QUETIAPINE: Seroquel, Seroquel XR, Various

Class: Antipsychotic (Atypical)

Dosage Forms. **Oral Tablet:** 25 mg, 50 mg, 100 mg, 200 mg, 300 mg, 400 mg; **Oral Tablet, Extended Release:** 50 mg, 150 mg, 200 mg, 300 mg, 400 mg

Common FDA Label Indication, Dosing, and Titration.

1. Bipolar disorder or schizophrenia, therapy initiation: Adults, immediate release, 50 mg po bid × 1 d, increase 50 mg/d × 3 d, may titrate to 800 mg/d; Adults, extended release, 300 mg po hs × 1 d, then 600 mg po hs × 1 d, may titrate to 800 mg/d; Children 10-17 y of age, immediate release, 50 mg po × 1 d, then 100 mg po × 1 d, then 200 mg po × 1 d, then 300 mg po × 1 d, then 400 mg po × 1 d, may titrate to 600 mg/d
2. Bipolar disorder or schizophrenia, maintenance: Adults, immediate release: 400-800 mg/d po; Adults, extended release, 400-800 mg/d po; Children 10-17 y of age, regular release, titrate to lowest effective dose
3. Major depressive disorder: Adults, extended release, 50 mg po daily hs, may titrate to 300 mg/d

Off-Label Uses.

1. Delirium in the critically ill: Adults, extended release, 50 mg po daily hs, may titrate to 300 mg/d
2. **MOA.** Quetiapine is an antagonist at multiple neurotransmitter receptors in the brain. It antagonizes serotonin 5-HT_{1A} and 5-HT_2, dopamine D_1 and D_2, histamine H_1, and adrenergic α_1 and α_2 receptors. Efficacy in schizophrenia and bipolar disorder is due to the antagonism of a combination of D_2 and 5-HT_2 receptors. Quetiapine also has no affinity for cholinergic muscarinic and benzodiazepine receptors.

AstraZeneca pictured

Drug Characteristics: Quetiapine

Dose Adjustment Hepatic	Regular release, initiate at 25 mg po daily; extended release, initiate at 50 mg po daily	**Absorption**	F = 9%, Cmax and AUC of extended-release tablet increased by high-fat meal
Dose Adjustment Renal	Not required	**Distribution**	Vd = 6-14 L/kg; 83% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Hepatic, CYP3A4/5 substrate
Pregnancy Category	C	**Elimination**	Renal elimination is 73% with a half-life of 6-7 h
Lactation	Weigh risks and benef ts	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to quetiapine, drugs that increase QT interval	**Black Box Warnings**	Mortality in elderly with dementia, suicidality, not approved for children <10 y

Medication Safety Issues: Quetiapine

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
XR	QUEtiapine, SEROquel	XR formulation	No	OLANZapine, SINEquan	Avoid use for behavioral problems of dementia unless nonpharmacologic options have failed and patient is threat to self or others

Drug Interactions: Quetiapine

Typical Agents	Mechanism	Clinical Management
CYP3A4/5 inducers	Increased quetiapine metabolism reduces quetiapine effectiveness	Consider dose increases of quetiapine
CYP3A4/5 inhibitors	Decreased quetiapine metabolism increases risk of quetiapine toxicity	Consider dose decreases of quetiapine
Agents that increase QT interval	Increased risk of QT prolongation (torsades de pointes, cardiac arrest)	Use with caution in combination with other agents that may prolong QTc; avoid in congenital long QT syndrome

Adverse Reactions: Quetiapine

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Agitation, headache, hypertension, somnolence, weight gain, xerostomia	Abdominal pain, asthenia, anxiety, backache, cataracts, constipation, dizziness, extrapyramidal effects, fatigue, hyperglycemia, hyperlipidemia, hyperprolactinemia, increased appetite, indigestion, insomnia, lethargy, nasal congestion, nausea, orthostatic hypotension, rash, tachycardia, tremor, vomiting	Neuroleptic malignant syndrome, neutropenia, pancreatitis, sudden cardiac death, syncope, tardive dyskinesia

Efficacy Monitoring Parameters. Improvement in signs and symptoms of schizophrenia, manic or mixed episodes associated with bipolar disorder, depression.

Toxicity Monitoring Parameters. BP, FPG, and CBC with differential, eye examination at baseline and periodically during therapy; fasting lipid profile/HgA_{1c} at baseline, 3 mo, and annually; weight, growth, BMI; TSH/T4; patients at high risk for suicide should be closely supervised.

Key Patient Counseling Points. Take with food but avoid alcohol. Avoid activities requiring mental alertness or coordination. Use caution with activities leading to an increased core temperature. Rise slowly from a sitting/supine position. Report signs/symptoms of hyperglycemia, bradycardia, arrhythmia, tardive dyskinesia, or neuroleptic malignant syndrome.

Clinical Pearls. Regular release may be switched to extended release at the equivalent total daily dose taken once daily; individual dosage adjustments may be required. Elderly patients with dementia-related psychosis taking quetiapine are at an increased risk of death compared to placebo.

QUINAPRIL: Accupril, Various

Class: ACE-I, Antihypertensive

Dosage Forms. **Oral Tablet:** 5 mg, 10 mg, 20 mg, 40 mg

Common FDA Label Indication, Dosing, and Titration.

1. Heart failure: 5 mg po bid, may titrate to 20-40 mg po bid
2. Hypertension: 10-20 mg po daily, may titrate to 80 mg po daily

Off-Label Uses.

1. Diabetic nephropathy: 20-40 mg po daily

MOA. Quinapril is a competitive ACE-I; it prevents conversion of angiotensin I to angiotensin II (a vasoconstrictor). It also reduces serum aldosterone leading to decreased sodium retention, potentiates the vasodilator kallikrein–kinin system and alters prostanoid metabolism, inhibits sympathetic nervous system, and inhibits the tissue renin–angiotensin system.

