc:** CYANIDE TOXICITY, thiocyanate toxicity.

Interactions

Drug-Drug: Increased hypotensive effect with **ganglionic blocking agents, general anesthetics,** and other **antihypertensives. Estrogens** and **sympathomimetics** may decrease the response to nitroprusside.

Route/Dosage

IV (Adults and Children): 0.3 mcg/kg/min initially; may be increased as needed up to 10 mcg/kg/min (usual dose is 3 mcg/kg/min; not to exceed 10 min of therapy at 10 mcg/kg/min infusion rate).

NURSING IMPLICATIONS

Assessment

- Monitor blood pressure, heart rate, and ECG frequently throughout course of therapy; continuous monitoring is preferred. Consult physician for parameters. Monitor for rebound hypertension following discontinuation of nitroprusside.
- Pulmonary capillary wedge pressure (PCWP) may be monitored in patients with MI or CHF.
- ***Lab Test Considerations:*** May cause decrease in bicarbonate concentrations, P_{CO_2}, and pH.
- May cause increased lactate concentrations.
- May cause increased serum cyanide and thiocyanate concentrations.

or when mixed with other capsules or tablets. Exposure to air, heat, and moisture also causes loss of potency. Instruct patient not to open bottle frequently, handle tablets, or keep bottle of tablets next to body (e.g., shirt pocket) or in automobile glove compartment. Advise patient that tablets should be replaced 6 mo after opening to maintain potency.

- **Lingual Spray:** Instruct patient to lift tongue and spray dose under tongue.

Evaluation/Desired Outcomes

- Decrease in frequency and severity of anginal attacks
- Increase in activity tolerance. During long-term therapy, tolerance may be minimized by intermittently administering in 12–14-hr on/10–12-hr off intervals.
- Controlled hypotension during surgical procedures.

Why was this drug prescribed for your patient?

- Monitor serum methemoglobin concentrations in patients receiving >10 mg/kg and who exhibit signs of impaired oxygen delivery despite adequate cardiac output and arterial P_{CO_2} (blood is chocolate-brown without change on exposure to air). Treatment of methemoglobinemia is 1–2 mg/kg of methylene blue IV administered over several minutes.
- ***Toxicity and Overdose:*** If severe hypotension occurs, drug effects are quickly reversed, within 1–10 min, by decreasing rate or temporarily discontinuing infusion. May place patient in Trendelenburg position to maximize venous return: Plasma thiocyanate levels should be monitored daily in patients receiving prolonged infusions at a rate >3 mcg/kg/min or 1 mcg/kg/min in patients with anuria. Thiocyanate levels should not exceed 1 millimole/liter. Signs and symptoms of thiocyanate toxicity include tinnitus, toxic psychoses, hyperreflexia, confusion, weakness, seizures, and coma, **Cyanide toxicity may manifest as lactic acidosis, hypoxemia, tachycardia, altered consciousness, seizures, and characteristic breath odor similar to that of almonds.** Treatment includes amyl nitrite inhalation and infusions of sodium nitrite and sodium thiosulfate.

Potential Nursing Diagnoses

Ineffective tissue perfusion (Indications)

Implementation

- If infusion of 10 mcg/kg/min for 10 min does not produce adequate reduction in BP, manufacturer recommends that nitroprusside be discontinued.
- May be administered in left ventricular CHF concurrently with an inotropic agent (dopamine, dobutamine) when effective doses of nitroprusside restore pump function and cause excessive hypotension.
- **Continuous Infusion:** Reconstitute each 50 mg with 2–3 ml of D5W for injection without preservatives. Dilute further in 250–1000 ml of D5W for concentrations of 200–500 mcg/ml. Do not use other diluents for reconstitution or infusion. Wrap infusion bottle in aluminum foil to protect from light; administration set tubing need not be covered. Amber plastic bags do not offer sufficient protection from light; wrap must be opaque. Freshly prepared solution has a slight brownish tint; discard if solution is brown, orange, blue, green, or dark red. Solution must be used within 24 hr of preparation.
- Avoid extravasation. ***Rate:*** Administer via infusion pump to ensure accurate dosage rate.
- **Y-Site Compatibility:** atracurium, diltiazem, dobutamine, dopamine, enalaprilat, esmolol, famotidine, heparin, inamrinone, indomethacin, insulin, labetalol, lidocaine, midazolam, morphine, nitroglycerin, pancuronium, tacrolimus, theophylline, vecuronium.
- **Additive Incompatibility:** Do not admix with other medications.

Patient/Family Teaching

- Advise patient to report the onset of tinnitus, dyspnea, dizziness, headache, or blurred vision immediately.

Evaluation/Desired Outcomes

- Decrease in BP without the appearance of side effects.
- Treatment of cardiac pump failure or cardiogenic shock.

Why was this drug prescribed for your patient?

olanzapine (oh-lan-za-peen)

Zyprexa, Zyprexa Zydis

Classification

Therapeutic: antipsychotics
Pharmacologic: thienobenzodiazepines

Pregnancy Category C

Indications

Psychotic disorders including.: Acute manic episodes due to bipolar disorder (may be used with lithium or valproate), long-term maintenance therapy of bipolar disorder, long-term treatment/maintenance of schizophrenia, agitation due to schizophrenia or mania (IM).

Action

Antagonizes dopamine and serotonin type 2 in the CNS. Also has anticholinergic, antihistaminic, and anti-alpha-adrenergic effects. **Therapeutic Effects:** Decreased manifestations of psychoses.

Pharmacokinetics

Absorption: Well absorbed but rapidly metabolized (60% bioavailability). Conventional tablets and orally disintegrating tablets are bioequivalent. IM administration results in significantly higher blood levels (5 times that of oral).
Distribution: Extensively distributed.
Metabolism and Excretion: Highly metabolized (mostly by the hepatic P450 CYP 1A2 system); 7% excreted unchanged in urine.
Half-life: 21–54 hr.

TIME/ACTION PROFILE (antipsychotic effects)

ROUTE	ONSET	PEAK*	DURATION
PO	unknown	6 hr	unknown
IM	unknown	15–45 min	2–4 hr

*Blood levels

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Lactation. **Orally disintegrating tablets only** Phenylketonuria (contain aspartame).
Use Cautiously in: Patients with hepatic impairment; Geriatric patients (may require ↓ doses; inappropriate use for dementia is associated with ↑ mortality); Cardiovascular or cerebrovascular disease; History of seizures; History of attempted suicide; Diabetes or risk factors for diabetes (may worsen glucose control); Prostatic hypertrophy; Narrow-angle glaucoma; History of paralytic ileus; Pregnancy or children <18 yr (safety not established).

Adverse Reactions/Side Effects

CNS: NEUROLEPTIC MALIGNANT SYNDROME, SEIZURES, agitation, dizziness, headache, restlessness, sedation, weakness, dystonia, insomnia, mood changes, personality disorder, speech impairment, tardive dyskinesia. **EENT:** amblyopia, rhinitis, increased salivation, pharyngitis. **Resp:** cough, dyspnea. **CV:** orthostatic hypotension, tachycardia, chest pain. **GI:** constipation, dry mouth, abdominal pain, increased appetite, nausea. **GU:** decreased libido, urinary incontinence. **Derm:** photosensitivity. **Endo:** hyperglycemia, goiter. **F and E:** increased thirst. **Metab:** weight gain, dyslipidemia, weight loss. **MS:** hypertonia, joint pain. **Neuro:** tremor. **Misc:** fever, flu-like syndrome.

Interactions

Drug-Drug: Effects may be ↓ by concurrent **carbamazepine**, **omeprazole**, or **rifampin**. ↑ hypotension may occur with **antihypertensives**. ↑ CNS depression may occur with concurrent use of **alcohol** or other **CNS depressants.** May antagonize the effects of **levodopa** or other **dopamine agonists.**

CONTINUED

olanzapine

- Medication may cause drowsiness. Caution patient to avoid driving or other activities requiring alertness until response to the medication is known.
- Caution patient to avoid taking alcohol and to notify health care professional prior to taking other Rx, OTC, or herbal products concurrently with this medication.
- Advise patient to use sunscreen and protective clothing when exposed to the sun. Extremes of temperature (exercise, hot weather, hot baths or showers) should also be avoided; this drug impairs body temperature regulation.
- Instruct patient to use frequent mouth rinses, good oral hygiene, and sugarless gum or candy to minimize dry mouth. Consult health care professional if dry mouth continues for >2 wk.
- Advise patient to notify health care professional of medication regimen before treatment or surgery.
- Instruct patient to notify health care professional promptly if sore throat, fever, unusual bleeding or bruising, rash, weakness, tremors, visual disturbances, dark-colored urine, or clay-colored stools occur.
- Emphasize the importance of routine follow-up exams and continued participation in psychotherapy as indicated.

Evaluation/Desired Outcomes

- Decrease in excitable, paranoic, or withdrawn behavior.

Why was this drug prescribed for your patient?

Route/Dosage

PO (Adults—Most Patients): *Schizophrenia*—5–10 mg/day initially; may increase at weekly intervals by 5 mg/day (not to exceed 20 mg/day). *Bipolar mania*—10–15 mg/day initially; may increase every 24 hr by 5 mg/day (not to exceed 20 mg/day).

PO (Adults—Debilitated or Nonsmoking Female Patients ≥65 yr): Initiate therapy at 5 mg/day.

IM (Adults): *Acute agitation*—5–10 mg, may repeat in 2 hr, then 4 hr later.

NURSING IMPLICATIONS

Assessment

- Assess mental status (orientation, mood, behavior) before and periodically during therapy.
- Monitor blood pressure (sitting, standing, lying), ECG, pulse, and respiratory rate before and frequently during dose adjustment.
- Observe patient carefully when administering medication to ensure that medication is taken and not hoarded.
- Assess fluid intake and bowel function. Increased bulk and fluids in the diet may help minimize constipation.
- Monitor patient for onset of akathisia (restlessness or desire to keep moving) and extrapyramidal side effects (*parkinsonian*—difficulty speaking or swallowing, loss of balance control, pill rolling, mask-like face, shuffling gait, rigidity, tremors; and *dystonic*—muscle spasms, twisting motions, twitching, inability to move eyes, weakness of arms or legs) every 2 mo during therapy and 8–12 wk after therapy has been discontinued. Report these symptoms if they occur, as reduction in dose or discontinuation of medication may be necessary. Trihexyphenidyl or diphenhydramine may be used to control symptoms.
- Monitor for tardive dyskinesia (uncontrolled rhythmic movement of mouth, face, and extremities; lip smacking or puckering; puffing of cheeks; uncontrolled chewing; rapid or worm-like movements of tongue). Report immediately; may be irreversible.
- **Monitor for development of neuroleptic malignant syndrome (fever, respiratory distress, tachycardia, seizures, diaphoresis, hypertension or hypotension, pallor, tiredness, severe muscle stiffness, loss of bladder control). Notify physician or other health care professional immediately if these symptoms occur.**
- ***Lab Test Considerations:*** Evaluate CBC, liver function tests, and ocular examinations periodically during therapy. May cause ↓ platelets. May cause ↑ bilirubin, AST, ALT, GGT, CPK, and alkaline phosphatase.
- Monitor blood glucose in patients with diabetes, and prior to and periodically during therapy in patients with risk factors for diabetes.

Potential Nursing Diagnoses

Disturbed thought process (Indications)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)
Noncompliance (Patient/Family Teaching)

Implementation

- **Do not confuse Zyprexa (olanzapine) with Celexa (citalopram) or Zyrtec (cetrizine).**
- **PO:** May be administered without regard to meals.
- For orally disintegrating tablets, peel back foil on blister, do not push tablet through foil. Using dry hands, remove from foil and place entire tablet in mouth. Tablet will disintegrate with or without liquid.
- **IM:** Reconstitute with 2.1 mL of Sterile Water for injection for a concentration of 5 mg/mL. Solution should be clear and yellow; do not administer solutions that are discolored or contain particulate matter. Inject slowly, deep into muscle. Do not administer IV or subcutaneously. Administer within 1 hr of reconstitution. Discard unused solution.

Patient/Family Teaching

- Advise patient to take medication as directed and not to skip doses or double up on missed doses. May need to discontinue gradually.
- Inform patient of possibility of extrapyramidal symptoms and tardive dyskinesia. Instruct patient to report these symptoms immediately to health care professional.
- Advise patient to change positions slowly to minimize orthostatic hypotension.

CONTINUED

omalizumab (o-ma-liz-u-mab)

Xolair

Classification

Therapeutic: antiasthmatics
Pharmacologic: monoclonal antibodies

Pregnancy Category B

Indications

Moderate to severe asthma not controlled by inhaled corticosteroids.

Action

Inhibits binding of IgE to receptors on mast cells and eosinophils; preventing the release of mediators of the allergic response. Also decreases amount of IgE receptors on basophils. **Therapeutic Effects:** Decreased incidence of exacerbations of asthma.

Pharmacokinetics

Absorption: 62% absorbed slowly from subcut sites.
Distribution: Enters breast milk.
Metabolism and Excretion: Degraded similarly to IgG via binding degradation, reticuloendothelial system and the liver.
Half-life: 26 days.

TIME/ACTION PROFILE (effects on IgE levels)

ROUTE	ONSET	PEAK	DURATION
Subcut	within 1 hr	unknown	up to 1 yr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Acute bronchospasm.

Use Cautiously in: Chronic use of inhaled corticosteroids; Pregnancy, lactation or children <12 yr (safety not established, use in pregnancy only if clearly needed.

Adverse Reactions/Side Effects

Local: injection site reactions. **Misc:** allergic reactions including ANAPHYLAXIS, ↑ risk of malignancy.

Interactions

Drug-Drug: None noted.

Route/Dosage

Subcut: (Adults and Children >12 yr): 150–375 mg every 2–4 wk (determined by pre-treatment serum IgE level and body weight).

NURSING IMPLICATIONS

Assessment

- Assess lung sounds and respiratory function prior to and periodically during therapy.
- Assess allergy symptoms (rhinitis, conjunctivitis, hives) before and periodically throughout therapy.
- Assess for allergic reactions (urticaria, tongue and/or throat edema) within 2 hr of first or subsequent injections. Observe patient following injection. Epinephrine, diphenhydramine, and corticosteroids should be available in case of anaphylaxis.
- Monitor for injection site reactions (bruising, redness, warmth, burning, stinging, itching, hives, pain, induration, mass, inflammation). Usually occur within 1 hr of injection, last <8 days, and decrease in frequency with subsequent dosing.
- ***Lab Test Considerations:*** Serum IgE levels will ↑ following administration and may persist for up to 1 year following discontinuation. Serum total IgE levels obtained <1 year following discontinuation may not reflect steady state free IgE levels and should not be used to reassess the dosing regimen.

omeprazole (o-mep-ra-zole)

♣Losec, Prilosec, Prilosec OTC, Zegerid

Classification

Therapeutic: antiulcer agents
Pharmacologic: proton-pump inhibitors

Pregnancy Category C

Indications

Gastroesophageal reflux disease (GERD)/maintenance of healing of erosive esophagitis. Duodenal ulcers (with or without anti-infectives for *Helicobacter pylori*). Short-term treatment of active benign gastric ulcer. Reduction of risk of GI bleeding in critically ill patients. Pathologic hypersecretory conditions, including Zollinger-Ellison syndrome. **OTC:** Heartburn occuring ≥ twice/wk.

Action

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

Pharmacokinetics

Absorption: Rapidly absorbed following oral administration; immediate release formulation contains bicarbonate to prevent acid degredation.
Distribution: Good distribution into gastric parietal cells.
Protein Binding: 95%.
Metabolism and Excretion: Extensively metabolized by the liver.
Half-life: 0.5–1 hr (increased in liver disease).