Greenstone 10 mg generic pictured

Drug Characteristics: Quinapril

Dose Adjustment Hepatic	Not required	**Absorption**	F = 60%, food decreases rate and extent of absorption
Dose Adjustment Renal	CrCl 30-60 mL/min, 5 mg po daily; CrCl 10-30 mL/min, 2.5 mg po daily	**Distribution**	Vd = 0.7 L/kg; 97% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Hepatic to active metabolite (quinaprilat) but not via CYP450
Pregnancy Category	D	**Elimination**	Renal elimination is 50-60% with a half-life of 25 h (metabolite)
Lactation	Weigh risks and benef ts	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to quinapril or other ACE-Is, history of ACE-I–induced angioedema	**Black Box Warnings**	Pregnancy

Medication Safety Issues: Quinapril

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	AcipHex, Accutane	No

Drug Interactions: Quinapril

Typical Agents	Mechanism	Clinical Management
Antacids	Binding and decreased absorption of quinapril	Separate administration by 2 h
Potassium-sparing diuretics	Increased risk of hypotension, hyperkalemia	Avoid concurrent use or monitor BP and serum potassium levels
Angiotensin receptor blockers	Increased risk of hypotension, hyperkalemia, nephrotoxicity	Avoid concurrent use or monitor BP, SCr, and potassium levels
Potassium supplements	Increased risk of hyperkalemia and cardiac arrhythmias	Avoid concurrent use or monitor serum potassium levels
NSAIDs	Decreased antihypertensive effect of quinapril, increased risk of nephrotoxicity	Avoid concurrent use or monitor BP and SCr levels
Aliskiren	Increased risk of hyperkalemia	Monitor serum potassium levels
Azathioprine	Increased risk of myelosuppression	Avoid concurrent use; monitor for anemia or leukopenia
Diuretics	Increased risk of postural hypotension due to hypovolemia	Monitor BP; rise from seated position slowly

Adverse Reactions: Quinapril

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
	Diarrhea, dizziness, dry cough, fatigue, headache, hypotension, hyperkalemia, nausea, nephrotoxicity, rash, tachycardia, vomiting	Angioedema, birth defects, liver failure

Efficacy Monitoring Parameters. BP, signs/symptoms of heart failure.

Toxicity Monitoring Parameters. Signs/symptoms of angioedema, persistent dry cough, hypotension; monitor baseline and periodic electrolytes, SCr, BUN, urine protein.

Key Patient Counseling Points. Avoid pregnancy. Avoid sudden discontinuation; rebound hypertension can occur. Use potassium supplements or salt substitutes only under medical supervision. May cause dizziness that may worsen if dehydrated.

Clinical Pearls. Safety and efficacy not established in children (captopril and enalapril are more commonly used in children). The full effect may not be observed for 2-4 wk. Dry cough associated with ACE-I is typically a class effect; consider switching to an ARB. Can lead to increases in SCr and potassium; recheck electrolytes within a week of initiation.

RABEPRAZOLE: AcipHex

Class: Proton Pump Inhibitor

Dosage Forms. **Oral Tablet, Delayed Release:** 20 mg; **Oral Capsule, Oral Sprinkle**: 20 mg

Common FDA Label Indication, Dosing, and Titration.

1. Duodenal ulcer disease: 20 mg po daily × up to 4 wk
2. *H. pylori* GI infection: 20 mg po bid × 10-14 d in combination with amoxicillin 1000 mg and clarithromycin 500 mg po bid
3. Gastric hypersecretion: 60 mg po daily, may titrate to 60 mg po bid
4. GERD, erosive or ulcerative, for symptom control, initial treatment, or maintenance: Adults and Children >12 y of age, 20 mg po daily

Eisai 20 mg pictured

Off-Label Uses.

1. Drug-induced GI disturbance, indigestion: 20 mg po daily
2. Gastric ulcer disease: 20-40 mg po daily

MOA. Rabeprazole is a proton pump inhibitor (PPI) that, when protonated in the secretory canaliculi of the parietal cells, covalently binds to H^+/K^+-ATPase (proton pump), which is the final pathway for acid secretion. Rabeprazole produces a profound and prolonged antisecretory effect and inhibits basal, nocturnal, and pentagastrin- and food-stimulated gastric acid secretion.

Drug Characteristics: Rabeprazole

Dose Adjustment Hepatic	Required for hepatic dysfunction	**Absorption**	F = 52%, food delays absorption
Dose Adjustment Renal	Not required	**Distribution**	96% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Hepatic, substrate for CYP3A4/5, 2C19; moderate inhibitor of CYP2C8
Pregnancy Category	B	**Elimination**	Renal elimination is 90% with a half-life of 1-2 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	CYP2C19 poor metabolizers have greater gastric acid suppression
Contraindications	Hypersensitivity to rabeprazole	**Black Box Warnings**	None

Medication Safety Issues: Rabeprazole

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	RABEprazole	Do not crush tablets, sprinkle capsules may be opened but not chewed	No	Aricept, ARIPiprazole	No

Drug Interactions: Rabeprazole

Typical Agents	Mechanism	Clinical Management
CYP3A4/5, 2C19 inducers	Increased rabeprazole metabolism reduces rabeprazole effectiveness	Monitor and consider dose increases of rabeprazole
CYP3A4/5, 2C19 inhibitors	Decreased rabeprazole metabolism increases risk of rabeprazole toxicity	Monitor and consider dose decreases of rabeprazole
CYP2C8 substrates	Decreased substrate metabolism may result in substrate toxicity	Monitor and consider decreasing dose of substrate
pH-dependent drugs	Lower gastric pH reduces absorption	Monitor pH-dependent drug and adjust dose as necessary
Clopidogrel	May decrease the effect of clopidogrel on platelet inhibition, resulting in cardiovascular events (MI, stroke, death)	Avoid concurrent use; consider alternative acid-reducing agent such as H_2 inhibitor
Warfarin	Increased INR and risk of bleeding	Monitor INR and consider dose adjustment

Adverse Reactions: Rabeprazole

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
	Headache, rash	Stevens-Johnson syndrome, fracture of bone, rhabdomyolysis, acute interstitial nephritis

Efficacy Monitoring Parameters. Resolution of GI symptoms, (reflux, ulcers, *H. pylori*, infection)

Toxicity Monitoring Parameters. Headache, SCr or blistering skin rash.

Key Patient Counseling Points. Open sprinkle capsules into a small quantity of room-temperature soft food or liquid and administer within 15 min. If used for duodenal ulcers, administer with breakfast.

Clinical Pearls. Multiple *H. pylori* regimens exist that include different combinations of PPIs and antibiotics; patients should complete full regimen if prescribed for *H. pylori* management. Many PPI and H_2 antagonists available OTC; warn patients not to take multiple products concurrently to avoid additive risk of adverse effects. Possible increased risk of osteoporosis. Use for shortest period of time and avoid use in those at risk for osteoporosis if possible.

RALOXIFENE: Evista

Class: Selective Estrogen Receptor Modulator

Dosage Forms. Oral Tablet: 60 mg

Lilly 60 mg pictured

Common FDA Label Indication, Dosing, and Titration.

1. Breast cancer, invasive, in postmenopausal women at high risk; prophylaxis: 60 mg po daily
2. Postmenopausal osteoporosis, prevention or treatment: 60 mg po daily

Off-Label Uses. None

MOA. Raloxifene is a selective estrogen receptor modulator (SERM) and binds to estrogen receptors, resulting in activation of estrogenic pathways in some tissues (agonism) and blockade of estrogenic pathways in others (antagonism). Raloxifene appears to act as an estrogen agonist in bone, decreasing bone resorption and bone turnover and increasing BMD.

Drug Characteristics: Raloxifene

Dose Adjustment Hepatic	Not required	**Absorption**	F = 2%, food has no effect on absorption
Dose Adjustment Renal	Not required	**Distribution**	Vd = 2583 L/kg; 95% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Hepatic; not via CYP
Pregnancy Category	X	**Elimination**	Fecal elimination with a half-life of 32 h
Lactation	Avoid	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to raloxifene; pregnancy or lactation, current or history of thromboembolic disorders	**Black Box Warnings**	Venous thromboembolism, stroke

Medication Safety Issues: Raloxifene

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	AVINza	No

Drug Interactions: Raloxifene

Typical Agents	Mechanism	Clinical Management
Bile acid sequestrants	Reduced absorption of raloxifene	Avoid concurrent use

Adverse Reactions: Raloxifene

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Hot f ashes, arthralgia, f u-like symptoms	Rash, sweating, weight gain, f atulence, nausea, vaginitis, bronchitis	Edema, hypertriglyceridemia venous thrombo-embolism, cerebrovascular accident, pulmonary embolism

Efficacy Monitoring Parameters. DEXA scan (BMD), mammogram.

Toxicity Monitoring Parameters. Weight gain, shortness of breath, symptoms of stroke, DVT (swelling of the leg, redness, pain); triglycerides.

Key Patient Counseling Points. Raloxifene increases the risk of blood clots, especially during the first 4 mo of therapy. Avoid sitting for long periods and be aware of the symptoms of DVT. If taking for osteoporosis, consider calcium and vitamin D supplementation.

Clinical Pearls. Tamoxifen and raloxifene are equivalent in efficacy of preventing breast cancer; however, raloxifene causes less endometrial hyperplasia, thromboembolic events, and cataracts. Medication guide required at dispensing.

RALTEGRAVIR: Isentress

Class: Antiretroviral Agent, Integrase Inhibitor

Dosage Forms. Oral Tablet: 400 mg; **Oral Chewable Tablet:** 25 mg; 100 mg; **Powder for Oral Suspension:** 100 mg/packet

Merck 400 mg pictured

Common FDA Label Indication, Dosing, and Titration.

1. Treatment of HIV-1 infection in combination with other antiretroviral agents: Adults and Children ≥12 y of age, 400 mg po bid; Children <12 y of age, dose is weight based

Off-Label Uses.

1. Occupational HIV postexposure prophylaxis: 400 mg po bid with concomitant emtricitabine/tenofovir

MOA. Raltegravir inhibits the catalytic activity of integrase HIV-1 integrase, thus preventing integration of the proviral gene into human DNA.

Drug Characteristics: Raltegravir

Dose Adjustment Hepatic	Use with caution if severe hepatic impairment	**Absorption**	F = 30-40%, no food effect
Dose Adjustment Renal	Not required	**Distribution**	CSF, semen
Dialyzable	No	**Metabolism**	Metabolized by UGT1A1 to an inactive metabolite
Pregnancy Category	C	**Elimination**	50% of the metabolites in feces, 30% renally eliminated as parent, half-life 9-12 h
Lactation	Weight risks and benefits	**Pharmacogenetics**	Resistance is associated with HIV mutations
Contraindications	None	**Black Box Warnings**	None

Medication Safety Issues: Raltegravir

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	Do not chew or crush oral tablets	Yes	No	No

Drug Interactions: Raltegravir

Typical Agents	Mechanism	Clinical Management
Aluminum salt, magnesium salts	Decreased absorption of raltegravir	Contraindicated
Fosamprenavir	Decreased amprenavir concentrations, unknown mechanism	Avoid
PPIs and H_2-blockers	Increased absorption of raltegravir with increased pH	Monitor for toxicity and consider dose reductions of raltegravir
Rifampin	Decreased raltegravir via induction of UGT by rifampin	Increase raltegravir dose to 800 mg bid

Adverse Reactions: Raltegravir

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
	Hyperglycemia, insomnia, headache, neutropenia, elevated LFTs	Anemia, cerebellar ataxia, depression, hepatitis, hypersensitivity, myopathy, nephrolithiasis, psychomotor hyperactivity (children), renal failure, rhabdomyolysis, Stevens-Johnson syndrome, suicidal ideation/behavior, thrombocytopenia, toxic epidermal necrolysis

Efficacy Monitoring Parameters. HIV viral load, CD4 count, HIV resistance testing.

Toxicity Monitoring Parameters. LFTs, bilirubin, CBC, glucose.

Key Patient Counseling Points. Take with or without food. May chew or crush the chewable tablet. For the oral suspension, add contents of foil pack (100 mg) to 5 mL water and swirl for 30-60 s. Use oral syringe to obtain correct dose. Administer within 30 min. Does not prevent transmission of HIV; practice safe sex.

Clinical Pearls. Not recommended for children <2 y of age. Recommended as a first-line therapy with tenofovir/emtricitabine in antiretroviral naïve patients. Chewable tablet and oral suspension have higher bioavailability than oral tablet; do not interchange these products.

RAMIPRIL: Altace, Various

Class: ACE-I, Antihypertensive

Dosage Forms. **Oral Capsule:** 1.25 mg, 2.5 mg, 5 mg, 10 mg

Common FDA Label Indication, Dosing, and Titration.

1. Heart failure post-MI: 1.25-2.5 mg po bid × 7 d, may titrate to 5 mg po bid
2. Hypertension: 2.5 mg po daily, may titrate to 2.5-20 mg po daily
3. Reduce risk of myocardial infarction, stroke and death from cardiovascular causes: 2.5 mg po bid × 7 d, may titrate as tolerated to 10 mg daily.

Off-Label Uses.

1. Diabetic nephropathy, kidney disease: 1.25-10 mg po daily

MOA. Ramipril is a competitive ACE-I. It is also a prodrug for the more potent ACE-I ramiprilat. ACE-I prevents conversion of angiotensin I to angiotensin II (a vasoconstrictor). It also reduces serum aldosterone, leading to decreased sodium retention, potentiates the vasodilator kallikrein–kinin system, and inhibits the tissue renin–angiotensin system.