TIME/ACTION PROFILE (antisecretory effects)

ROUTE	ONSET	PEAK	DURATION
PO	within 1 hr	within 2 hr	72–96 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity.
Use Cautiously in: Liver disease (dosage reduction may be necessary); Pregnancy, lactation, or children <2 yr(safety not established).

Adverse Reactions/Side Effects

CNS: dizziness, drowsiness, fatigue, headache, weakness. **CV:** chest pain. **GI:** abdominal pain, acid regurgitation, constipation, diarrhea, flatulence, nausea, vomiting. **Derm:** itching, rash. **Misc:** allergic reactions.

Interactions

Drug-Drug: Omperazole is metabolized by the CYP450 enzyme system and may compete with other agents metabolized by this system. ↓ metabolism and may ↑ effects of **diazepam**, **flurazepam**, **triazolam**, **cyclosporine**, **disulfiram** and **phenytoin**. May interfere with absorption of drugs requiring acidic gastric pH, including esters of **ampicillin**, **iron salts**, **digoxin**, **cyanocobalamine**, and **ketoconazole**. Has been used safely with **antacids.** May ↑ risk of bleeding with **warfarin** (monitor INR/PT).

Route/Dosage

PO (Adults): *GERD*—20 mg once daily. *Duodenal ulcers associated with H. pylori*—40 mg daily in the morning with clarithromycin for 2 wk, then 20 mg once daily for 2 wk *or* 20 mg twice daily with clarithromycin 500 mg twice daily and amoxicillin 1000 mg twice daily for 10 days (if ulcer is present at beginning of therapy, continue omeprazole 20 mg daily for 18 more days); has also been used with clarithromycin and metronidazole. *Reduction of the risk of GI bleeding in critically ill patients*—40 mg initially, then another 40 mg 6–8 hr later, followed by 40 mg once daily for up to 14 days. *Gastric ulcer*—40 mg once daily for 4–6 wk. *Gastric hypersecre-*

Potential Nursing Diagnoses

Ineffective airway clearance

Implementation

- Doses of inhaled corticosteroids may be gradually decreased with supervision of health care professional; do not discontinue abruptly.
- **Subcut:** To reconstitute draw 1.4 ml of sterile water for injection into a 3–cc syringe with a 1–inch 18–gauge needle. With the vial upright on a flat surface, inject the sterile water into vial. Keep vial upright and gently swirl for approximately 1 min to evenly wet powder. Do not shake. Lyophilized omalizumab takes 15–20 min to dissolve. Gently swirl vial for 5–10 seconds every 5 min to dissolve any remaining particles. Solution should be clear or slightly opalescent and may have small bubbles or foam around edge of vial. Do not use if particles are visible or if contents do not dissolve completely within 40 min. Invert vial for 15 seconds to allow solution to drain toward stopper. Solution may be somewhat viscous. In order to obtain full 1.2 ml dose, all of solution must be withdrawn from the vial using a new 3–cc syringe with an 18–gauge needle, before expelling any air or excess solution from syringe. Administer within 8 hr if refrigerated or within 4 hr if stored at room temperature. Discard unused solution.
- Replace the 18–gauge needle with a 25–gauge needle for subcut injection. Because solution is slightly viscous, injection may take 5–10 seconds to administer. Divide doses >150 mg into 2 injection sites.

Patient/Family Teaching

- Explain purpose of medication to patient. Inform patient that they may not see immediate results from omalizumab therapy.
- Instruct patient not to discontinue or reduce other asthma medications, especially inhaled corticosteroids, without consulting health care professional.

Evaluation/Desired Outcomes

- Decreased incidence of exacerbations of asthma.

Why was this drug prescribed for your patient?

tory conditions—60 mg once daily initially; may be increased up to 120 mg 3 times daily (doses >80 mg/day should be given in divided doses); *OTC*—20 mg once daily for up to 14 days.
PO (Children >2 yr and <20 kg): 10 mg once daily.
PO (Children >2 yr and ≥ 20 kg): 20 mg once daily.

NURSING IMPLICATIONS

Assessment

- Assess patient routinely for epigastric or abdominal pain and frank or occult blood in the stool, emesis, or gastric aspirate.
- ***Lab Test Considerations:*** Monitor CBC with differential periodically during therapy.
- May cause ↑ AST, ALT, alkaline phosphatase, and bilirubin.
- May cause serum gastrin concentrations to ↑ during first 1–2 wk of therapy. Levels return to normal after discontinuation of omeprazole.
- Monitor INR and prothrombin time in patients taking warfarin.

Potential Nursing Diagnoses

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

Implementation

- **Do not confuse Prilosec (omeprazole) with Prinivil (lisinopril).**
- **PO:** Administer doses before meals, preferably in the morning. **Capsules should be swallowed whole; do not crush or chew** Capsules may be opened and sprinkled on cool applesauce, entire mixture should be ingested immediately and followed by a drink of water. Do not store for future use.
- *Powder for oral suspension:* Administer on empty stomach, as least 1 hr before a meal. For patients with nasogastric or enteral feeding, suspend feeding for 3 hr before and 1 hr after administration. Empty packet contents into a small cup containing 1–2 tablespoons of water. **Do not use other liquids or foods**. If administered through a nasogastric tube, suspend in 20 ml of water. Stir well and drink immediately. Refill cup with water and drink again.
- May be administered concurrently with antacids.

Patient/Family Teaching

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

Evaluation/Desired Outcomes

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

Why was this drug prescribed for your patient?

ondansetron (on-**dan**-se-tron)

Zofran

Classification

Therapeutic: antiemetics
Pharmacologic: 5 HT$_3$ antagonists

Pregnancy Category B

Indications

Prevention of nausea and vomiting associated with chemotherapy or radiation therapy. **IM, IV:** Prevention and treatment of postoperative nausea and vomiting.

Action

Blocks the effects of serotonin at 5-HT$_3$ receptor sites (selective antagonist) located in vagal nerve terminals and the chemoreceptor trigger zone in the CNS. **Therapeutic Effects:** Decreased incidence and severity of nausea and vomiting following chemotherapy or surgery.

Pharmacokinetics

Absorption: IV administration results in complete bioavailability; 50% absorbed following oral administration.
Distribution: Unknown.
Metabolism and Excretion: Extensively metabolized by the liver; 5% excreted unchanged by the kidneys.
Half-life: 3.5–5.5 hr.

TIME/ACTION PROFILE (antiemetic effect)

ROUTE	ONSET	PEAK	DURATION
PO, IV	rapid	15–30 min	4 hr
IM	rapid	40 min	unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Orally disintegrating tablets contain aspartame and should not be used in patients with phenylketonuria.

Use Cautiously in: Liver impairment (daily dose not to exceed 8 mg); Abdominal surgery (may mask ileus); Pregnancy, lactation, or children ≤3 yr (safety not established).

Adverse Reactions/Side Effects

CNS: headache, dizziness, drowsiness, fatigue, weakness. **GI:** constipation, diarrhea, abdominal pain, dry mouth, increased liver enzymes. **Neuro:** extrapyramidal reactions.

Interactions

Drug-Drug: May be affected by **drugs altering the activity of liver enzymes.**

Route/Dosage

PO (Adults and Children ≥12 yr): *Prevention of chemotherapy-induced nausea/vomiting*—8 mg 30 min before chemotherapy, repeated 8 hr later and q 12 hr for 1–2 days if needed. *Prevention of radiation-induced nausea/vomiting*—8 mg 1–2 hr before radiation; may be repeated q 8 hr. *Prevention of postoperative nausea/vomiting*—16 mg 1 hr before anesthesia.
PO (Children 4–11 yr): *Prevention of chemotherapy-induced nausea/vomiting*—4 mg 30 min before chemotherapy and repeat 4 and 8 hr later; 4 mg q 8 hr may be given for 1–2 days after chemotherapy.
IV (Adults): *Prevention of chemotherapy-induced nausea/vomiting*—0.15 mg/kg 15–30 min before chemotherapy, repeated 4 and 8 hr later or 32-mg single dose 30 min before chemotherapy; lower doses have also been used.
IM, IV (Adults): *Prevention of postoperative nausea/vomiting*—4 mg before induction of anesthesia or postoperatively.
IV (Children 4–18 yr): *Prevention of chemotherapy-induced nausea/vomiting*—0.15 mg/kg 15–30 min before chemotherapy, repeated 4 and 8 hr later.
IV (Children 2–12 yr and ≤40 kg): *Prevention of postoperative nausea/vomiting*—0.15 mg/kg.
IV (Children >40 kg): *Prevention of postoperative nausea/vomiting*—4 mg.

♣ = Canadian drug name.

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

oprelvekin (o-**prell**-ve-kin)

Neumega

Classification

Therapeutic: colony-stimulating factors
Pharmacologic: interleukins, thrombopoetic growth factors

Pregnancy Category C

Indications

Prevention of severe thrombocytopenia and reduction of the need for platelet transfusions after myelosuppressive chemotherapy in patients with nonmyeloid malignancies at risk for thrombocytopenia.

Action

Stimulates production of megakaryocytes and platelets. **Therapeutic Effects:** Increased platelet count.

Pharmacokinetics

Absorption: >80% absorbed after subcut administration.
Distribution: Unknown.
Metabolism and Excretion: Appears to be mostly metabolized, with metabolites eliminated by kidneys.
Half-life: 6.9 hr.

TIME/ACTION PROFILE (increase in platelet count)

ROUTE	ONSET	PEAK	DURATION
Subcut	5–9 days	unknown	7–14 days†

†Counts continue to rise for 7 days after discontinuation and then return to baseline by 14 days

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Lactation.

Use Cautiously in: Any condition in which sodium and water retention would pose problems (congestive heart failure, renal disease); Pre-existing pericardial effusion or ascites (may be exacerbated); History of atrial arrhythmias (especially if receiving cardiac medications or previous doxorubicin therapy); Pre-existing papilledema or tumors of the CNS; Pregnancy or children (safety not established).

Adverse Reactions/Side Effects

These effects occurred in patients who had recently received myelosuppressive chemotherapy **CNS:** dizziness, headache, insomnia, nervousness, weakness. **EENT:** injected conjunctivae, blurred vision, papilledema, pharyngitis, rhinitis. **Resp:** cough, dyspnea, pleural effusions. **CV:** atrial fibrillation, edema, palpitations, syncope, tachycardia, vasodilation. **GI:** anorexia, constipation, diarrhea, dyspepsia, mucositis, nausea, oral moniliasis, vomiting, abdominal pain. **Derm:** alopecia, ecchymoses, rash. **F and E:** sodium and water retention. **Local:** injection site reactions. **MS:** bone pain, myalgia. **Misc:** chills, fever, infection, pain.

Interactions

Drug-Drug: None significant.

Route/Dosage

Subcut: (Adults): 50 mcg/kg once daily for 10–21 days.

NURSING IMPLICATIONS

Assessment

- Assess patient for signs of fluid retention (dyspnea on exertion, peripheral edema) during therapy. Fluid retention is a common side effect that usually resolves within several days after discontinuation of oprelvekin.
- ***Lab Test Considerations:*** Monitor platelet count before and periodically during therapy, especially at expected nadir. Therapy is continued until postnadir platelet count is >50,000 cells/ml.
- CBC should be monitored before and at regular intervals during therapy. Decrease in hemoglobin concentration, hematocrit, and red blood cell

♣ = Canadian drug name.

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

NURSING IMPLICATIONS

Assessment

- Assess patient for nausea, vomiting, abdominal distention, and bowel sounds prior to and following administration.
- Assess patient for extrapyramidal effects (involuntary movements, facial grimacing, rigidity, shuffling walk, trembling of hands) periodically during therapy.
- ***Lab Test Considerations:*** May cause transient ↑ in serum bilirubin, AST, and ALT levels.

Potential Nursing Diagnoses

Imbalanced nutrition: less than body requirements (Indications)
Diarrhea (Side Effects)
Constipation (Side Effects)

Implementation

- Do not confuse Zofran (ondansetron) with Zosyn (piperacillin/tazobactam).
- First dose is administered prior to emetogenic event.
- **PO:** For orally disintegrating tablets, do not attempt to push through foil backing; with dry hands, peel back backing and remove tablet. Immediately place tablet on tongue; tablet will dissolve in seconds, then swallow with saliva. Administration of liquid is not necessary.
- **Direct IV:** Administer undiluted immediately before induction of anesthesia or postoperatively if nausea and vomiting occur shortly after surgery. ***Rate:*** Administer over at least 30 sec and preferably over 2–5 min.
- **Intermittent Infusion:** Dilute doses for prevention of nausea and vomiting associated with chemotherapy in 50 ml of D5W, 0.9% NaCl, D5/0.9% NaCl, D5/0.45% NaCl. Solution is clear and colorless. Stable for 7 days at room temperature following dilution. ***Rate:*** Administer each dose as an IV infusion over 15 min.
- **Syringe Compatibility:** alfentanil, atropine, fentanyl, glycopyrrolate, meperidine, metoclopramide, midazolam, morphine, naloxone, neostigmine, propofol.
- **Syringe Incompatibility:** droperidol.
- **Y-Site Compatibility:** aldesleukin, amifostine, amikacin, azithromycin, aztreonam, bleomycin, carboplatin, carmustine, cefazolin, cefotaxime, cefoxitin, ceftazidime, ceftizoxime, cefuroxime, chlorpromazine, cimetidine, cisatracurium, cisplatin, cladribine, clindamycin, cyclophosphamide, cytarabine, dacarbazine, dactinomycin, daunorubicin, dexamethasone sodium phosphate, dexmedetomidine, diphenhydramine, docetaxel, dopamine, doxorubicin, doxorubicin liposome, doxycycline, droperidol, etoposide, etoposide phosphate, famotidine, fenoldopam, filgrastim, floxuridine, fluconazole, fludarabine, gatifloxacin, gemcitabine, gentamicin, haloperidol, heparin, hydrocortisone sodium succinate, hydrocortisone sodium phosphate, hydromorphone, ifosfamide, imipenem/cilastatin, linezolid, magnesium sulfate, mannitol, mechlorethamine, melphalan, meperidine, mesna, methotrexate, metoclopramide, mitomycin, mitoxantrone, morphine, paclitaxel, pentostatin, piperacillin/tazobactam, potassium chloride, promethazine, prochlorperazine edisylate, ranitidine, remifentanil, sodium acetate, streptozocin, teniposide, thiotepa, ticarcillin, ticarcillin/clavulanate, topotecan, vancomycin, vinblastine, vincristine, vinorelbine, zidovudine.
- **Y-Site Incompatibility:** acyclovir, allopurinol, aminophylline, amphotericin B, amphotericin B cholesteryl sulfate, ampicillin, ampicillin/sulbactam, cefepime, cefoperazone, furosemide, ganciclovir, lorazepam, methylprednisolone sodium succinate, piperacillin, sargramostim, sodium bicarbonate.

Patient/Family Teaching

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

Evaluation/Desired Outcomes

- Prevention of nausea and vomiting associated with initial and repeat courses of emetogenic cancer chemotherapy.
- Prevention of postoperative nausea and vomiting.
- Prevention of nausea and vomiting due to radiation therapy.

Why was this drug prescribed for your patient?

count may occur because of increased plasma volume (dilutional anemia); usually begins within 3–5 days of therapy and is reversible within a week of discontinuation of therapy.
- Monitor electrolyte concentrations in patients receiving chronic diuretic therapy. Hypokalemia may be fatal.
- May cause an increase in plasma fibrinogen.

Potential Nursing Diagnoses

Excess fluid volume (Side Effects)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)

Implementation

- Therapy should be started within 6–24 hr after completion of chemotherapy and continued for 10–21 days.
- Treatment should be discontinued at least 2 days before next planned chemotherapy cycle.
- **Subcut:** Reconstitute with 1 ml of sterile water for injection without preservatives for a concentration of 5 mg/ml. Direct diluent to sides of vial and swirl gently. Solution is clear and colorless. Do not administer solutions that are discolored or contain particulate matter. Do not shake or agitate vigorously. Do not freeze. Do not reuse vials. Administer within 3 hr of reconstitution as a single injection in abdomen, hip, thigh, or upper arm.

Patient/Family Teaching

- Instruct patient in proper technique for preparation and administration of medication. Provide a puncture-resistant container for disposal of needles.
- May cause transient blurred vision or dizziness. Caution patient to avoid driving or other activities requiring alertness until response to medication is known.
- Advise patient to notify health care professional if pregnancy is planned or suspected.
- Inform patient of side effects and advise patient to notify health care professional if chest pain, shortness of breath, fatigue, blurred vision, or irregular heartbeat persists.

Evaluation/Desired Outcomes

- Increase in postnadir platelet count to ≥50,000 cells/ml.

Why was this drug prescribed for your patient?

oxaliplatin (ox-a-li-pla-tin)

Eloxatin

Classification

Therapeutic: antineoplastics

Pregnancy Category D

Indications

Used in combination with 5–Fluorouracil and leucovorin in the treatment of metastatic colon or rectal cancer that has progressed despite treatment with first-line agents.

Action

Inhibits DNA replication and transcription by incorporating platinum into normal cross-linking (cell-cycle nonspecific). **Therapeutic Effects:** Death of rapidly replicating cells, particularly malignant ones.

Pharmacokinetics

Absorption: IV administration results in complete bioavailability.
Distribution: Extensive tissue distribution.
Protein Binding: >90% (platinum).
Metabolism and Excretion: Undergoes rapid and extensive nonenzymatic biotransformation; excreted mostly by the kidneys.
Half-life: Unknown.

TIME/ACTION PROFILE

ROUTE	ONSET	PEAK	DURATION
IV	unknown	unknown	unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Hypersensitivity to other platinum compounds. Pregnancy or lactation.

Use Cautiously in: Renal impairment; Geriatric patients (increased risk of adverse reactions); Children (safety not established).

Adverse Reactions/Side Effects

Adverse reactions are noted for the combination of oxaliplatin, 5–FU and leucovorin **CNS:** fatigue. **CV:** chest pain, edema, thromboembolism. **Resp:** PULMONARY FIBROSIS, coughing, dyspnea. **GI:** diarrhea, nausea, vomiting, abdominal pain, anorexia, gastroesophageal reflux, stomatitis. **F and E:** dehydration, hypokalemia. **Hemat:** leukopenia, NEUTROPENIA, THROMBOCYTOPENIA, anemia. **Local:** injection site reactions. **MS:** back pain. **Neuro:** neurotoxicity. **Misc:** ANAPHYLAXIS/ANAPHYLACTOID REACTIONS, fever.

Interactions

Drug-Drug: Concurrent use of **nephrotoxic agents** may increase toxicity.

Route/Dosage

IV (Adults): *Day 1*—85 mg/m² with leucovorin 200 mg/m² at the same time over 2 hr, followed by 5–FU 400 mg/m² bolus over 2–4 min, then 5–FU 600 mg/m² as a 22 hr infusion. *Day 2*—leucovorin 200 mg/m² over 2 hr, followed by 5–FU 400 mg/m² bolus over 2–4 min, then 5–FU 600 mg/m² as a 22 hr infusion. Cycle is repeated every 2 wk. Dosage reduction/alteration may be required for neurotoxicity or other serious adverse effects.

NURSING IMPLICATIONS

Assessment

- Assess for peripheral sensory neuropathy. *Acute onset* occurs within hrs to 1–2 days of dosing, resolves within 14 days, and frequently recurs with further dosing (transient paresthesia, dysesthesia and hypothesia of hands, feet, perioral area, or throat). Symptoms may be precipitated or exacerbated by exposure to cold or cold objects. May also cause jaw spasm, abnormal tongue sensation, dysarthria, eye pain, and a feeling of chest pressure. *Persistent* (>14 days) causes paresthesias, dysesthesias, and hypoesthesias, but may also include deficits in proprioception that may interfere with daily activities (walking, writing, swallowing). Persis-

High Alert

oxycodone (ox-i-koe-done)

Endocodone, M-Oxy, Oxycontin, OxyFAST, OxyIR, Percolone, Roxicodone, Roxicodone SR, ♣Supeudol

oxycodone/acetaminophen†

♣Endocet, ♣Oxycocet, Percocet, ♣Percocet-Demi, Roxicet, Roxilox, Tylox

oxycodone/aspirin†

♣Endodan, ♣Oxycodan, Percodan, Percodan-Demi, Roxiprin

Classification

Therapeutic: opioid analgesics
Pharmacologic: opioid agonists, opioid agonists/nonopioid analgesic combinations

Schedule II

Pregnancy Category C (oxycodone alone)

†See also acetaminophen and salicylates monographs

Indications

Moderate to severe pain.

Action

Binds to opiate receptors in the CNS—alters perception of and response to painful stimuli while producing generalized CNS depression. **Therapeutic Effects:** Decreased pain.

Pharmacokinetics

Absorption: Well absorbed from the GI tract.
Distribution: Widely distributed. Crosses placenta; enters breast milk.
Metabolism and Excretion: Mostly metabolized by the liver.
Half-life: 2–3 hr.

TIME/ACTION PROFILE (analgesic effects)

ROUTE	ONSET	PEAK	DURATION
PO	10–15 min	60–90 min	3–6 hr
PO-CR	10–15 min	3 hr	12 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Some products contain alcohol or bisulfites; avoid in patients with known intolerance or hypersensitivity. Pregnancy or lactation (avoid chronic use).

Use Cautiously in: Head trauma; Increased intracranial pressure; Severe renal, hepatic, or pulmonary disease; Hypothyroidism; Adrenal insufficiency; Alcoholism; Undiagnosed abdominal pain; Prostatic hypertrophy; Geriatric or debilitated patients (decrease initial dose).

Adverse Reactions/Side Effects

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

Interactions

Drug-Drug: Use with caution in patients receiving **MAO inhibitors** (may result in unpredictable reactions—decrease initial dose of oxycodone to 25% of usual dose). ↑ CNS depression with **alcohol, antihistamines,** and **sedative/hypnotics.** Administration of **partial-antagonist opioid analgesics** may precipitate withdrawal in physically dependent patients. **Nalbuphine, buprenorphine,** or **pentazocine** may decrease analgesia. **Drug-Natural Products:** Concomitant use of **kava, valerian** or **chamomile** can ↑ CNS depression.

tent neuropathy may occur without prior acute neuropathy and may improve upon discontinuation of oxaliplatin.
- Assess for signs of pulmonary fibrosis (non-productive cough, dyspnea, crackles, radiological; infiltrates). May be fatal. Discontinue oxaliplatin if pulmonary fibrosis occurs.
- Monitor for signs of anaphylaxis (rash, hives, swelling or lips or tongue, sudden cough). Epinephrine, corticosteroids, and antihistamines should be readily available.
- ***Lab Test Considerations:*** Monitor WBC with differential, hemoglobin, platelet count, and blood chemistries (ALT, AST, bilirubin, and creatinine) before each oxaliplatin cycle.

Potential Nursing Diagnoses
Nausea (Adverse Reactions)

Implementation
- Extravasation may result in local pain and inflammation that may be severe and lead to necrosis.
- Premedicate patient with antiemetics with or without dexamethasone. Prehydration is not required.
- **Intermittent Infusion:** Protect concentrated solution from light; do not freeze. Must be further diluted with 250–500 ml of D5W. **Do not use 0.9% NaCl or any other chloride-containing solution for final solution.** Do not use aluminum needles or administration sets containing aluminum parts; aluminum may cause degradation of platinum compounds. May be stored in refrigerator for 24 hr or 6 hr at room temperature. Diluted solution is not light-sensitive. Do not administer solutions that are discolored or contain particulate matter. ***Rate:*** Administer oxaliplatin simultaneously with leucovorin in separate bags via Y-line over 120 min. Prolonging infusion time to 6 hr may decrease acute toxicities. Infusion times for flurouracil and leucovorin do not need to change.
- **Y-Site Incompatibility:** Alkaline solutions, chloride-containing solutions. Infusion line should be flushed with D5W prior to administration of other solutions or medications.

Patient/Family Teaching
- Inform patients and caregivers of potential for peripheral neuropathy and potentiation by exposure to cold or cold objects. Advise patient to avoid cold drinks, to avoid use of ice in drinks or as ice packs, and to cover exposed skin prior to exposure to cold temperature or cold objects. Caution patients to cover themselves with a blanket during infusion, not breathe deeply when exposed to cold air, wear warm clothing, and cover mouth and nose with a scarf or pull-down ski cap to warm the air that goes to their lungs; do not take things from the freezer or refrigerator without wearing gloves; drink fluids warm or at room temperature; always drink through a straw; do not use ice chips for nausea; be aware that most metals (car doors, mailbox) are cold; wear gloves to touch; do not run air conditioning at high levels in house or car; and if hands get cold wash them with warm water. Advise health care professional of how you did since last treatment before next infusion.
- Instruct patient to notify health care professional immediately if signs of low blood cell counts (fever, persistent diarrhea, infection) or if persistent vomiting, signs of dehydration, cough or breathing difficulty, thirst, dry mouth, dizziness, decreased urination or signs of allergic reactions occur.

Evaluation/Desired Outcomes
- Decrease in size and spread of malignancies.

Why was this drug prescribed for your patient?

Route/Dosage
Larger doses may be required during chronic therapy. Consider cumulative effects of additional acetaminophen/aspirin; if toxic levels are exceeded, change to pure oxycodone product.
PO (Adults ≥50 kg): 5–10 mg q 3–4 hr initially, as needed. Controlled-release tablets (Oxycontin) may be given q 12 hr after careful consideration as to dose, indication, and previous analgesic use/abuse history.
PO (Adults <50 kg or Children): 0.2 mg/kg q 3–4 hr initially, as needed.
Rect (Adults): 10–40 mg 3–4 times daily initially, as needed.

NURSING IMPLICATIONS

Assessment
- Assess type, location, and intensity of pain before and 1 hr (peak) after administration. When titrating opioid doses, increases of 25–50% should be administered until there is a 50% reduction in the patient's pain rating on a numerical or visual analog scale or the patient reports satisfactory pain relief. A repeat dose can be safely administered at the time of the peak if previous dose is ineffective and side effects are minimal.
- Patients taking controlled-release tablets may require additional short-acting opioid doses for breakthrough pain. Doses should be equivalent to 10–20% of 24 hr total and given every 2 hr as needed.
- An equianalgesic chart (see Appendix B) should be used when changing routes or when changing from one opioid to another.
- **Assess blood pressure, pulse, and respirations before and periodically during administration. If respiratory rate is <10/min, assess level of sedation.** Physical stimulation may prevent significant hypoventilation. Dose may need to be decreased by 25–50%. Initial drowsiness will diminish with continued use.
- Prolonged use may lead to physical and psychological dependence and tolerance. This should not prevent patient from receiving adequate analgesia. Most patients who receive oxycodone for pain do not develop psychological dependence. Progressively higher doses may be required to relieve pain with long-term therapy.
- Assess bowel function routinely. Prevent constipation with increased fluids and bulk, and laxatives to minimize constipating effects. Stimulant laxatives should be administered routinely if opioid use exceeds 2–3 days, unless contraindicated.
- ***Toxicity and Overdose:*** If an opioid antagonist is required to reverse respiratory depression or coma, naloxone (Narcan) is the antidote. Dilute the 0.4-mg ampule of naloxone in 10 ml of 0.9% NaCl and administer 0.5 ml (0.02 mg) by direct IV push every 2 min. For children and patients weighing <40 kg, dilute 0.1 mg of naloxone in 10 ml of 0.9% NaCl for a concentration of 10 mcg/ml and administer 0.5 mcg/kg every 2 min. Titrate dose to avoid withdrawal, seizures, and severe pain.

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

Implementation
- ***High Alert:*** Accidental overdosage of opioid analgesics has resulted in fatalities. Before administering, clarify all ambiguous orders; have second practitioner independently check original order and dose calculations. Do not confuse oxycodone with OxyContin. Do not confuse Percocet with Percodan.
- Regularly administered doses may be more effective than prn administration. Analgesic is more effective if given before pain becomes severe.
- Coadministration with nonopioid analgesics may have additive analgesic effects and may permit lower doses. Medication should be discontinued gradually after long-term use to prevent withdrawal symptoms.
- **PO:** May be administered with food or milk to minimize GI irritation.
- **Controlled-release tablets should be swallowed whole; do not crush, break, or chew. Taking broken, chewed, or crushed controlled-release tablets leads to rapid release and absorption of a potentially fatal dose of oxycodone.** Administer solution with properly calibrated measuring device.

CONTINUED

CONTINUED

oxycodone

- **Controlled Release:** Dose should be based on 24-hr opioid requirement determined with short-acting opioids then converted to controlled-release form.

Patient/Family Teaching

- Instruct patient on how and when to ask for pain medication. Caution patient not to increase the dose of controlled-release oxycodone without consulting health care professional.
- Caution patient that controlled-release oxycodone is a potential drug of abuse. Medication should be protected from theft and never given to anyone other than the individual for whom it was prescribed.
- Medication may cause drowsiness or dizziness. Advise patient to call for assistance when ambulating or smoking. Caution patient to avoid driving and other activities requiring alertness until response to medication is known.
- Advise patients taking Oxycontin tablets that empty matrix tablets may appear in stool.
- Advise patient to make position changes slowly to minimize orthostatic hypotension.
- Advise patient to avoid concurrent use of alcohol or other CNS depressants with this medication.
- 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.

oxytocin (ox-i-**toe**-sin)

Pitocin, Syntocinon

Classification

Therapeutic: hormones
Pharmacologic: oxytocics

Pregnancy Category X (intranasal), UK (IV, IM)

Indications

IV: Induction of labor at term. Facilitation of uterine contractions at term. Facilitation of threatened abortion. Postpartum control of bleeding after expulsion of the placenta. **Intranasal:** To promote milk letdown in lactating women. **Unlabeled uses:** Evaluation of fetal status (fetal stress test).

Action

Stimulates uterine and mammary gland smooth muscle, producing uterine contractions similar to spontaneous labor contractions. **Therapeutic Effects: IV:** Induction of labor. **Intranasal:** Milk letdown.

Pharmacokinetics

Absorption: Well absorbed from the nasal mucosa.
Distribution: Widely distributed; small amounts reach fetus.
Metabolism and Excretion: Rapidly metabolized by liver and kidneys.
Half-life: 3–9 min.

TIME/ACTION PROFILE

ROUTE	ONSET	PEAK	DURATION
IV	immediate	unknown	1 hr
IM	3–5 min	unknown	30–60 min
Intranasal	few min	unknown	20 min

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Anticipated nonvaginal delivery. Pregnancy (intranasal dosage form).

Use Cautiously in: 1st and 2nd stages of labor.

Adverse Reactions/Side Effects

Maternal adverse reactions are noted for IV use only. **CNS:** *maternal*— COMA, SEIZURES; *fetal*— INTRACRANIAL HEMORRHAGE. **Resp:** *fetal*— ASPHYXIA, hypoxia. **CV:** *maternal*— hypotension; *fetal*— arrhythmias. **F and E:** *maternal*— hypochloremia, hyponatremia, water intoxication. **Misc:** *maternal*— increased uterine motility, painful contractions, abruptio placentae, decreased uterine blood flow, hypersensitivity.

Interactions

Drug-Drug: Severe hypertension may occur if oxytocin follows administration of **vasopressors.** Concurrent use with **cyclopropane** anesthesia may result in excessive hypotension.