Lupin generic 10 mg pictured

Drug Characteristics: Ramipril

Dose Adjustment Hepatic	Not required	**Absorption**	F = 60%, food has no effect on absorption
Dose Adjustment Renal	CrCl <40 mL/min: use 25% of normal dose	**Distribution**	73% protein bound
Dialyzable	Yes	**Metabolism**	Metabolized in liver to active metabolite (ramiprilat) not via CYP
Pregnancy Category	C (1st trimester), D (2nd and 3rd trimesters)	**Elimination**	Renal elimination is 50-60% with a half-life of 13-17 h (metabolite)
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to ramipril or other ACE-Is, history of ACE-I–induced angioedema	**Black Box Warnings**	Pregnancy

Medication Safety Issues: Ramipril

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	Capsule	No	Amaryl, enalapril	No

Drug Interactions: Ramipril

Typical Agents	Mechanism	Clinical Management
Antacids	Binding and decreased absorption	Separate administration by 2 h
Potassium-sparing diuretics	Increased risk of hypotension, hyperkalemia	Avoid concurrent use or monitor BP and serum potassium levels
Angiotensin receptor blockers	Increased risk of hypotension, hyperkalemia, nephrotoxicity	Avoid concurrent use or monitor BP, SCr, and potassium levels
Potassium supplements	Increased risk of hyperkalemia and cardiac arrhythmias	Avoid concurrent use or monitor serum potassium levels
NSAIDs	Decreased antihypertensive effect of ramipril, increased risk of nephrotoxicity	Avoid concurrent use or monitor BP and SCr levels
Aliskiren	Increased risk of hyperkalemia	Monitor serum potassium levels
Azathioprine	Increased risk of myelosuppression	Avoid concurrent use; monitor for anemia or leukopenia
Diuretics	Increased risk of postural hypotension due to hypovolemia	Monitor BP; rise from seated position slowly

Adverse Reactions: Ramipril

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
	Diarrhea, dizziness, dry cough, headache, hypotension, hyperkalemia, nausea, nephrotoxicity, rash, tachycardia, vomiting	Angioedema, birth defects, liver failure

Efficacy Monitoring Parameters. BP, progression of heart failure.

Toxicity Monitoring Parameters. Angioedema (swelling of the face, eyes, lips, tongue, or throat), persistent dry cough, hypotension; baseline and periodic potassium, SCr, BUN, and urine protein.

Key Patient Counseling Points. Avoid pregnancy. Use potassium supplements or salt substitutes only under medical supervision. May cause dizziness that may worsen if dehydrated.

Clinical Pearls. Contents of capsule may be mixed with water, apple juice, or apple sauce for administration but do not chew. Dry cough associated with ACE-I is typically a class effect; consider switching to an ARB. Can lead to increases in SCr and K^+; recheck electrolytes within 1 wk of initiation.

RANITIDINE: Zantac, Various

Class: Histamine H_2 Receptor Antagonist

Dosage Forms. Oral Tablet: 75 mg, 150 mg, 300 mg; **Oral Capsule:** 150 mg, 300 mg; **Oral Syrup:** 15 mg/mL; **Oral Suspension:** 22.4 mg/mL

Amneal generic pictured

Common FDA Label Indication, Dosing, and Titration.

1. Duodenal ulcer, acute or maintenance, gastric ulcer, acute or maintenance, erosive esophagitis, acute or maintenance: Children 1 mo to 16 y of age, 2-4 mg/kg po bid, *max* of 300 mg/d; Adults, 150 mg po bid or 300 mg po daily hs
2. Indigestion, prevention or treatment: 75-150 mg po bid
3. *H. pylori* GI tract infection, quadruple therapy: 150 mg po bid × 10-14 d in combination with metronidazole 250 mg po qid, bismuth subsalicylate 525 mg po qid, and tetracycline 500 mg po qid

Off-Label Uses.

1. Stress ulcer prophylaxis: 150 mg po bid

MOA. Ranitidine competitively inhibits histamine H_2 receptors and inhibits gastric acid secretion. Both the acid concentration and volume of gastric secretion are suppressed by ranitidine, while changes in pepsin secretion are proportional to volume output.

Drug Characteristics: Ranitidine

Dose Adjustment Hepatic	Not required	**Absorption**	F = 50%, food has no effect on absorption
Dose Adjustment Renal	CrCl <50 mL/min, *max* of 150 mg po daily	**Distribution**	Vd = 1.4 L/kg; 15% protein bound
Dialyzable	Yes	**Metabolism**	Minor hepatic, not via CYP
Pregnancy Category	B	**Elimination**	Renal elimination is 30-70% with a half-life of 2-3 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to ranitidine or other H_2 antagonists	**Black Box Warnings**	None

Medication Safety Issues: Ranitidine

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
FusePaq, Maximum strength	No	No	No	Xanax, Zofran, Zyrtec	No

Drug Interactions: Ranitidine

Typical Agents	Mechanism	Clinical Management
pH-dependent drugs	Lower gastric pH reduces absorption	Separate administration by 12 h or use alternative agents

Adverse Reactions: Ranitidine

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Constipation, diarrhea, nausea	Skin rash	Stevens-Johnson syndrome, increased liver enzymes, acute interstitial nephritis

Efficacy Monitoring Parameters. Resolution of GERD symptoms, resolution of peptic ulcers, gastric pH (if indicated).

Toxicity Monitoring Parameters. SCr, AST, ALT

Key Patient Counseling Points. Advise patients to take at bedtime. Patients may take with food or antacids, if needed.

Clinical Pearls. This and other PPI and H_2 antagonists available OTC; warn patients not to take multiple products concurrently to avoid additive risk of adverse effects. Injectable dosage form also available; when the intravenous route is used, treatment should be converted to oral route as soon as possible to avoid cost and risks associated with intravenous therapy. If taking as needed to prevent heartburn, take 30-60 min before problem foods.

RANOLAZINE: Ranexa

Class: Antianginal agent

Dosage Forms. **Oral Tablet, Extended Release:** 500 mg, 1000 mg

Common FDA Label Indication, Dosing, and Titration.

1. Chronic angina: Initial, 500 mg po bid, may titrate to *max* dose 1000 mg po bid

Off-Label Uses. None

MOA. Ranolazine inhibits the late phase of the inward sodium channel during cardiac repolarization reducing intracellular sodium concentrations and thereby reducing calcium influx via Na^{+}-Ca^{2+} exchange that in turn reduces ventricular tension and myocardial oxygen consumption.

Drug Characteristics: Ranolazine

Dose Adjustment Hepatic	Avoid if severe hepatic dysfunction	**Absorption**	F = 76%, food has no effect on absorption
Dose Adjustment Renal	Avoid if acute renal failure	**Distribution**	62% protein bound
Dialyzable	Unknown	**Metabolism**	Hepatic, CYP3A4/5 substrate, P-glycoprotein substrate
Pregnancy Category	C	**Elimination**	Renal elimination is 75% with a half-life of 7 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hepatic cirrhosis, strong CYP3A4 inducers or inhibitors	**Black Box Warnings**	None

Medication Safety Issues: Ranolazine

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	Do not chew, crush, or break	No	CeleXA	No

Drug Interactions: Ranolazine

Typical Agents	Mechanism	Clinical Management
CYP3A4/5 inducers	Increased ranolazine metabolism reduces ranolazine effectiveness	Strong inducers contraindicated. Moderate or weak inducers; monitor and consider dose increase of ranolazine
CYP3A4/5 inhibitors	Decreased ranolazine metabolism increases risk ranolazine toxicity	Strong inhibitors contraindicated. *Max* dose is 500 mg bid if concurrent strong inhibitors
P-glycoprotein inducers	Increased ranolazine transport reduces ranolazine effectiveness	Monitor and consider dose increase of ranolazine
P-glycoprotein inhibitors	Decreased ranolazine transport increases risk ranolazine toxicity	Contraindicated
Agents that prolong the QTc interval	Additive QTc prolongation	Use with caution in combination with other agents that may prolong QTc or in congenital long QT syndrome

Adverse Reactions: Ranolazine

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
	Dizziness, headache, bradycardia, hypotension, edema, constipation, nausea, xerostomia, blurred vision	Angioedema, pancytopenia, pulmonary fibrosis, arrhythmia, renal failure, syncope, QTc prolongation

Efficacy Monitoring Parameters. Improvement in angina symptoms, improved exercise tolerance.

Toxicity Monitoring Parameters. Baseline and follow-up ECG to evaluate QTc if concerns for prolongation, monitor BP and renal function at baseline and periodically.

Key Patient Counseling Points. Do not crush or chew, but may be taken with or without meals. There are multiple significant drug interactions so talk to pharmacist or physician before starting any new medications or herbal supplements. Ranolazine will not stop an acute angina episode.

Clinical Pearls. May be used in combination with beta-blockers or alone in patients who do not respond to or tolerate beta-blockers.

REPAGLINIDE: Prandin

Class: Meglitinide, Antidiabetic

Dosage Forms. Oral Tablet: 0.5 mg, 1 mg, 2 mg

Common FDA Label Indication, Dosing, and Titration.

1. Diabetes mellitus, type 2: 0.5-4 mg po bid-qid (with meal), may titrate to 16 mg po daily

Off-Label Uses. None

MOA. Repaglinide is a meglitinide agent that stimulates insulin release from the pancreas via inhibition of adenosine triphosphate (ATP)-potassium channels on the beta-cell membrane and potassium efflux. The resulting depolarization and calcium influx induces insulin secretion.

Novo Nordisk 2 mg pictured

Drug Characteristics: Repaglinide

Dose Adjustment Hepatic	Not required	**Absorption**	F = 56%, food has no effect on absorption
Dose Adjustment Renal	CrCl 20-40 mL/min: initial dose of 0.5 mg po daily and titrate carefully	**Distribution**	Vd = 24-31 L; 98% protein bound
Dialyzable	Unknown	**Metabolism**	Hepatic substrate of CYP3A4/5, 2C8
Pregnancy Category	C	**Elimination**	Fecal elimination is 90% with a half-life of 1 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to repaglinide, diabetic ketoacidosis, type 1 diabetes, concurrent gemfibrozil	**Black Box Warnings**	None

Medication Safety Issues: Repaglinide

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	Yes	Avandia	No

Drug Interactions: Repaglinide

Typical Agents	Mechanism	Clinical Management
Beta-blockers, SSRIs, NSAIDs, MAOI	Altered glucose metabolism and increased risk of hypoglycemia	Monitor carefully and manage as appropriate
CYP2C8, CYP3A4/5 inducers	Increased repaglinide metabolism reduces repaglinide effectiveness	Monitor and consider dose increases of repaglinide
CYP2C8, CYP3A4/5 inhibitors	Decreased repaglinide metabolism increases risk of repaglinide toxicity	Monitor and consider dose decreases of repaglinide

Adverse Reactions: Repaglinide

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Hypoglycemia, headache	Arthralgia nasopharyngitis, nausea, diarrhea, chest pain	Angina, hypertension, arrhythmia, thrombocytopenia, hypersensitivity, hepatotoxicity, Stevens-Johnson syndrome

Efficacy Monitoring Parameters. Preprandial blood glucose between 70 and 130 mg/dL, HbC_{1c} <7%.

Toxicity Monitoring Parameters. Hypoglycemia (symptoms include nausea, sweating, loss of consciousness, mental status changes, nervousness, headache, shaking, and seizures). Monitor BP, HR, CBC, and LFT.

Key Patient Counseling Points. Monitor blood glucose in frequent intervals (2-4 times/d). Take 15-30 min before each meal, up to 4 times/day. Do not take if skipping a meal. Add a dose if eating an extra meal. Counsel on recognition and treatment of hypoglycemia. Encourage healthy lifestyle choices to improve glucose control.

Clinical Pearls. Compared with sulfonylureas, repaglinide has a quicker onset and shorter duration of action, resulting in a lower risk of prolonged hypoglycemia. No studies evaluate use in children; avoid. Repaglinide is usually considered a third-line therapy for type 2 diabetes, but could be first-line therapy in patients with contraindications to metformin (impaired renal function) or intolerance to sulfonylureas. Also available as combination tablet with metformin. Use caution in combination with beta-blockers, which can mask hypoglycemia.

RISEDRONATE: Actonel, Atelvia

Class: Bisphosphonate

Dosage Forms. **Oral Tablet:** 5 mg, 30 mg, 35 mg, 150 mg; **Oral Tablet, Delayed Release:** 35 mg

Common FDA Label Indication, Dosing, and Titration.

1. Postmenopausal osteoporosis: Delayed release, 35 mg po once weekly immediately following breakfast; immediate release, 5 mg po daily, 35 mg po once weekly, or 150 mg po once a month; all with supplemental calcium and vitamin D
2. Paget disease: Immediate release, 30 mg po daily for 2 mo
3. Osteoporosis (glucocorticoid induced) prevention and treatment: Immediate release, 5 mg po daily
4. Osteoporosis (male): Immediate release, 35 mg po once weekly

Off-Label Uses. None

MOA. Risedronate binds to bone hydroxyapatite and inhibits osteoclast activity at the cellular level, thereby modulating bone metabolism.