Route/Dosage

Induction/Stimulation of Labor

IV (Adults): 0.5–2 milliunits/min, increase by 1–2 milliunits/min q 15–60 min until pattern established (usually 5–6 milliunits/min; maximum 20 milliunits/min), then decrease dose.

Postpartum Hemorrhage

IV (Adults): 10 units infused at 20–40 milliunits/min.
IM (Adults): 10 units after delivery of placenta.

Incomplete/Inevitable Abortion

IV (Adults): 10 units at a rate of 20–40 milliunits/min.

Promotion of Milk Letdown

Intranasal (Adults): 1 spray in one or both nostrils 2–3 min before breastfeeding or pumping breasts.

Fetal Stress Test

IV (Adults): 0.5 milliunits/min, may be doubled q 20 min until 3 moderate contractions occur in one 10-min period (usually 5–6 milliunits/min) to a maximum of 20 milliunits with maternal/fetal monitoring.

NURSING IMPLICATIONS

Assessment

- Fetal maturity, presentation, and pelvic adequacy should be assessed before administration of oxytocin for induction of labor.
- Assess character, frequency, and duration of uterine contractions; resting uterine tone; and fetal heart rate frequently throughout administration. If contractions occur <2 min apart and are >50–65 mm Hg on monitor, if they last 60–90 sec or longer, or if a significant change in fetal heart rate develops, stop infusion and turn patient on her left side to prevent fetal anoxia. Notify physician or other health care professional immediately.
- Monitor maternal blood pressure and pulse frequently and fetal heart rate continuously throughout administration.
- This drug occasionally causes water intoxication. Monitor patient for signs and symptoms (drowsiness, listlessness, confusion, headache, anuria) and notify physician or other health care professional if they occur.
- ***Lab Test Considerations:*** Monitor maternal electrolytes. Water retention may result in hypochloremia or hyponatremia.

Potential Nursing Diagnoses

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

Implementation

- **General: Do not confuse Pitocin (oxytocin) with Pitressin (vasopressin).**
- Do not administer oxytocin simultaneously by more than one route.
- **Continuous Infusion:** Rotate infusion container to ensure thorough mixing. Store solution in refrigerator, but do not freeze.
- Infuse via infusion pump for accurate dosage. Oxytocin should be connected via Y-site injection to an IV of 0.9% NaCl for use during adverse reactions.
- Magnesium sulfate should be available if needed for relaxation of the myometrium.
- **Induction of Labor:** Dilute 1 ml (10 units) in 1 L of compatible infusion fluid for a concentration of 10 milliunits/ml. ***Rate:*** Begin infusion at 0.5–2 milliunits/min (0.05–0.2 ml), increase in increments of 1–2 milliunits/min at 15–30-min intervals until contractions simulate normal labor.
- **Postpartum Bleeding:** For control of postpartum bleeding, dilute 1–4 ml (10–40 units) in 1 L of compatible infusion fluid (10–40 milliunits/ml). ***Rate:*** Begin infusion at a rate of 20–40 milliunits/min to control uterine atony. Adjust rate as indicated.
- **Incomplete or Inevitable Abortion:** For incomplete or inevitable abortion, dilute 1 ml (10 units) in 500 ml of compatible infusion fluid, for a concentration of 20 milliunits/ml. ***Rate:*** Infuse at a rate of 20–40 milliunits/min.
- **Solution Compatibility:** dextrose/Ringer's or lactated Ringer's combinations, dextrose/saline combinations, Ringer's or lactated Ringer's injection, D5W, D10W, 0.45% NaCl, 0.9% NaCl.
- **Intranasal:** Hold squeeze bottle upright while patient is in sitting position. Patient should clear nasal passages before administration.

Patient/Family Teaching

- Advise patient to expect contractions similar to menstrual cramps after administration has started.
- **Nasal Spray:** Advise patient to administer nasal spray 2–3 min before planned breastfeeding. Patient should notify health care professional if milk drips from non-nursed breast or if uterine cramps occur.

Evaluation/Desired Outcomes

- Onset of effective contractions.
- Increase in uterine tone.
- Effective letdown reflex.

Why was this drug prescribed for your patient?

paclitaxel (pak-li-tax-el)

Onxol, Taxol

paclitaxel protein bound particles (albumin bound)

Abraxane

Classification

Therapeutic: antineoplastics
Pharmacologic: taxoids

Pregnancy Category D

Indications

Paclitaxel: Advanced ovarian cancer (with cisplatin). Non–small cell lung cancer when potentially curative surgery or radiation therapy is not an option. Metastatic ovarian cancer unresponsive to other therapy. Metastatic breast cancer unresponsive to other therapy. Node-positive breast cancer when administered sequentially to standard combination chemotherapy. Treatment of AIDS-related Kaposi's sarcoma. **Paclitaxel protein bound particles (albumin-bound):** Metastatic breast cancer after treatment failure or relapse where therapy included an anthracycline.

Action

Interferes with the normal cellular microtubule function that is required for interphase and mitosis. **Therapeutic Effects:** Death of rapidly replicating cells, particularly malignant ones.

Pharmacokinetics

Absorption: IV administration results in complete bioavailability.
Distribution: Unknown.
Metabolism and Excretion: Highly metabolized by the liver, <4% excreted unchanged in urine.

Half-life: *Paclitaxel*—5.3–17.4 hr; *Paclitaxel protein-bound particles (albumin-bound)* 27 hr.

TIME/ACTION PROFILE (effect on WBCs)

ROUTE	ONSET	PEAK	DURATION
IV	unknown	11 days	3 wk

Contraindications/Precautions

Contraindicated in: Hypersensitivity to paclitaxel or to castor oil (non-protein-bound vehicle contains polyoxyethylated castor oil). WBC ≤ 1500/mm³ in patients with ovarian or breast cancer. WBC ≤1000/mm³ in patients with AIDS-related Kaposi's sarcoma. Pregnancy or lactation.
Use Cautiously in: Severe hepatic impairment; Geriatric patients (may have increased risk of neuropathy and cardiovascular events); Active infection; Decreased bone marrow reserve; Chronic debilitating illnesses; Women with childbearing potential; Children (safety not established).

Adverse Reactions/Side Effects

CNS: abnormal ECG, malaise, weakness. **CV:** bradycardia, hypotension. **GI:** diarrhea, nausea, vomiting, abnormal liver function tests, stomatitis. **Derm:** alopecia, maculopapular rash, pruritus, radiation recall reactions. **Hemat:** anemia, leukopenia, thrombocytopenia. **MS:** arthralgia, myalgia. **Neuro:** peripheral neuropathy. **Misc:** hypersensitivity reactions including ANAPHYLAXIS and STEVENS-JOHNSON SYNDROME., TOXIC EPIDERMAL NECROLYSIS.

Interactions

Drug-Drug: Ketoconazole may ↓ metabolism and ↑ risk of serious toxicity; concurrent use should be undertaken with caution; **cyclosporine**, **doxorubicin**, **felodipine**, **diazepam**, and **midazolam** may also ↓ metabolism and ↑ toxicity. ↑ risk of myelosuppression with other **antineoplastics** or **radiation therapy**. **Phenobarbital** and **carbamazepine** may ↓ blood levels and effectiveness. Concurrent **radiation** increases the risk of radiation pneumonitis. Myelosuppression ↑ when given after **cis-**

CONTINUED

paclitaxel

- ***Lab Test Considerations:*** Monitor CBC and differential prior to and periodically during therapy. The nadir of leukopenia occurs in 11 days, with recovery by days 15–21. Notify physician if the leukocyte count is <1500/mm³ (1000/mm³ in AIDS-related Kaposi's sarcoma) or if the platelet count is <100,000/mm³. Subsequent doses are usually held until leukocyte count is >1500/mm³ (1000/mm³ in AIDS-related Kaposi's sarcoma) and platelet count is >100,000/mm³.
- Monitor liver function studies (AST, ALT, LDH, bilirubin) prior to and periodically during therapy to detect hepatotoxicity.
- May cause ↑ serum triglycerides.

Potential Nursing Diagnoses

Risk for infection (Adverse Reactions)
Risk for injury (Adverse Reactions)

Implementation

- Do not confuse Taxol (paclitaxel) with Taxotere (docetaxel). Do not confuse paclitaxel with Paxil (paroxitine).

Paclitaxel protein-bound particles (albumin-bound)

- **Intermittent Infusion:** Reconstitute by slowly adding 20 mL to each vial over at least 1 min for a concentration of 5 mg/mL. Direct solution to inside wall of vial to prevent foaming. Allow vial to sit for at least 5 min to ensure proper wetting of cake/powder. Gently swirl or invert vial for at least 2 min until powder is completely dissolved; avoid foaming. If foaming or clumping occurs, allow vial to stand for 15 min until foaming dissolves. Solution should be milky and homogenous without visible particles. If particles or settling are visible, gently invert vial to resuspend. Inject appropriate amount into sterile PVC IV bag. Do not use an in-line filter during administration. Do not administer solutions that are discolored or contain particulate matter. Reconstituted solution should be administered immediately but is stable for 8 hr if refrigerated. Discard unused portion. ***Rate:*** Administer over no more than 30 min. Monitor infusion site closely for infiltration

Paclitaxel

- **Continuous Infusion:** Paclitaxel must be diluted prior to injection. Dilute contents of 5-ml (30-mg) vials to a concentration of 0.3–1.2 mg/ml with the following diluents: 0.9% NaCl, D5W, D5/0.9% NaCl, or dextrose in Ringer's solution. Although haziness in the solution is normal, inspect for particulate matter or discoloration before use. Use an in-line filter of not >0.22-micron pore size. Solutions are stable for 27 hr at room temperature and lighting. Do not use PVC containers or administration sets. ***Rate:*** Dose for *breast cancer or AIDS-related Kaposi's sarcoma* is administered over 3 hr. Dose for *ovarian cancer* is administered as a 24-hr infusion.
- **Y-Site Compatibility:** acyclovir, amikacin, aminophylline, ampicillin/sulbactam, bleomycin, butorphanol, calcium chloride, carboplatin, cefepime, cefotetan, ceftazidime, ceftriaxone, cimetidine, cisplatin, cladribine, cyclophosphamide, cytarabine, dacarbazine, diphenhydramine, doxorubicin, droperidol, etoposide, etoposide phosphate, famotidine, floxuridine, fluconazole, fluorouracil, furosemide, ganciclovir, gatifloxacin, gemcitabine, gentamicin, granisetron, haloperidol, heparin, hydrocortisone, hydromorphone, ifosfamide, linezolid, lorazepam, magnesium sulfate, mannitol, meperidine, mesna, methotrexate, metoclopramide, morphine, nalbuphine, ondansetron, pentostatin, potassium chloride, prochlorperazine edisylate, propofol, ranitidine, sodium bicarbonate, thiotepa, topotecan, vancomycin, vinblastine, vincristine, zidovudine.

platin. May ↑ levels and toxicity of **doxorubicin**. May ↓ antibody response to and ↑ risk of adverse reactions from **live-virus vaccines.**

Route/Dosage

Many other regimens are used.

PACLITAXEL

Ovarian Carcinoma

IV (Adults): *First–line therapy*—175 mg/m² over 3 hr every 3 wk, or 135 mg/m² over 24 hr every 3 wk, followed by cisplatin; *after failure of first-line therapy*—135 mg/m² or 175 mg/m² over 3 hr every 3 wk.

Breast Carcinoma

IV (Adults): *Adjuvant treatment of node-positive breast cancer*—175 mg/m² over 3 hr every 3 wk for 4 courses sequentially to doxorubicin-containing combination chemotherapy (Taxol only); *progression of metastatic disease or relapse within 6 mo of adjuvant therapy*—175 mg/m² over 3 hr every 3 wk.

Non–Small Cell Lung Cancer

IV (Adults): 135 mg/m² over 24 hr every 3 wk, followed by cisplatin.

AIDS-Related Kaposi's Sarcoma

IV (Adults): 135 mg/m² q 3 wk or 100 mg/m² every 2 wk (dosage reduction/adjustment may be necessary in patients with advanced HIV infection).

PACLITAXEL PROTEIN-BOUND PARTICLES (albumin-bound)

IV (Adults): 260 mg/m² every three weeks.

NURSING IMPLICATIONS

Assessment

- Monitor vital signs frequently, especially during first hr of 24-hr infusion.
- Monitor cardiovascular status especially during first hr of infusion. Hypotension and bradycardia are common but usually do not require treatment. Continuous ECG monitoring is recommended only for patients with serious underlying conduction abnormalities.
- Monitor for bone marrow depression. Assess for bleeding (bleeding gums, bruising, petechiae, guaiac 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. Granulocyte-colony stimulating factor (G-CSF) may be used if necessary.
- Assess for development of peripheral neuropathy. If severe symptoms occur, subsequent dose should be reduced by 20%.
- Monitor intake and output, appetite, and nutritional intake. Paclitaxel causes nausea and vomiting in 60% of patients. Prophylactic antiemetics may be used. Adjust diet as tolerated to help maintain fluid and electrolyte balance and nutritional status.
- Assess patient for arthralgia and myalgia, which usually begin 2–3 days after therapy and resolve within 5 days. Pain is usually relieved by nonopioid analgesics but may be severe enough to require treatment with opioid analgesics.
- **Paclitaxel:** Monitor for hypersensitivity reactions continuously during the first 30 min and frequently thereafter. These occur frequently (19%), usually during the first 10 min of paclitaxel infusion, after the first or second dose. Pretreatment is recommended for **all** patients and should include dexamethasone 20 mg PO (10 mg for patients with advanced HIV disease) 12 and 6 hours prior to paclitaxel, diphenhydramine 50 mg IV 30–60 min prior to paclitaxel, and cimetidine 300 mg or ranitidine 50 mg IV 30–60 min prior to paclitaxel. Most common manifestations are dyspnea, hypotension, and chest pain. If these occur, stop infusion and notify physician. Treatment may include bronchodilators, epinephrine, antihistamines, and corticosteroids. Keep these agents and resuscitative equipment close by in the event of an anaphylactic reaction. Other manifestations of hypersensitivity reactions include flushing and rash.
- No premedication for hypersensitivty is required for paclitaxel protein-bound (albumin-bound).

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- **Y-Site Incompatibility:** amphotericin B, amphotericin B cholesteryl sulfate, chlorpromazine, doxorubicin liposome, methylprednisolone sodium succinate, mitoxantrone.

Patient/Family Teaching

- Instruct patient to notify health care professional promptly if fever; chills; cough; hoarseness; sore throat; signs of infection; lower back or side pain; painful or difficult urination; bleeding gums; bruising; petechiae; blood in stools, urine, or emesis; increased fatigue; dyspnea; or orthostatic hypotension occurs. Caution patient to avoid crowds and persons with known infections. Instruct patient to use soft toothbrush and electric razor and to avoid falls. Caution patient not to drink alcoholic beverages or to take medication containing aspirin or NSAIDs; may precipitate gastric bleeding.
- Instruct patient to notify health care professional if abdominal pain, yellow skin, weakness, paresthesia, gait disturbances, or joint or muscle aches occur.
- Instruct patient to inspect oral mucosa for redness and ulceration. If mouth sores occur, advise patient to use sponge brush and rinse mouth with water after eating and drinking. Stomatitis usually resolves in 5–7 days.
- Discuss with patient the possibility of hair loss. Complete hair loss usually occurs between days 14 and 21 and is reversible after discontinuation of therapy. Explore coping strategies.
- Advise patient to use a nonhormonal method of contraception. Advise male patients not to father a child while receiving paclitaxel.
- 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 size or spread of malignancy.

Why was this drug prescribed for your patient?

palonosetron (pa-lone-o-se-tron)

Aloxi

Classification

Therapeutic: antiemetics
Pharmacologic: 5 HT$_3$ antagonists

Pregnancy Category B

Indications

Prevention of acute and delayed nausea and vomiting caused by moderate or highly emetogenic chemotherapy.