Procter & Gamble
35 mg pictured

R

Drug Characteristics: Risedronate

Dose Adjustment Hepatic	Not required	**Absorption**	F <1%, food impairs absorption, take 30-60 min prior to meal
Dose Adjustment Renal	CrCl <30 mL/min, avoid	**Distribution**	Vd = 13.8 L; 24% protein bound
Dialyzable	Unknown	**Metabolism**	Not metabolized
Pregnancy Category	C	**Elimination**	Renal elimination is 50% with a half-life of 561 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Known hypersensitivity to risedronate, esophageal abnormalities that delay esophageal emptying, hypocalcemia, inability to sit or stand upright for at least 30 min	**Black Box Warnings**	None

Medication Safety Issues: Risedronate

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	Do not chew or crush either formulation	No	Alendronate, Actos	No

Drug Interactions: Risedronate

Typical Agents	Mechanism	Clinical Management
Aluminum, calcium-containing products	Decreased bisphosphonate absorption	Separate administration by 1-2 h
H_2-blockers and PPIs	Decreased bisphosphonate absorption	Separate administration by 12 h, avoid XR formulation

Adverse Reactions: Risedronate

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Rash, abdominal pain, constipation, diarrhea, nausea, indigestion, backache, UTI	Asthenia, flu-like illness, edema, arrhythmias, nephrolithiasis, myalgia, bone pain	Osteonecrosis of the jaw, hypersensitivity reaction

Efficacy Monitoring Parameters. Increased BMD, decreased incidence of fractures, normalization of alkaline phosphatase (Paget's).

Toxicity Monitoring Parameters. Baseline SCr, calcium. Severe skin rash, chest pain, difficulty in swallowing, swelling, tooth problems, pain with urination, severe pain.

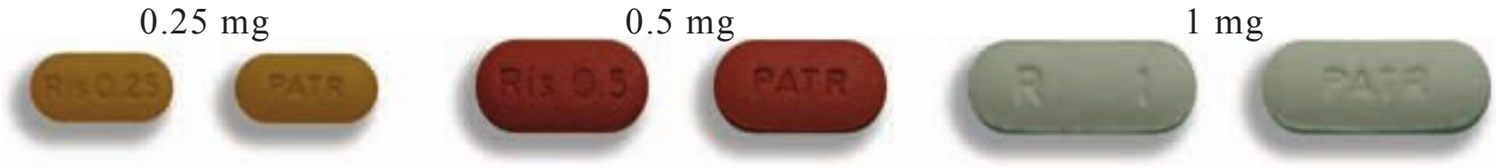
Key Patient Counseling Points. Take as soon as you get out of bed in the morning, before you eat or have anything to drink. Swallow tablet whole with 240 mL of plain water only (not mineral water, coffee, juice, or any other liquid). Do not chew tablet. Do not take the medicine while you are still in bed, and do not take it at bedtime. Wait at least 30 min after you swallow the tablet before you eat or drink anything or take any other medicines. Do not lie down for at least 30 min after taking this medicine, and do not lie down until after you have eaten some food.

Clinical Pearls. Concurrent chemotherapy and poor oral hygiene increase the risk for osteonecrosis of the jaw. Atypical fractures of the thigh (subtrochanteric and diaphyseal femur fractures) have been reported in patients taking bisphosphonates for osteoporosis; discontinue therapy in patients who develop evidence of a femoral shaft fracture. Atelvia is the brand name of the extended-release product. Medication guide required at dispensing.

RISPERIDONE: Risperdal, Various

Class: Benzisoxazole, Antipsychotic

Dosage Forms. Oral Tablet: 0.25 mg, 0.5 mg, 1 mg, 2 mg, 3 mg, 4 mg; **Oral Dispersible Tablet:** 0.25 mg, 0.5 mg, 1 mg, 2 mg, 3 mg, 4 mg; **Oral Solution:** 1 mg/mL



Common FDA Label Indication, Dosing, and Titration.

1. Autistic disorder, irritability: Children ≥5 y of age and weighing <20 kg, 0.25 mg po daily, titrate to response; Children ≥5 y of age and weighing >20 kg, 0.5 mg po daily, titrate to response
2. Bipolar I disorder: Adults, 2-3 mg po daily, may titrate to 6 mg/d; Children ≥10 y of age, 0.5 mg po daily, may titrate to 2.5 mg/d
3. Schizophrenia: Adults, 1 mg po bid, may titrate to 18 mg/d; Children ≥13 y of age, 0.5 mg po daily, may titrate to 3 mg/d

Off-Label Uses.

1. Posttraumatic stress disorder: 0.5-8 mg po once daily
2. Tourette syndrome: 0.25-0.5 mg po daily, may titrate to *max* dose of 6mg po daily
3. Pervasive developmental disorder: Children ≥5 y of age, 0.01 mg/kg/dose po daily, may titrate to 0.06 mg/kg/d

MOA. Risperidone is a potent serotonin-5-HT_2 antagonist with weaker dopamine-D_2 antagonism. Whereas typical antipsychotics are dopamine antagonists, the additional serotonin antagonism increases efficacy for negative symptoms of schizophrenia and reduces the likelihood of extrapyramidal symptoms.

Drug Characteristics: Risperidone

Dose Adjustment Hepatic	Severe hepatic impairment, initiate at 0.5 mg po bid, titrate slowly	**Absorption**	F = 70%, food has no effect on absorption
Dose Adjustment Renal	Severe renal impairment, initiate at 0.5 mg po bid, titrate slowly	**Distribution**	Vd = 1-2 L/kg; 90% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Hepatic, substrate of CYP2D6, to active metabolite (9-hydroxyrisperidone), P-glycoprotein substrate
Pregnancy Category	C	**Elimination**	Renal elimination is 70% with a half-life of 3-20 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	CYP2D6 poor metabolizers have higher risperidone and lower metabolite levels; limited clinical implication as both parent and metabolite are active
Contraindications	Hypersensitivity to risperidone, agents that increase QT interval	**Black Box Warnings**	Mortality in elderly with dementia

Medication Safety Issues: Risperidone

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
Consta, M-Tab	RisperiDONE, RisperDAL	Dispersible tablet	No	Reserpine, rOPINIRole	Avoid use for behavioral problems of dementia unless nonpharmacologic options have failed and patient is threat to self or others

Drug Interactions: Risperidone

Typical Agents	Mechanism	Clinical Management
CYP2D6, P-glycoprotein inhibitors	Decreased risperidone metabolism increases risk of risperidone toxicity	Monitor and consider dose decreases of risperidone; *max* dose 8 mg/d in combination w/fluoxetine or paroxetine
P-glycoprotein inducers	Increased risperidone excretion reduces risperidone effectiveness	Monitor and consider dose increases of risperidone
Agents that increase QT interval	Increased risk of QT prolongation (torsades de pointes, cardiac arrest)	Use with caution in combination with other agents that may prolong QTc; avoid in congenital long QT syndrome
Valproic acid	Increased valproic acid concentrations	Monitor for adverse effects, monitor valproic acid serum levels, adjust dose as needed
Anticholinergics	Additive anticholinergic activity	Avoid combination

Adverse Reactions: Risperidone

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Extrapyramidal symptoms, insomnia, anxiety, fatigue, metabolic changes (hyperglycemia, dyslipidemia, weight gain, DM)	Abdominal pain, akathisia, GI symptoms (constipation, N/V, diarrhea, dyspepsia), cough, dizziness, hyperprolactinemia, orthostatic hypotension, edema, rash, rhinitis, tachycardia, tremor, xerostomia, dysphagia	Neuroleptic malignant syndrome, pancreatitis, stroke, pancytopenia, sudden cardiac death, syncope, tardive dyskinesia, priapism

Efficacy Monitoring Parameters. Improvement in signs and symptoms of schizophrenia, manic or mixed episodes associated with bipolar disorder, depression.

Toxicity Monitoring Parameters. BP (including orthostatics), FPG, A1C in diabetic patients, lipid panel, weight, BMI, abdominal circumference, CBC w/differential, symptoms of tardive dyskinesia; closely supervise patients at high risk for suicide.

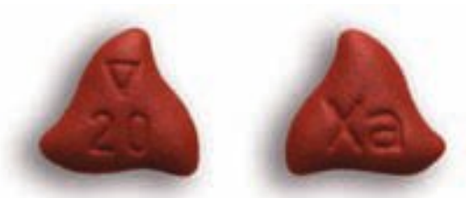
Key Patient Counseling Points. Take with food. Avoid alcohol or other CNS depressants. Avoid activities requiring mental alertness or coordination until drug effects are known. Use caution during activities leading to an increased core temperature. Rise slowly from a sitting/supine position. Report signs/symptoms of hyperglycemia, arrhythmia, tardive dyskinesia, or neuroleptic malignant syndrome. Keep dispersible tablet in blister pack until use. Place on tongue and swallow after dissolved. Oral solution may be mixed with water, coffee, orange juice, or low fat milk, but should not be mixed with cola or tea.

Clinical Pearls. Monitor closely for tardive dyskinesia; tics may become permanent if not treated appropriately. Increases risk of death in elderly patients with dementia-related psychosis. If initiating Risperdal CONSTA (IM injection Q2 wk), continue oral antipsychotic for 3 wk after 1st injection, then discontinue.

RIVAROXABAN: Xarelto

Class: Anticoagulant, Factor Xa inhibitor

Dosage Forms. Oral Tablet: 10 mg, 15 mg, 20 mg



Janssen 20 mg pictured

Common FDA Label Indication, Dosing, and Titration.

1. Prevention of thromboembolism in patients after orthopedic surgery: 10 mg po daily beginning at least 6 h after surgery × 12-14 d for knee replacement or 35 d for hip replacement; if CrCl 30-50 mL/min no dose adjustment, use with caution; do not use if CrCl <30 mL/min
2. Prevention of thromboembolism in patients with nonvalvular atrial fibrillation: 20 mg po daily if CrCl >50 mL/min; 15 mg po daily if CrCl 15-50 mL/min; do not use if CrCl <15 mL/min
3. Treatment and secondary prevention of DVT or pulmonary embolism: 15 mg po bid × 21 d, then 20 mg po daily; do not use if CrCl <30 mL/min

Off-Label Uses. None

MOA. Rivaroxaban is an orally bioavailable factor Xa inhibitor that selectively blocks the active site of factor Xa and does not require a cofactor (such as anti-thrombin III) for activity. Activation of factor X to factor Xa via the intrinsic and extrinsic pathways plays a central role in the cascade of blood coagulation.

Drug Characteristics: Rivaroxaban

Dose Adjustment Hepatic	Avoid use in moderate to severe dysfunction	**Absorption**	F = 66-100%; food increases extent of absorption at higher doses
Dose Adjustment Renal	Dose adjustments based on indication, see above	**Distribution**	Vd = 50 L; 95% albumin bound
Dialyzable	Use in ESRD should be avoided; hemodialysis removes 60% of drug in 2-3 h	**Metabolism**	Hepatic, CYP3A4/5 substrate
Pregnancy Category	C	**Elimination**	Renal elimination is 66% with a half-life of 5-9 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Active bleeding	**Black Box Warnings**	Premature discontinuation increases thrombotic risk, risk of spinal/epidural hematoma

Medication Safety Issues: Rivaroxaban

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
Starter Pack	No	No	Yes	No	No

Drug Interactions: Rivaroxaban

Typical Agents	Mechanism	Clinical Management
CYP3A4/5 inducers	Increased rivaroxaban metabolism reduces rivaroxaban effectiveness	Avoid strong CYP3A/5 inducers. Monitor carefully for clotting
CYP3A4/5 inhibitors	Decreased rivaroxaban metabolism increases risk of rivaroxaban toxicity	Avoid strong CYP3A4/5 inhibitors. Monitor carefully for bleeding
Antiplatelet agents, NSAIDs, and anticoagulants	Additive risk of bleeding	Avoid concurrent use if possible or monitor carefully for bleeding

Adverse Reactions: Rivaroxaban

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Bleeding	Peripheral edema, dizziness, headache, fatigue, bruising, pruritus, rash, nausea, vomiting	Syncope, major bleeding, epidural hematoma, anaphylaxis, intracranial bleeding

Efficacy Monitoring Parameters. Prevention of clotting or recurrence of clotting. Routine monitoring of anticoagulation tests is not necessary with rivaroxaban. If used, anti-Xa activity is the preferred test.

Toxicity Monitoring Parameters. Monitor for signs and symptoms of bleeding. Monitor renal function for potential dose adjustment. Monitor CBC, vital signs.

Key Patient Counseling Points. Administer with the evening meal. Educate patient on signs and symptoms of bleeding and interactions with other anticoagulant or antiplatelet medications, including OTC medications. Warn of risks of epidural (spinal) anesthesia while taking rivaroxaban.

Clinical Pearls. Detailed dosing conversion protocols to convert patients from warfarin or parenteral anticoagulants to rivaroxaban are available in the product package insert. Many drug-drug interactions; monitor concurrent drug use carefully. Tablets may be crushed and mixed with apple sauce immediately prior to administration; may mix with water for NG tube administration.