Action

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

Pharmacokinetics

Absorption: IV administration results in complete bioavailability.
Distribution: Unknown.
Metabolism and Excretion: 50% metabolized; 40% excreted unchanged in urine.
Half-life: 40 hr.

TIME/ACTION PROFILE

ROUTE	ONSET	PEAK	DURATION
IV	within 30 min	unknown	7 days

Contraindications/Precautions

Contraindicated in: Hypersensitivity; cross sensitivity with other 5–HT$_3$ antagonists may occur. Lactation.

Use Cautiously in: Hereditary or acquired QTc prolongation, hypokalemia, hypomagnesemia, concurrent diuretic or antiarrhythmic therapy or history of high cumulative anthracycline therapy (may increase risk of arrhythmias); Pregnancy or children (safety not established).

Adverse Reactions/Side Effects

CNS: dizziness, headache. **GI:** constipation, diarrhea.

Interactions

Drug-Drug: Concurrent **diuretic** or **antiarrhythmic** therapy or history of high cumulative **anthracycline** therapy may ↑ risk of arrhythmias.

Route/Dosage

IV (Adults): 0.25 mg 30 min before start of chemotherapy.

NURSING IMPLICATIONS

Assessment

- Assess patient for nausea, vomiting, abdominal distention, and bowel sounds prior to and following administration.
- ***Lab Test Considerations:*** May cause transient ↑ in serum bilirubin, AST, and ALT levels.

Potential Nursing Diagnoses

Imbalanced nutrition: less than body requirements (Indications)
Diarrhea (Side Effects)
Constipation (Side Effects)

Implementation

- First dose is administered prior to emetogenic event.
- Repeated dose within a 7 day period is not recommended.
- **Direct IV:** Administer dose undiluted 30 min prior to chemotherapy. Flush line prior to and after administration with 0.9% NaCl. Do not administer solutions that are discolored or contain particulate matter. ***Rate:*** Administer over 30 seconds.
- **Y-Site Incompatibility:** Do not mix with other drugs.

pantoprazole (pan-toe-pra-zole)

Protonix, Protonix I.V

Classification

Therapeutic: antiulcer agents
Pharmacologic: gastric acid pump inhibitors

Pregnancy Category B

Indications

Erosive esophagitis associated with GERD. Decrease relapse rates of daytime and nighttime heartburn symptoms on patients with GERD. Pathologic gastric hypersecretory conditions.

Action

Binds to an enzyme in the presence of acidic gastric pH, preventing the final transport of hydrogen ions into the gastric lumen. **Therapeutic Effects:** Diminished accumulation of acid in the gastric lumen, with lessened acid reflux. Healing of duodenal ulcers and esophagitis. Decreased acid secretion in hypersecretory conditions.

Pharmacokinetics

Absorption: Tablet is enteric-coated; absorption occurs only after tablet leaves the stomach.
Distribution: Unknown.
Protein Binding: 98%.
Metabolism and Excretion: Mostly metabolized by the liver via the cytochrome P450 (CYP) system; inactive metabolites are excreted in urine (71%) and feces (18%).
Half-life: 1 hr.

TIME/ACTION PROFILE (effect on acid secretion)

ROUTE	ONSET†	PEAK	DURATION†
PO, IV	2.5 hr	unknown	1 wk

†Onset = 51% inhibition; duration = return to normal following discontinuation

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Lactation.
Use Cautiously in: Pregnancy or children (safety not established).

Adverse Reactions/Side Effects

CNS: headache. **GI:** abdominal pain, diarrhea, eructation, flatulence. **Endo:** hyperglycemia.

Interactions

Drug-Drug: May alter the bioavailability and effects of **drugs for which absorption is pH dependent.** May ↑ risk of bleeding with **warfarin** (monitor INR/PT).

Route/Dosage

PO (Adults): *GERD*—40 mg once daily; *Gastric hypersecretory conditions*—40 mg twice daily, up to 120 mg twice daily.
IV (Adults): *GERD*—40 mg once daily for 7–10 days. *Gastric hypersecretory conditions*—80 mg q 12 hr (up to 240 mg/day).

Availability

Delayed-release tablets: 40 mg. **Powder for injection:** 40 mg/vial.

NURSING IMPLICATIONS

Assessment

- Assess patient routinely for epigastric or abdominal pain and for frank or occult blood in stool, emesis, or gastric aspirate.
- ***Lab Test Considerations:*** May cause abnormal liver function tests, including ↑ AST, ALT, alkaline phosphatase, and bilirubin.

Patient/Family Teaching

- Inform patient of purpose of medication.
- Advise patient to notify health care professional if nausea or vomiting occur.

Evaluation/Desired Outcomes

- Prevention of nausea and vomiting associated with initial and repeat courses of emetogenic cancer chemotherapy.

Why was this drug prescribed for your patient?

Potential Nursing Diagnoses

Acute pain (Indications)

Implementation

- Patients receiving pantoprazole IV should be converted to PO dosing as soon as possible.
- **PO:** May be administered with or without food. **Do not break, crush, or chew tablets**.
- Antacids may be used concurrently.
- **IV:** Reconstitute each vial with 10 mL of 0.9% NaCl for a concentration of 4 mg/mL. Reconstituted solution is stable for 6 hr at room temperature.
- **Direct IV:** Administer the 4 mg/mL solution undiluted. ***Rate:*** Administer over at least 2 min.
- **Intermittent Infusion:** Dilute further with 100 ml of D5W, 0.9% NaCl, or LR for a concentration of 0.4 mg/ml. Diluted solution is stable for 24 hr at room temperature. ***Rate:*** Administer over 15 min at a rate of <3 mg/min.
- **Y-Site Incompatibility:** Administer through a dedicated line or flush line before and after administration. Do not administer in line with other solutions, midazolam, solutions containing zinc.

Patient/Family Teaching

- Instruct patient to take medication as directed for the full course of therapy, even if feeling better.
- Advise patient to avoid alcohol, products containing aspirin or NSAIDs, and foods that may cause an increase in GI irritation.
- Advise patient to report onset of black, tarry stools; diarrhea; or abdominal pain to health care professional promptly.

Evaluation/Desired Outcomes

- Healing in patients with erosive esophagitis. Therapy is continued for up to 8 wk.

Why was this drug prescribed for your patient?

paroxetine hydrochloride (par-ox-e-teen)

Paxil, Paxil CR

paroxetine mesylate

Pexeva

Classification

Therapeutic: antianxiety agents, antidepressants
Pharmacologic: selective serotonin reuptake inhibitors (SSRIs)

Pregnancy Category D

Indications

Treatment of Depression, Panic disorder, OCD, Social anxiety disorder, Generalized anxiety disorder, post-traumatic stress disorder, Generalized anxiety disorder (often in conjunction with psychotherapy), Premenopausal dysphoric disorder.

Action

Inhibits neuronal reuptake of serotonin in the CNS, thus potentiating the activity of serotonin; has little effect on norepinephrine or dopamine. **Therapeutic Effects:** Antidepressant action. Decreased frequency of panic attacks, OCD, or anxiety. Improvement in manifestations of post-traumatic stress disorder. Decreased dysphoria prior to menses.

Pharmacokinetics

Absorption: Well absorbed (50–100%) following oral administration. Controlled release tablets are enteric-coated and control medication release over 4–5 hr.
Distribution: Widely distributed; enters breast milk.
Metabolism and Excretion: Highly metabolized by the liver; 2% excreted unchanged in urine.
Half-life: 21 hr.

TIME/ACTION PROFILE (antidepressant action)

ROUTE	ONSET	PEAK	DURATION
PO	1–4 wk	unknown	unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Concurrent MAO inhibitor therapy.
Use Cautiously in: Severe renal hepatic impairment; geriatric or debilitated patients (daily dose should not be >40 mg); History of mania/risk of suicide; 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); Use during the first trimester may be associated with an increased risk of malformations, consider fetal risk/maternal benefit; use during third trimester may result in neonatal serotonin syndrome requiring prolonged hospitalization, respiratory and nutritional support; Lactation, (safety not established).

Adverse Reactions/Side Effects

CNS: anxiety, dizziness, drowsiness, headache, insomnia, weakness, agitation, amnesia, confusion, emotional lability, hangover, impaired concentration, malaise, mental depression, syncope. **EENT:** blurred vision, rhinitis. **Resp:** cough, pharyngitis, respiratory disorders, yawning. **CV:** chest pain, edema, hypertension, palpitations, postural hypotension, tachycardia, vasodilation. **GI:** constipation, dry mouth, diarrhea, nausea, abdominal pain, decreased appetite, dyspepsia, flatulence, increased appetite, altered taste, vomiting. **GU:** ejaculatory disturbance, decreased libido, genital disorders, urinary disorders, urinary frequency. **Derm:** sweating, photosensitivity, pruritus, rash. **Metab:** weight gain, weight loss. **MS:** back pain, myalgia, myasthenia, myopathy. **Neuro:** tremor, myoclonus, paresthesia. **Misc:** chills, fever.

Interactions

Drug-Drug: Serious, potentially fatal reactions (hyperthermia, rigidity, myoclonus, autonomic instability, with fluctuating vital signs and extreme

CONTINUED

paroxetine hydrochloride

may cause dizziness, sensory disturbances, agitation, anxiety, nausea, and sweating.

- May cause drowsiness or dizziness. Caution patient to avoid driving and other activities requiring alertness until response to the drug is known.
- Advise patient to avoid alcohol or other CNS-depressant drugs during therapy and to consult with health care professional before taking other medications or herbal products with paroxetine.
- Inform patient that frequent mouth rinses, good oral hygiene, and sugarless gum or candy may minimize dry mouth. If dry mouth persists for more than 2 wk, consult health care professional regarding use of saliva substitute.
- Advise patient to wear sunscreen and protective clothing to prevent photosensitivity reactions.
- Instruct female patient to inform health care professional if pregnancy is planned or suspected or if she is breastfeeding.
- Advise patient to notify health care professional if headache, weakness, nausea, anorexia, anxiety, or insomnia persists.
- Emphasize the importance of follow-up exams to monitor progress. Encourage patient participation in psychotherapy.

Evaluation/Desired Outcomes

- Increased sense of well-being
- Renewed interest in surroundings. May require 1–4 wk of therapy to obtain antidepressant effects.
- Decrease in obsessive-compulsive behaviors.
- Decrease in frequency and severity of panic attacks.
- Improvement in manifestations of post-traumatic stress disorder.
- Decreased dysphoria prior to menses.

Why was this drug prescribed for your patient?

agitation, which may proceed to delirium and coma) may occur with concurrent **MAO inhibitor** therapy. **MAO inhibitors** should be stopped at least 14 days prior to paroxetine therapy. Paroxetine should be stopped at least 14 days prior to **MAO inhibitor** therapy. May ↓ the metabolism and ↑ the effects of **drugs that are metabolized by the liver** including other **antidepressants**, **class IC antiarrhythmics**, **phenothiazines**, **procyclidine**, and **quinidine**. **Cimetidine** increases blood levels. **Phenobarbital** and **phenytoin** may ↓ effectiveness. Concurrent **alcohol** is not recommended. May ↓ the effectiveness of **digoxin**. Concurrent **tryptophan** may result in headache, nausea, sweating, and dizziness. May ↑ the risk of bleeding with **warfarin**. Concurrent use with **5-HT$_1$ agonist vascular headache suppressants** (**frovatriptan**, **naratriptan**, **rizatriptan**, **sumatriptan**, **zolmitriptan**) may result in weakness, hyperreflexia and incoordination.

Route/Dosage

PO (Adults): 10–20 mg as a single dose in the morning intially, may be increased by 10 mg/day at weekly intervals (doses up to 60 mg/day have been used). *Controlled-release tablets*—25 mg once daily initially. May increase at weekly intervals by 1.25 mg, up to 62.5 mg/day. *premenstrual dysphoric disorder (controlled release)* - 12.5 mg once daily throughout cycle or during luteal phase of cycle only; may be increased to 25 mg/day after one week.

PO (Geriatric Patients or Debilitated Patients): 10 mg/day initially; may be slowly increased (not to exceed 40 mg/day). *Controlled-release tablets*—12.5 mg once daily initially; may be titrated up to 50 mg/day.

NURSING IMPLICATIONS

Assessment

- Monitor appetite and nutritional intake. Weigh weekly. Notify physician or other health care professional of continued weight loss. Adjust diet as tolerated to support nutritional status.
- **Depression:** Monitor mood changes. Inform physician or other health care professional if patient demonstrates significant increase in anxiety, nervousness, or insomnia.
- Assess for suicidal tendencies, especially during early therapy. Restrict amount of drug available to patient.
- **OCD:** Assess patient for frequency of obsessive-compulsive behaviors. Note degree to which these thoughts and behaviors interfere with daily functioning.
- **Panic Attacks:** Assess frequency and severity of panic attacks.
- **Social Anxiety Disorder:** Assess frequency and severity of episodes of anxiety.
- **Post-traumatic Stress Disorder:** Assess manifestations of post-traumatic stress disorder periodically during therapy.
- **Premenstrual Dysphoria:** Assess symptoms of premenstrual distress prior to and during therapy.
- ***Lab Test Considerations:*** Monitor CBC and differential periodically during therapy. Report leukopenia or anemia.

Implementation

- **Do not confuse paroxetine (Paxil) with paclitaxel (Taxol).**
- Paroxetine mesylate (Pexeva) cannot be substituted with paroxetine (Paxil or Paxil CR) or generic paroxetine.
- Periodically reassess dose and continued need for therapy.
- **PO:** Administer as a single dose in the morning. May administer with food to minimize GI irritation.
- **Controlled-release tablets should be swallowed whole. Do not crush, break, or chew.**

Patient/Family Teaching

- Instruct patient to take paroxetine as directed. Take missed doses as soon as possible and return to regular dosing schedule. Do not double doses. Caution patient to consult health care professional before discontinuing paroxetine. Daily doses should be decreased slowly. Abrupt withdrawal

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pegfilgrastim (peg-fil-**gra**-stim)

Neulasta

Classification

Therapeutic: colony-stimulating factors

Pregnancy Category C

Indications

To decrease the incidence of infection (febrile neutropenia) in patients with nonmyeloid malignancies receiving myelosuppressive antineoplastics associated with a high risk of febrile neutropenia.

Action

Filgrastim is a glycoprotein that binds to and stimulates neutrophils to divide and differentiate. Also activates mature neutrophils. Binding to a polyethylene glycol molecule prolongs it effects. **Therapeutic Effects:** Decreased incidence of infection in patients who are neutropenic from chemotherapy.

Pharmacokinetics

Absorption: Well absorbed following subcut administration.
Distribution: Unknown.
Metabolism and Excretion: Unknown.
Half-life: 15–80 hr.

TIME/ACTION PROFILE

ROUTE	ONSET	PEAK	DURATION
Subcut	unknown	unknown	unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity to filgrastim or *Escherichia coli*-derived proteins.

Use Cautiously in: Patients with sickle cell disease (increased risk of sickle cell crisis); Concurrent use of lithium; Malignancy with myeloid characteristics; Pregnancy, lactation, or children (safety not established; 6 mg fixed dose should not be used in infants, children, and smaller adolescents weighing <45 kg; use in pregnancy only if potential benefits to mother justifies potential risk to the fetus).

Adverse Reactions/Side Effects

Resp: ADULT RESPIRATORY DISTRESS SYNDROME (ARDS). **GI:** SPLENIC RUPTURE. **Hemat:** SICKLE CELL CRISIS, leukocytosis. **MS:** medullary bone pain. **Misc:** allergic reaction including ANAPHYLAXIS.

Interactions

Drug-Drug: Simultaneous use with **antineoplastics** may have adverse effects on rapidly proliferating neutrophils; avoid use for 24 hr before and 24 hr following chemotherapy. **Lithium** may potentiate the release of neutrophils; concurrent use should be undertaken cautiously.

Route/Dosage

Subcut: (Adults): 6 mg per chemotherapy cycle.

NURSING IMPLICATIONS

Assessment

- Assess patient for bone pain throughout therapy. Pain is usually mild to moderate and controllable with nonopioid analgesics, but may require opioid analgesics.
- Assess patient periodically for signs of ARDS (fever, lung infiltration, respiratory distress). If ARDS occurs, treat condition and discontinue pegfilgrastim and/or withold until symptoms resolve.
- ***Lab Test Considerations:*** Obtain CBC and platelet count before chemotherapy. Monitor hematocrit and platelet count regularly.
- May cause elevated LDH, alkaline phosphatase, and uric acid.

Potential Nursing Diagnoses

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

Implementation

- Pegfilgrastim should not be administered between 14 and 24 days after administration of cytotoxic chemotherapy.

PENICILLINS (pen-i-**sill**-ins)

penicillin G

Pfizerpen

penicillin V

♣Apo-Pen VK, Beepen-VK, ♣Nadopen-V, ♣Novo-Pen-VK, ♣Pen•Vee, Pen•Vee K, ♣PVF K, Veetids

procaine penicillin G

♣Ayercillin, Wycillin

benzathine penicillin G

Bicillin L-A, ♣Megacillin, Permapen

Classification

Therapeutic: anti-infectives
Pharmacologic: penicillins

Pregnancy Category B

Indications

Treatment of a wide variety of infections caused by susceptible (penicillin-sensitive) pathogens, including Pneumococcal pneumonia, Streptococcal pharyngitis, Syphilis, Gonorrhea strains. Treatment of enterococcal infections (requires the addition of an aminoglycoside). Prevention of rheumatic fever. Should not be used as a single agent to treat anthrax. **Unlabeled uses:** Treatment of Lyme disease, prevention of recurrent *S. pneumoniae* septicemia in children with sickle-cell disease.

Action

Bind to bacterial cell wall, resulting in cell death. **Therapeutic Effects:** Bactericidal action against susceptible bacteria. **Spectrum:** Active against: Most gram-positive organisms, including many streptococci (*Streptococcus pneumoniae*, group A beta-hemolytic streptococci) and staphylococci (non–penicillinase-producing strains) and *Bacillus anthracis*, some gram-negative organisms, such as *Neisseria meningitidis* and *N. gonorrhoeae (only penicillin susceptible strains)*, some anaerobic bacteria and spirochetes including *Borellia burgdorferi*.

Pharmacokinetics

Absorption: Variably absorbed from the GI tract. *Penicillin V*—resists acid degradation in the GI tract. *Procaine and benzathine penicillin*—IM absorption is delayed and prolonged and results in sustained therapeutic blood levels.
Distribution: Widely distributed, although CNS penetration is poor in the presence of uninflamed meninges. Cross the placenta and enter breast milk.
Protein Binding: 60%.
Metabolism and Excretion: Minimally metabolized by the liver, excreted mainly unchanged by the kidneys.
Half-life: 30–60 min.

TIME/ACTION PROFILE (blood levels)

ROUTE	ONSET	PEAK	DURATION
Penicillin PO	rapid	0.5–1 hr	4–6 hr
Penicillin G IM	rapid	0.25–0.5 hr	4–6 hr
Benzathine penicillin IM	delayed	12–24 hr	3 wk
Procaine penicillin IM	delayed	1–4 hr	12 hr
Penicillin G IV	rapid	end of infusion	4–6 hr

Contraindications/Precautions

Contraindicated in: Previous hypersensitivity to penicillins (cross-sensitivity may exist with cephalosporins). Hypersensitivity to procaine or benzathine (procaine and benzathine preparations only). Some products may contain tartrazine and should be avoided in patients with known hypersensitivity.

Use Cautiously in: Severe renal insufficiency (dosage reduction recommended); Pregnancy (although safety not established, has been used safely); Geriatric patients (consider decreased body mass, age-related decrease

- Keep patients with sickle cell disease receiving pegfilgrastim well hydrated and monitor for sickle cell crisis.
- **Subcut:** Administer subcut once per chemotherapy cycle. Do not administer solutions that are discolored or contain particulate matter. Do not shake. Store refrigerated; may be allowed to reach room temperature for a maximum of 48 hr, but protect from light.
- Supplied in prefilled syringes. Following administration, activate UltraSafe Needle Guard to prevent needle sticks by placing hands behind needle, grasping guard with one hand, and sliding guard forward until needle is completely covered and guard clicks into place. If audible click is not heard, guard may not be completely activated. Dispose of by placing entire prefilled syringe with guard activated into puncture-proof container.

Patient/Family Teaching

- Advise patient to notify health care professional immediately if signs of allergic reaction (shortness of breath, hives, rash, pruritus, laryngeal edema) or signs of splenic rupture (left upper abdominal or shoulder tip pain) occur.
- Emphasize the importance of compliance with therapy and regular monitoring of blood counts.
- **Home Care Issues:** Instruct patient on correct disposal technique for home administration. Caution patient not to reuse needle, syringe, or drug product. Provide patient with a puncture-proof container for disposal of prefilled syringe.

Evaluation/Desired Outcomes

- Decreased incidence of infection in patients who receive bone marrow–depressing antineoplastics.

Why was this drug prescribed for your patient?

in renal/hepatic/cardiac function, intercurrent diseases and drug therapy); Lactation.

Adverse Reactions/Side Effects

CNS: SEIZURES. **GI:** diarrhea, epigastric distress, nausea, vomiting, pseudomembranous colitis. **GU:** interstitial nephritis. **Derm:** rashes, urticaria. **Hemat:** eosinophilia, hemolytic anemia, leukopenia. **Local:** pain at IM site, phlebitis at IV site. **Misc:** allergic reactions including ANAPHYLAXIS and SERUM SICKNESS, superinfection.

Interactions

Drug-Drug: Penicillin V may decrease the effectiveness of oral contraceptive agents. **Probenecid** decreases renal excretion and increases blood levels of penicillin (therapy may be combined for this purpose). **Neomycin** may decrease the absorption of penicillin V. Concurrent use with **methotrexate** decreases methotrexate elimination and increases the risk of serious toxicity.

Route/Dosage

1 mg = 1600 units.

Penicillin G

IM, IV (Adults): *Most infections*—1–5 million units q 4–6 hr.
IM, IV (Children): 8333–16,667 units/kg q 4 hr; 12,550–25,000 units/kg q 6 hr; up to 250,000 units/kg/day in divided doses, some infections may require up to 300,000 units/kg/day.
IV (Infants >7 days): 75,000 units/kg/day in divided doses every 8 hr; *meningitis*—200,000–300,000 units/kg/day in divided doses q 6 hr.
IV (Infants <7 days): 50,000 units/kg/day in divided doses q 12 hr; *streptococcus B. meningitis*—100,000–150,000 units/kg/day in divided doses.

Penicillin V

PO (Adults and Children ≥12 yr): *Most infections*—125–500 mg q 6–8 hr. *Rheumatic fever prevention*—125–250 mg q 12 hr.
PO (Children <12 yr): *Lyme disease*—50 mg/kg/day in 4 divided doses (unlabeled); prevention of s. pneumoniae sepsis in children with sickle cell disease—125 mg twice daily.

Benzathine Penicillin G

IM (Adults): *Streptococcal infections/erysipeloid*—1.2 million units single dose. *Primary, secondary, and early latent syphilis*—2.4 million units single dose. *Tertiary and late latent syphilis (not neurosyphilis)*—2.4 million units once weekly for 3 wk. *Prevention of rheumatic fever*—1.2 million units q 3–4 wk.
IM (Children >27 kg): *Streptococcal infections/erysipeloid*—900,000–1.2 million units (single dose). *Primary, secondary, and early latent syphilis*—up to 2.4 million units single dose. *Late latent or latent syphilis of undetermined duration*—50,000 units/kg weekly for 3 wk. *Prevention of rheumatic fever*—1.2 million units q 2–3 wk.
IM (Children <27 kg): *Streptococcal infections/erysipeloid*—300,000–600,000 units single dose. *Primary, secondary, and early latent syphilis*—up to 2.4 million units single dose. *Late latent or latent syphilis of undetermined duration*—50,000 units/kg weekly for 3 wk. *Prevention of rheumatic fever*—1.2 million units q 2–3 wk.

Procaine Penicillin G

IM (Adults): *Moderate or severe infections*—600,000–1.2 million units/day, single dose or 2 divided doses. *Neurosyphilis*—2.4 million units/day with 500 mg probenecid PO 4 times daily for 10–14 days.
IM (Children): *Congenital syphilis*—50,000 units/kg/day for 10–14 days.

NURSING IMPLICATIONS

Assessment

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

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CONTINUED

PENICILLINS

- Obtain a history to determine previous 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 or other health care professional immediately if these symptoms occur. Keep epinephrine, an antihistamine, and resuscitation equipment close by in case of an anaphylactic reaction.**
- ***Lab Test Considerations:*** May cause positive direct Coombs' test results.
- Hyperkalemia may develop after large doses of penicillin G potassium.
- Monitor serum sodium concentrations in patient with hypertension or CHF. Hypernatremia may develop after large doses of penicillin sodium.
- May cause ↑ AST, ALT, LDH, and serum alkaline phosphatase concentrations.
- May cause leukopenia and neutropenia, especially with prolonged therapy or hepatic impairment.

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 penicillin with penicillamine. Do not confuse penicillin G potassium with penicillin G procaine.**
- **PO:** Administer around the clock. Penicillin V may be administered without regard to meals.
- Use calibrated measuring device for liquid preparations. Solution is stable for 14 days if refrigerated.
- **IV:** Reconstitute according to manufacturer's directions with sterile water for injection, D5W, or 0.9% NaCl.
- **IM:** Shake medication well before injection. Inject penicillin deep into a well-developed muscle mass at a slow, consistent rate to prevent blockage of the needle. Massage well. Accidental injury near or into a nerve can result in severe pain and dysfunction.
- Penicillin G potassium or sodium may be diluted with lidocaine (without epinephrine) 1% or 2% to minimize pain from IM injection.
- Never give penicillin G benzathine or penicillin G procaine suspensions IV; may cause embolism or toxic reactions.
- **IV:** Change IV sites every 48 hr to prevent phlebitis.
- Administer slowly and observe patient closely for signs of hypersensitivity.
- **Intermittent Infusion:** Doses of 3 million units or less should be diluted in at least 50 ml of D5W or 0.9% NaCl; doses of more than 3 million units should be diluted with 100 ml. ***Rate:*** Infuse over 1–2 hr in adults or 15–30 min in children.
- **Continuous Infusion:** Doses of 10 million units or more may be diluted in 1 or 2 L. ***Rate:*** Infuse over 24 hr.

Penicillin G Potassium

- **Y-Site Compatibility:** acyclovir, amiodarone, cyclophosphamide, diltiazem, enalaprilat, esmolol, fluconazole, foscarnet, heparin, hydromorphone, labetalol, magnesium sulfate, meperidine, morphine, perphenazine, potassium chloride, tacrolimus, theophylline, verapamil, vitamin B complex with C.

phenobarbital (fee-noe-**bar**-bi-tal)

♣Ancalixir, Luminal, Solfoton

Classification

Therapeutic: anticonvulsants, sedative/hypnotics
Pharmacologic: barbiturates

Schedule IV

Pregnancy Category D

Indications

Anticonvulsant. Sedative (preoperative and other). Hypnotic (short-term). **Unlabeled uses:** Prevention/treatment of hyperbilirubinemia.

Action

Produces all levels of CNS depression. Inhibits transmission in CNS and ↑ seizure threshold. Induces liver enzymes that metabolize drugs, bilirubin, and other compounds. **Therapeutic Effects:** Anticonvulsant activity. Sedation.

Pharmacokinetics

Absorption: Absorption is slow but complete (70–90%).
Distribution: Unknown.
Metabolism and Excretion: 75% metabolized by the liver; 25% excreted unchanged by the kidneys.
Half-life: 2–6 days.

TIME/ACTION PROFILE (sedation†)

ROUTE	ONSET	PEAK	DURATION
PO	30–60 min	unknown	>6 hr
IM, subcut	10–30 min	unknown	4–6 hr
IV	5 min	30 min	4–6 hr

†Full anticonvulsant effects occur after 2–3 wk of chronic dosing unless a loading dose has been used

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Pre-existing CNS depression. Uncontrolled severe pain. Known alcohol intolerance (elixir only). Lactation.
Use Cautiously in: Hepatic/renal impairment; History of suicide attempt or drug abuse; Geriatric patients (↓ initial dose); Pregnancy (chronic use causes drug dependency in infant; may result in coagulation defects/fetal malformation; acute use at term may cause respiratory depression in the newborn).

Adverse Reactions/Side Effects

CNS: hangover, delirium, depression, drowsiness, excitation, lethargy, vertigo. **Resp:** respiratory depression; *IV*— LARYNGOSPASM, bronchospasm. **CV:** *IV*— hypotension. **GI:** constipation, diarrhea, nausea, vomiting. **Derm:** photosensitivity, rashes, urticaria. **Local:** phlebitis at IV site. **MS:** arthralgia, myalgia, neuralgia. **Misc:** hypersensitivity reactions including ANGIOEDEMA and SERUM SICKNESS, physical dependence, psychological dependence.

Interactions

Drug-Drug: Additive CNS depression with other **CNS depressants,** including **alcohol, antihistamines, opioid analgesics,** and other **sedative/hypnotics.** May induce hepatic enzymes that metabolize other drugs, decreasing their effectiveness, including **hormonal contraceptives, warfarin, chloramphenicol, cyclosporine, dacarbazine, corticosteroids, tricyclic antidepressants,** and **quinidine**. May increase the risk of hepatic toxicity of **acetaminophen. MAO inhibitors, valproic acid**, or **divalproex** may decrease the metabolism of phenobarbital, increasing sedation. May increase the risk of hematologic toxicity with **cyclophosphamide**.
Drug-Natural Products: Concomitant use of **kava, valerian, skullcap, chamomile,** or **hops** can increase CNS depression. **St. John's wort** may decrease effects.

Route/Dosage

PO (Adults): *Anticonvulsant*—60–250 mg/day single dose or 2–3 divided doses. *Sedative*—30–120 mg/day in 2–3 divided doses. *Hypnotic*—100–320 mg at bedtime. *Hyperbilirubinemia*—30–60 mg 3 times daily.
PO (Children): *Anticonvulsant*—1–6 mg/kg/day, single dose or divided doses. *Sedative*—2 mg/kg (60 mg/m²) 3 times daily. *Hyperbilirubinemia*—1–4 mg/kg 3 times daily.

- **Y-Site Incompatibility:** If aminoglycosides and penicillins must be administered concurrently, administer in separate sites at least 1 hr apart.
- **Additive Incompatibility:** amphotericin B. Incompatible with aminoglycosides; do not admix.

Penicillin G Sodium

- **Y-Site Incompatibility:** If aminoglycosides and penicillins must be administered concurrently, administer in separate sites at least 1 hr apart.

Patient/Family Teaching

- Instruct patient to take medication around the clock and to finish drug completely as directed, even if feeling better. Advise patient that sharing this medication may be dangerous.
- Advise patient to report signs of superinfection (black furry overgrowth on tongue, vaginal itching or discharge, loose or foul-smelling stools) and allergy.
- Instruct patient to notify health care professional if fever and diarrhea develop, especially if stool contains blood, pus, or mucus. Advise patient not to treat diarrhea without consulting health care professional.
- Instruct patient to notify health care professional if symptoms do not improve.
- Advise patient taking oral contraceptives to use an additional nonhormonal method of contraception during therapy with penicillin V and until next menstrual period.
- Patient with an allergy to penicillin should be instructed to always carry an identification card with this information.

Evaluation/Desired Outcomes

- Resolution of signs and symptoms of infection. Length of time for complete resolution depends on the organism and site of infection.
- Prevention of rheumatic fever.

Why was this drug prescribed for your patient?

PO, IM, IV (Children): *Preoperative sedative*—1–3 mg/kg 60–90 min preop.
PO, IM (Neonates): *Hyperbilirubinemia*—5–10 mg/kg/day.
IM, IV (Adults): *Sedative*—30–120 mg/day in 2–3 divided doses. *Preoperative sedative*—130–200 mg 60–90 min preop. *Hypnotic*—100–325 mg at bedtime.
IV (Adults): *Anticonvulsant*—100–320 mg initially (total of 600 mg/24-hr period). *Status epilepticus*—10–20 mg/kg.
IV (Children): *Anticonvulsant*—10–20 mg/kg initially, followed by 1–6 mg/kg/day. *Status epilepticus*—15–20 mg/kg.

NURSING IMPLICATIONS

Assessment

- **Monitor respiratory status, pulse, and blood pressure frequently in patients receiving phenobarbital IV. Equipment for resuscitation and artificial ventilation should be readily available. Respiratory depression is dose-dependent.**
- Prolonged therapy may lead to psychological or physical dependence. Restrict amount of drug available to patient, especially if depressed, suicidal, or with a history of addiction.
- **Seizures:** Assess location, duration, and characteristics of seizure activity.
- **Sedation:** Assess level of consciousness and anxiety when phenobarbital is used as a preoperative sedative.
- Assess postoperative patients for pain. Phenobarbital may increase sensitivity to painful stimuli.
- ***Lab Test Considerations:*** Patients on prolonged therapy should have hepatic and renal function and CBC evaluated periodically.
- Serum folate concentrations should be monitored periodically because of increased folate requirements of patients on long-term anticonvulsant therapy with phenobarbital.
- May cause decreased serum bilirubin concentrations in neonates, in patients with congenital nonhemolytic unconjugated hyperbilirubinemia, and in epileptics.
- ***Toxicity and Overdose:*** Serum phenobarbital levels may be monitored when used as an anticonvulsant. Therapeutic blood levels are 10–40 mcg/ml. Symptoms of toxicity include confusion, drowsiness, dyspnea, slurred speech, and staggering.

Potential Nursing Diagnoses

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

Implementation

- **Do not confuse phenobarbital with pentobarbital.**
- Supervise ambulation and transfer of patients following administration. Remove cigarettes. Side rails should be raised and call bell within reach at all times. Keep bed in low position. Institute seizure precautions.
- **PO:** Tablets may be crushed and mixed with food or fluids (do not administer dry) for patients with difficulty swallowing. Oral solution may be taken undiluted or mixed with water, milk, or fruit juice. Use calibrated measuring device for accurate measurement of liquid doses.
- **IM:** Injections should be given deep into the gluteal muscle to minimize tissue irritation. Do not inject >5 ml into any one site because of tissue irritation.
- **IV:** Doses may require 15–30 min to reach peak concentrations in the brain. Administer minimal dose and wait for effectiveness before administering second dose to prevent cumulative barbiturate-induced depression.
- **Direct IV:** Reconstitute sterile powder for IV dose with a minimum of 3 ml of sterile water for injection. Dilute further with 10 ml of sterile water. Do not use solution that is not absolutely clear within 5 min after reconstitution or that contains a precipitate. Discard powder or solution that has been exposed to air for longer than 30 min.
- Solution is highly alkaline; avoid extravasation, which may cause tissue damage and necrosis. If extravasation occurs, injection of 5% procaine solution into affected area and application of moist heat may be ordered. ***Rate:*** Administer each 60 mg over at least 1 min. Titrate slowly for desired response. Rapid administration may result in respiratory depression.
- **Y-Site Compatibility:** enalaprilat, gatifloxacin, levofloxacin, linezolid, meropenem, propofol, sufentanil.
- **Y-Site Incompatibility:** hydromorphone.

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phenobarbital

Patient/Family Teaching

- Advise patient to take medication exactly as directed. If a dose is missed, take as soon as remembered if it is not almost time for next dose; do not double doses.
- Advise patient on prolonged therapy not to discontinue medication without consulting health care professional. Abrupt withdrawal may precipitate seizures or status epilepticus.
- Medication may cause daytime drowsiness. Caution patient to avoid driving and other activities requiring alertness until response to medication is known. Do not resume driving until physician gives clearance based on control of seizure disorder.
- Caution patient to avoid taking alcohol or other CNS depressants concurrently with this medication.
- Advise female patient using oral contraceptives to use an additional nonhormonal contraceptive during therapy and until next menstrual period. Instruct patient to contact health care professional immediately if pregnancy is suspected.
- Advise patient to notify health care professional if fever, sore throat, mouth sores, unusual bleeding or bruising, nosebleeds, or petechiae occur.

Evaluation/Desired Outcomes

- Decrease or cessation of seizure activity without excessive sedation. Several weeks may be required to achieve maximum anticonvulsant effects.
- Preoperative sedation.
- Improvement in sleep patterns.
- Decrease in serum bilirubin levels.

Why was this drug prescribed for your patient?

PHENYTOIN/FOSPHENYTOIN

phenytoin (**fen**-i-toyn)
Dilantin, Diphenylhydantoin, DPH, Phenytek

fosphenytoin (foss-**fen**-i-toyn)
Cerebyx

Classification
Therapeutic: antiarrhythmics (class IB), anticonvulsants
Pharmacologic: hydantoins

Pregnancy Category C (phenytoin), D (fosphenytoin)

Indications

Phenytoin: Treatment/prevention of tonic-clonic (grand mal) seizures and complex partial seizures. **Fosphenytoin:** Short-term (<5 day) management of seizures when oral phenytoin use is not feasible. Treatment/prevention of seizures during neurosurgery. **Unlabeled uses: Phenytoin:** As an antiarrhythmic, particularly for arrhythmias associated with cardiac glycoside toxicity. Management of painful syndromes, including trigeminal neuralgia.

Action

Limits seizure propagation by altering ion transport. Antiarrhythmic properties cause improvement in AV conduction. May also decrease synaptic transmission. Fosphenytoin is rapidly converted to phenytoin, which is responsible for its pharmacologic effects. **Therapeutic Effects:** Diminished seizure activity. Control of arrhythmias. Decreased pain.

Pharmacokinetics

Absorption: *Phenytoin*—Absorbed slowly from the GI tract. Bioavailability differs between extended and prompt release products. *Fosphenytoin*—Rapidly converted to phenytoin following IV administration and completely absorbed following IM administration.

Distribution: Distributes into CSF and other body tissues and fluids. Enters breast milk; crosses the placenta achieving similar maternal/fetal levels. Preferentially distributes into fatty tissue.
Metabolism and Excretion: Mostly metabolized by the liver; minimal amounts excreted in the urine.
Half-life: *Fosphenytoin*—15 min; *phenytoin*—22 hr (longer at higher blood levels).

TIME/ACTION PROFILE (anticonvulsant effect)

ROUTE	ONSET†	PEAK	DURATION
Fosphenytoin IM	unknown	30 min	up to 24 hr
Fosphenytoin IV	15–45 min	15–60 min	up to 24 hr
Phenytoin PO	2–24 hr (1 wk)	1.5–3 hr	6–12 hr
Phenytoin PO-ER	2–24 hr (1 wk)	4–12 hr	12–36 hr
Phenytoin IV	1–2 hr (1 wk)	rapid	12–24 hr

† = time required for onset of action without a loading dose

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Hypersensitivity to propylene glycol (phenytoin injection only). Alcohol intolerance (phenytoin injection and liquid only). Sinus bradycardia, sinoatrial block, second- or third-degree heart block, or Stokes-Adams syndrome.
Use Cautiously in: Hepatic or renal disease (increased risk of adverse reactions; dosage reduction recommended for hepatic impairment); Geriatric patients or those with severe cardiac or respiratory disease (parenteral use—increased risk of serious adverse reactions especially with IV phenytoin); Obese patients (initial dose of IV phenytoin should be based on ideal body weight + 1.33 times excess weight); Pregnancy (safety not established; may result in fetal hydantoin syndrome if used chronically or hemorrhage in the newborn if used at term); Lactation (safety not established).

Adverse Reactions/Side Effects

Most listed are for chronic use of phenytoin. **CNS:** ataxia, agitation, cerebral edema, coma, dizziness, drowsiness, dysarthria, dyskinesia, extrapyramidal

syndrome, headache, nervousness, weakness. **EENT:** diplopia, nystagmus, tinnitus. **CV:** hypotension (increased with IV phenytoin), tachycardia, vasodilation. **GI:** gingival hyperplasia, nausea, altered taste, anorexia, constipation, drug-induced hepatitis, dry mouth, vomiting, weight loss. **GU:** pink, red, reddish-brown discoloration of urine. **Derm:** hypertrichosis, rashes, exfoliative dermatitis, pruritus. **F and E:** hypocalcemia. **Hemat:** AGRANULOCYTOSIS, APLASTIC ANEMIA, leukopenia, megaloblastic anemia, thrombocytopenia. **MS:** back pain, osteomalacia, pelvic pain. **Misc:** allergic reactions including STEVENS-JOHNSON SYNDROME, fever, lymphadenopathy.

Interactions

Drug-Drug: Phenylbutazone, **disulfiram**, acute ingestion of **alcohol**, **amiodarone**, **isoniazid**, **chloramphenicol**, **influenza vaccine**, **sulfonamides, disulfiram**, **fluoxetine**, **benzodiazepines, omeprazole itraconazole**, **ketoconazole**, **fluconazole**, **miconazole**, **estrogens**, **halothane**, **methylphenidate**, **phenothiazines, salicylates, tolbutamide**, **trazodone**, **felbamate**, and **cimetidine** may increase phenytoin blood levels. **Barbiturates, carbamazepine**, **reserpine**, chronic ingestion of **alcohol,** and may decrease phenytoin blood levels. Phenytoin may alter the effects of **felbamate**, **corticosteroids, doxycycline**, **rifampin**, **quinidine**, **methadone**, **cyclosporine**, and **estrogens.** IV phenytoin and **dopamine** may cause additive hypotension. Additive CNS depression with other **CNS depressants,** including **alcohol, antihistamines, antidepressants, opioid analgesics,** and **sedative/hypnotics. Antacids** may decrease absorption of orally administered phenytoin. May decrease the effectiveness of **streptozocin** or **theophylline**. Additive cardiac depression may occur with **propranolol** or **lidocaine**. **Calcium** and **sucralfate** decrease phenytoin absorption. Initially phenytoin will increase the effects of **warfarin** in patients stabilized on **warfarin** therapy, this is followed by a decreased response to **warfarin** (monitoring of response to **warfarin** recommended during initiation and maintenance of phenytoin with appropriate adjustments made).

Drug-Food: Phenytoin may decrease absorption of **folic acid.** Concurrent administration of **enteral tube feedings** may decrease phenytoin absorption.

Route/Dosage

All doses are expressed as phenytoin sodium equivalents (PE).

Fosphenytoin

IV (Adults and Children): ***Status Epilepticus*—** 15–20 mg PE/kg.
IV, IM (Adults and Children): *Nonemergent and Maintenance Dosing*—10–20 mg PE/kg (loading dose); 4–6 mg PE/kg/day (maintenance dose).

Phenytoin

PO (Adults): ***Anticonvulsant*—** Loading dose 1 g or 20 mg/kg as extended capsules in 3–4 divided doses at 2-hr intervals or as 400 mg, then 300 mg q 2 hr for 2 doses; maintenance dose 300–400 mg/day. May be given once daily as extended capsules (Dilantin Kapseals) or in 3 divided doses; usual maximum dose 600 mg/day.
PO (Geriatric Patients): 3 mg/kg/day in divided doses.
PO (Children): Initially 5 mg/kg/day; maintenance dose 4–8 mg/kg/day (250 mg/m^2) in 2–3 divided doses (not to exceed 300 mg/day).
IV (Adults): 15–20 mg/kg. Rate not to exceed 25–50 mg/min, followed by 100 mg q 6–8 hr.
IV (Children): 15–20 mg/kg (250 mg/m^2) at 1–3 mg/kg/min.
IV (Adults): ***Antiarrhythmic*** —50–100 mg q 10–15 min until arrhythmia is abolished, 15 mg/kg has been given, or toxicity occurs.
PO (Adults): ***Antineuralgic*** —200–600 mg/day in divided doses.

NURSING IMPLICATIONS

Assessment

- **Seizures:** Assess location, duration, frequency, and characteristics of seizure activity. EEG may be monitored periodically throughout therapy.

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PHENYTOIN/FOSPHENYTOIN

- **Arrhythmias:** Monitor ECG continuously during treatment of arrhythmias.
- **Neuralgia:** Assess pain (location, duration, intensity, precipitating factors) before and periodically throughout therapy.
- **Phenytoin:** Assess oral hygiene. Vigorous cleaning beginning within 10 days of initiation of phenytoin therapy may help control gingival hyperplasia.
- **Assess patient for phenytoin hypersensitivity syndrome (fever, skin rash, lymphadenopathy). Rash usually occurs within the first 2 wk of therapy. Hypersensitivity syndrome usually occurs 3–8 wk, but may occur up to 12 wk after initiation of therapy. May lead to renal failure, rhabdomyolysis, or hepatic necrosis; may be fatal.**
- **Fosphenytoin:** Monitor blood pressure, ECG, and respiratory function continuously during administration of fosphenytoin and throughout period when peak serum plasma occurs (10–20 min following infusion).
- **Observe patient for development of rash. Fosphenytoin should be discontinued at the first sign of skin reactions. Serious adverse reactions such as exfoliative, purpuric, or bullous rashes or the development of lupus erythematosus, Stevens-Johnson syndrome, or toxic epidermal necrolysis preclude further use of phenytoin or fosphenytoin. If less serious skin eruptions (measles-like or scarlatiniform) occur, fosphenytoin may be resumed after complete clearing of the rash. If rash reappears, further use of fosphenytoin or phenytoin should be avoided.**
- ***Lab Test Considerations:*** *Phenytoin:* **CBC and platelet count, serum calcium, albumin, urinalysis, and hepatic and thyroid function tests should be monitored before and monthly for the first several months, then periodically throughout therapy.**
- May cause increased serum alkaline phosphatase, GTT, and glucose levels.
- Serum folate concentrations should be monitored periodically during prolonged therapy.
- ***Toxicity and Overdose:*** **Phenytoin:** Serum phenytoin levels should be routinely monitored. Therapeutic blood levels are 10–20 mcg/ml in patients with normal serum albumin and renal function. In patients with altered protein binding (neonates, patients with renal failure, hypoalbuminemia, acute trauma), free phenytoin serum concentrations should be monitored. Therapeutic serum free phenytoin levels are 0.8–2 mcg/ml. Progressive signs and symptoms of phenytoin toxicity include nystagmus, ataxia, confusion, nausea, slurred speech, and dizziness.

Potential Nursing Diagnoses

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

Implementation

- **Do not confuse fosphenytoin (Cerebyx) with celecoxib (Celebrex) or with citalopram (Celexa).**
- Implement seizure precautions.
- When transferring from phenytoin to another anticonvulsant, dosage adjustments are made gradually over several weeks.
- When substituting *fosphenytoin* for oral *phenytoin* therapy, the same total daily dose may be given as a single dose. Unlike parenteral phenytoin, fosphenytoin may be given safely by the IM route.
- The anticonvulsant effect of fosphenytoin is not immediate. Additional measures (including parenteral benzodiazepines) are usually required in

CONTINUED

PHENYTOIN/FOSPHENYTOIN

- **Phenytoin:** Instruct patient to take medication exactly as directed, at the same time each day. If a dose is missed from a once-a-day schedule, take as soon as possible and return to regular dosing schedule. If taking several doses a day, take missed dose as soon as possible within 4 hr of next scheduled dose; do not double doses. Consult health care professional if doses are missed for 2 consecutive days. Abrupt withdrawal may lead to status epilepticus.
- Caution patient to avoid taking alcohol or OTC medications concurrently with phenytoin without consulting health care professional.
- Instruct patient on importance of maintaining good dental hygiene and seeing dentist frequently for teeth cleaning to prevent tenderness, bleeding, and gingival hyperplasia. Institution of oral hygiene program within 10 days of initiation of phenytoin therapy may minimize growth rate and severity of gingival enlargement. Patients under 23 yr of age and those taking doses >500 mg/day are at increased risk for gingival hyperplasia.
- Advise patient that brands of phenytoin may not be equivalent. Check with health care professional if brand or dosage form is changed.
- Inform patient that phenytoin may color urine pink, red, or reddish brown, but color change is not significant.
- Advise diabetic patient to monitor blood glucose carefully and to notify health care professional of significant changes.
- Instruct patient to notify health care professional of medication regimen before treatment or surgery.
- Advise patient not to take phenytoin within 2–3 hr of antacids or antidiarrheals.
- Advise female patient to use an additional nonhormonal method of contraception during therapy and until next menstrual period. Instruct patient to notify health care professional if pregnancy is planned or suspected.

Evaluation/Desired Outcomes

- Decrease or cessation of seizures without excessive sedation.
- Suppression of arrhythmias.
- Relief of pain caused by neuralgia.

Why was this drug prescribed for your patient?

the immediate management of status epilepticus. Loading dosage of *fosphenytoin* should be followed with the institution of maintenance anticonvulsant therapy.

- **PO:** Administer with or immediately after meals to minimize GI irritation. Shake liquid preparations well before pouring. Use a calibrated measuring device for accurate dosage. Chewable tablets must be crushed or chewed well before swallowing. Capsules may be opened and mixed with food or fluids for patients with difficulty swallowing. To prevent direct contact of alkaline drug with mucosa, have patient swallow a liquid first, follow with mixture of medication, then follow with a full glass of water or milk or with food.
- If patient is receiving enteral tube feedings, 2 hr should elapse between feeding and phenytoin administration. If phenytoin is administered via nasogastric tube, flush tube with 2–4 oz water before and after administration.
- Do not interchange chewable phenytoin tablets with phenytoin sodium capsules, because they are not bioequivalent.
- Capsules labeled "extended" may be used for once-a-day dosage (Dilantin Kapseals only); those labeled "prompt" may result in toxic serum levels if used for once-a-day dosage.

Phenytoin

- **IV:** Slight yellow color will not alter solution potency. If refrigerated, may form precipitate, which dissolves after warming to room temperature. Discard solution that is not clear.
- To prevent precipitation and minimize local venous irritation, follow infusion with 0.9% NaCl. Avoid extravasation; phenytoin is caustic to tissues.
- **Direct IV:** Administer at a rate not to exceed 50 mg over 1 min (25 mg/min [may be as low as 5–10 mg/min] in patients who may develop hypotension, patients who are on sympathomimetic medication, patients with cardiovascular disease, or geriatric patients; 1–3 mg/kg/min in neonates). Rapid administration may result in severe hypotension, cardiovascular collapse, or CNS depression.
- **Intermittent Infusion:** Administer by mixing with no more than 50 ml of 0.9% NaCl in a concentration of 1–10 mg/ml. Administer immediately following admixture. Use tubing with a 0.45- to 0.22-micron in-line filter. ***Rate:*** Complete infusion within 1 hr at a rate not to exceed 50 mg/min. Monitor cardiac function and blood pressure throughout infusion.
- **Y-Site Compatibility:** esmolol, famotidine, fluconazole, foscarnet, tacrolimus.
- **Y-Site Incompatibility:** ciprofloxacin, diltiazem, enalaprilat, hydromorphone, potassium chloride, sufentanil, vitamin B complex with C.
- **Additive Incompatibility:** Do not admix with other solutions or medications, especially dextrose, because precipitation will occur.

Fosphenytoin

- **Direct IV:** Dilute fosphenytoin in D5W or 0.9% NaCl for a concentration of 1.5–25 mg PE/kg. May be refrigerated for up to 48 hours. ***Rate:*** Administer at a rate of <150 mg PE/min to minimize risk of hypotension.
- **Additive Incompatibility:** Information unavailable. Do not admix with other solutions or medications.

Patient/Family Teaching

- May cause drowsiness or dizziness. Caution patient to avoid driving or other activities requiring alertness until response to medication is known. Do not resume driving until physician gives clearance based on control of seizure disorder.
- Advise patient to carry identification at all times describing disease process and medication regimen.
- Advise patient to notify health care professional if skin rash, severe nausea or vomiting, drowsiness, slurred speech, unsteady gait, swollen glands, bleeding or tender gums, yellow skin or eyes, joint pain, fever, sore throat, unusual bleeding or bruising, or persistent headache occurs.
- Emphasize the importance of routine exams to monitor progress. Patient should have routine physical exams, especially monitoring skin and lymph nodes, and EEG testing.

CONTINUED

phosphate/biphosphate (foss-fate/bye-foss-fate)

Fleet Enema, Fleet Phospho-Soda, Visicol

Classification

Therapeutic: laxatives (saline)

Pregnancy Category UK

Indications

Preparation of the bowel prior to surgery or radiologic studies. Intermittent treatment of chronic constipation. **Visicol:** Cleansing of the bowel as a preparation for colonoscopy in adults 18 years of age or older.

Action

Osmotically active in the lumen of the GI tract. Produces laxative effect by causing water retention and stimulation of peristalsis. Stimulates motility and inhibits fluid and electrolyte absorption from the small intestine. **Therapeutic Effects:** Relief of constipation. Emptying of the bowel.

Pharmacokinetics

Absorption: 1–20% of rectally administered sodium and phosphate may be absorbed; some absorption follows oral administration.
Distribution: Unknown.
Metabolism and Excretion: Excreted by the kidneys.
Half-life: Unknown.

TIME/ACTION PROFILE (laxative effect)

ROUTE	ONSET	PEAK	DURATION
PO	0.5–3 hr	unknown	unknown
Rect	2–5 min	unknown	unknown

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Abdominal pain, nausea, or vomiting, especially when associated with fever or other signs of an acute abdomen. Severe renal or cardiovascular disease. Intestinal obstruction. Pregnancy (at term). *Visicol*—congestive heart failure, ascites, unstable angina, acute colitis, toxic megacolon or hypomotility syndrome.
Use Cautiously in: Excessive or chronic use (may lead to dependence); Renal or cardiovascular disease, dehydration or concurrent use of diuretics or other drugs known to alter electrolytes (correct abnormalities prior to administration); Pregnancy (may cause sodium retention and edema); *Visicol tablets*—use cautiously within 3 mos of MI, cardiac surgery, in patients with acute exacerbations of inflammatory bowel disease.

Adverse Reactions/Side Effects

CNS: *Visicol*— dizziness, headache. **CV:** ARRHYTHMIAS. **GI:** cramping, nausea, colonic aphtous ulcerations; *Visicol*—abdominal bloating, abdominal pain, vomiting. **F and E:** hyperphosphatemia, hypocalcemia, hypokalemia, sodium retention.

Interactions

Drug-Drug: *Visicol*—Concurrently administered oral medications may not be absorbed due to rapid peristalsis and diarrhea.

Route/Dosage

Each Fleet Enema contains 4.4 g sodium/118 ml. Each 20 ml of Fleet Phospho-Soda oral solution contains 96.4 mEq sodium.
PO (Adults): 20–30 ml Phospho-Soda; *Visicol*—evening before colonoscopy: 3 tablets every 15 min (with at least 8 oz of water), last dose will be 2 tablets (total of 20 tablets), on morning of colonoscopy starting 3–5 hr before procedure, 3 tablets every 15 min (with at least 8 oz of clear liquids), last dose will be 2 tablets (total of 20 tablets); should not be repeated in less than 7 days.
PO (Children): 5–15 ml Phospho-Soda.

pioglitazone (pi-o-glit-a-zone)

Actos

Classification

Therapeutic: antidiabetics
Pharmacologic: thiazolidinediones

Pregnancy Category C

Indications

Management of type 2 diabetes mellitus; may also be used with a sulfonylurea, metformin, or insulin when the combination of diet, exercise, and metformin does not achieve glycemic control.

Action

Improves sensitivity to insulin by acting as an agonist at receptor sites involved in insulin responsiveness and subsequent glucose production and utilization. Requires insulin for activity. **Therapeutic Effects:** Decreased insulin resistance resulting in glycemic control without hypoglycemia.

Pharmacokinetics

Absorption: Well absorbed after oral administration.
Distribution: Unknown.
Protein Binding: >99 % bound to plasma proteins; active metabolites are also highly (>99 %) bound.
Metabolism and Excretion: Extensively metabolized by the liver; at least two metabolites have pharmacologic activity. Minimal renal excretion of unchanged drug.
Half-life: *Pioglitazone*—3–7 hr; *total pioglitazone (pioglitazone plus metabolites)*—16–24 hr.

TIME/ACTION PROFILE (effects on blood glucose)

ROUTE	ONSET	PEAK	DURATION
PO	30 min	2–4 hr	24 hr

Contraindications/Precautions

Contraindicated in: Hypersensitivity. Diabetic ketoacidosis. Clinical evidence of active liver disease or increased ALT (>2.5 times upper limit of normal). Pregnancy or lactation (not recommended for use during pregnancy or lactation; insulin should be used). Children <18 yr or Type 1 diabetes (requires insulin for activity).
Use Cautiously in: Edema; Congestive heart failure (CHF) (avoid use in moderate to severe CHF); Hepatic impairment; Women with childbearing potential (may restore ovulation and risk of pregnancy).

Adverse Reactions/Side Effects

CV: edema. **Hemat:** anemia.

Interactions

Drug-Drug: May ↓ efficacy of **hormonal contraceptives.** Pioglitazone is metabolized by the CYP450 3A4 enzyme system. Concurrent use of drugs that alter the activity of this system may result in drug-drug interactions. **Ketoconazole** may ↑ effects of pioglitazone. Concurrent use with **insulin** may ↑ risk of CHF (consider predisposing factors).
Drug-Natural Products: Glucosamine may worsen blood glucose control. **Chromium** and **coenzyme Q-10** may produce ↑ hypoglycemic effects.

Route/Dosage

PO (Adults): 15–30 mg once daily, may be increased to 45 mg/day if needed. Doses greater than 30 mg have not been evaluated in combination with insulin and other antidiabetics.

Rect (Adults and Children >12 yr): 118 ml Fleet Enema.
Rect (Children >2 yr): ½ of the adult dose.

NURSING IMPLICATIONS

Assessment

- Assess patient for fever, abdominal distention, presence of bowel sounds, and usual pattern of bowel function.
- Assess color, consistency, and amount of stool produced.
- May rarely cause arrhythmias. Monitor patients with underlying cardiovascular disease, renal disease, bowel perforation, misuse or over dose.
- ***Lab Test Considerations:*** May cause increased serum sodium and phosphorus levels, decreased serum calcium and potassium levels, and acidosis. Electrolyte changes are transient, self-limiting, do not require treatment and are not usually associated with adverse clinical events.

Potential Nursing Diagnoses

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

Implementation

- Do not administer at bedtime or late in the day.
- **PO:** Administer on an empty stomach for more rapid results. Mix dose in at least ½ glass cold water. May be followed by carbonated beverage or fruit juice to improve flavor.
- See Route and Dose section for dosing of Visicol. Undigested Visicol tablets may appear in the stool or be visualized during colonoscopy.
- **Rect:** Position patient on left side with knee slightly flexed. Insert prelubricated tip about 2 in. into rectum, aiming toward the umbilicus. Gently squeeze bottle until empty. Discontinue if resistance is met, because perforation may occur if contents are forced into rectum.

Patient/Family Teaching

- Advise patient that laxatives should be used only for short-term therapy. Long-term therapy may cause electrolyte imbalance and dependence.
- Caution patient on sodium restriction that this product has a high sodium content.
- Advise patient not to take oral form of this medication within 2 hr of other medications.
- Encourage patient to use other forms of bowel regulation, such as increasing bulk in the diet, fluid intake, and mobility. Normal bowel habits may vary from 3 times/day to 3 times/wk.
- Advise patient to notify health care professional if unrelieved constipation, rectal bleeding, or symptoms of electrolyte imbalance (muscle cramps or pain, weakness, dizziness, and so forth) occur.

Evaluation/Desired Outcomes

- Soft, formed bowel movement.
- Evacuation of the bowel.

Why was this drug prescribed for your patient?

NURSING IMPLICATIONS

Assessment

- Observe patient taking concurrent insulin for signs and symptoms of hypoglycemic reactions (sweating, hunger, weakness, dizziness, tremor, tachycardia, anxiety).
- ***Lab Test Considerations:*** Monitor serum glucose and Hb A_1 periodically during therapy to evaluate effectiveness of treatment.
- Monitor CBC with differential periodically during therapy. May cause ↓ in hemoglobin and hematocrit, usually during the first 4–12 wk of therapy; then levels stabilize.
- Monitor serum ALT levels before starting therapy and periodically thereafter or if jaundice or symptoms of hepatic dysfunction occur. Pioglitazone should not be started in patients with active liver disease or ALT levels >2.5 times the upper limit of normal. Patients with mild ALT ↑ should have more frequent monitoring. If ALT ↑ to >3 times the upper limit of normal, recheck ALT promptly. Discontinue pioglitazone if ALT remains >3 times normal.
- May cause transient ↑ in CPK levels.

Potential Nursing Diagnoses

Imbalanced nutrition: more than body requirements (Indications)
Deficient knowledge, related to medication regimen (Patient/Family Teaching)
Noncompliance (Patient/Family Teaching)

Implementation

- Patients stabilized on a diabetic regimen who are exposed to stress, fever, trauma, infection, or surgery may require administration of insulin.
- **PO:** May be administered with or without meals.

Patient/Family Teaching

- Instruct patient to take medication exactly as directed. If dose for 1 day is missed, do not double dose the next day.
- Explain to patient that this medication controls hyperglycemia but does not cure diabetes. Therapy is long-term.
- Review signs of hypoglycemia and hyperglycemia with patient. If hypoglycemia occurs, advise patient to take a glass of orange juice or 2–3 tsp of sugar, honey, or corn syrup dissolved in water and notify health care professional.
- Encourage patient to follow prescribed diet, medication, and exercise regimen to prevent hypoglycemic or hyperglycemic episodes.
- Instruct patient in proper testing of serum glucose and ketones. These tests should be closely monitored during periods of stress or illness, and health care professional should be notified if significant changes occur.
- Advise patient to notify health care professional immediately if signs of hepatic dysfunction (nausea, vomiting, abdominal pain, fatigue, anorexia, dark urine, jaundice) or CHF (edema, shortness of breath, rapid weight gain) occur.
- Insulin is the preferred method of controlling blood glucose during pregnancy. Counsel female patients that higher doses of oral contraceptives or a form of contraception other than oral contraceptives may be required and to notify health care professional promptly if pregnancy is planned or suspected.
- Advise patient to inform health care professional of medication regimen before treatment or surgery.
- Advise patient to carry a form of sugar (sugar packets, candy) and identification describing disease process and medication regimen at all times.
- Emphasize the importance of routine follow-up exams.

Evaluation/Desired Outcomes

- Control of blood glucose levels.

Why was this drug prescribed for your patient?