ROPINIROLE: Requip, Requip XL, Various

Class: Dopamine Agonist

Dosage Forms. Oral Tablet: 0.25 mg, 0.5 mg, 1 mg, 2 mg, 3 mg, 4 mg, 5 mg; **Oral Tablet, Extended Release:** 2 mg, 4 mg, 6 mg, 8 mg, 12 mg

Common FDA Label Indication, Dosing, and Titration.

1. Parkinson disease: Immediate release, 0.25 mg po tid × 1 wk, then 0.5 mg po tid × 1 wk, then 0.75 mg po tid × 1 wk, then 1 mg po tid, then may titrate to 24 mg/d; extended release, 2 mg po daily × 1-2 wk, then may titrate to 24 mg/d
2. Restless legs syndrome: Immediate release only, 0.25 mg po daily hs × 2 d, then 0.5 mg po daily hs × 5 d, then 1 mg po daily × 1 wk, then 1.5 mg po daily hs for 1 wk, then 2 mg po daily hs, then may titrate to 4 mg po daily hs

Off-Label Uses. None

MOA. Ropinirole is a nonergoline dopamine agonist that has a higher specificity to D_3 than to D_2 and D_4 subtypes of dopamine receptors. The drug has a moderate affinity for opioid receptors and has insignificant effects on D_1, 5-hydroxytryptamine 1 (5-HT_1), 5-HT_2, benzodiazepine, GABA, muscarinic, α_1-, α_2-, and β-adrenoreceptors. It is suggested that ropinirole stimulates the postsynaptic D_2-type receptor found in the brain's caudate putamen in Parkinson disease.

0.25 mg

0.5 mg

1 mg

3 mg

Core Pharma generic pictured

Drug Characteristics: Ropinirole

Dose Adjustment Hepatic	Use with caution	**Absorption**	F = 45-55%, food increases Tmax and Cmax
Dose Adjustment Renal	Not required	**Distribution**	Vd = 7.5 L/kg; 40% protein bound
Dialyzable	Unknown	**Metabolism**	Hepatic, CYP1A2 substrate
Pregnancy Category	C	**Elimination**	Renal elimination is >80% with a half-life of 6 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to ropinirole	**Black Box Warnings**	None

Medication Safety Issues: Ropinirole

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
XL	rOPINIRole	Extended-release tablets	No	RisperDAL, risperiDONE	No

Drug Interactions: Ropinirole

Typical Agents	Mechanism	Clinical Management
CYP1A2 inducers	Increased ropinirole metabolism reduces ropinirole effectiveness	Monitor and consider dose increases of ropinirole
CYP1A2 inhibitors	Decreased ropinirole metabolism increases risk of ropinirole toxicity	Monitor and consider dose decreases of ropinirole
Antipsychotics	May decrease effectiveness of antipsychotics and/or dopamine agonists	Avoid concurrent use, or monitor both agents and consider dose adjustments to one or both

Adverse Reactions: Ropinirole

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Dizziness, dyskinesia, nausea, orthostatic hypotension, somnolence, vomiting, hallucinations	Abdominal pain, abnormal vision, constipation, edema, fatigue, headache, increased HR, sleep attack, syncope, vomiting	Sinus node dysfunction

Efficacy Monitoring Parameters. Reduction in extrapyramidal movements, rigidity, tremor, gait disturbances; decrease in desire to move limbs.

Toxicity Monitoring Parameters. Signs/symptoms of postural hypotension, BP, CNS depression/somnolence, decreased HR, periodic dermatologic screening.

Key Patient Counseling Points. Take with food to reduce nausea. Avoid driving and other activities requiring mental alertness or coordination until drug effects are realized. Rise slowly from sitting/lying-down position. Report new onset or exacerbation of dyskinesia, changes in BP, fainting, or unusual urges. Avoid sudden discontinuation of drug. Do not drink alcohol or take other CNS depressants while using this drug.

Clinical Pearls. May switch directly from immediate-release ropinirole to extended-release; start an extended-release dose that matches most closely with the total daily immediate-release dose.

ROSIGLITAZONE: Avandia

Class: Thiazolidinedione Antidiabetic

Dosage Forms. Oral Tablet: 2 mg, 4 mg, 8 mg

Common FDA Label Indication, Dosing, and Titration.

1. Diabetes mellitus: 4 mg po daily or 2 mg po bid; may titrate to *max* of 8 mg daily as monotherapy or in combination with a sulfonylurea, or metformin

Off-Label Uses. None

Glaxo SmithKline 4 mg pictured

MOA. Rosiglitazone is a thiazolidinedione antihyperglycemic and a potent peroxisome proliferator-activated receptor-gamma (PPAR [γ]) agonist used to improve insulin sensitivity in patients with type 2 diabetes. Insulin-dependent glucose disposal in skeletal muscle is improved and hepatic glucose production is decreased; both actions contribute to rosiglitazone's glucose-lowering effects.

Drug Characteristics: Rosiglitazone

Dose Adjustment Hepatic	Avoid in active liver disease or if LFT elevated	**Absorption**	F = 99%, food has no effect on absorption
Dose Adjustment Renal	Not required	**Distribution**	Vd = 17.6 L; 99% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Hepatic, CYP2C8 substrate, moderate inhibitor of CYP2C8
Pregnancy Category	C	**Elimination**	Renal elimination is 64% with a half-life of 3-4 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to rosiglitazone, heart failure, NYHA class III or IV	**Black Box Warnings**	Heart failure, MI risk

Medication Safety Issues: Rosiglitazone

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	Yes	Avalide	No

Drug Interactions: Rosiglitazone

Typical Agents	Mechanism	Clinical Management
CYP2C8 inducers	Increased rosiglitazone metabolism reduces rosiglitazone effectiveness	Monitor and consider dose increases of rosiglitazone
CYP2C8 inhibitors	Decreased rosiglitazone metabolism increases risk of rosiglitazone toxicity	Monitor and consider dose decreases of rosiglitazone
CYP2C8 substrates	Decreased substrate metabolism may result in substrate toxicity	Monitor and consider decreasing dose of substrate
Psyllium	Psyllium may delay absorption of glucose from meals, leading to less postprandial hyperglycemia and potentially allowing a reduced dosage of the antidiabetic agent	Avoid concurrent use if possible; monitor and consider dose adjustments
Corticosteroids	May diminish or increase hypoglycemic effect of rosiglitazone	Monitor and consider rosiglitazone dose adjustment
NSAIDs, SSRIs	Altered glucose metabolism and increased risk of hypoglycemia and hyperglycemia	Avoid concurrent use if possible; monitor and consider dose adjustments
MAOIs	Stimulation of insulin secretion, hypoglycemic effects	Avoid concurrent use if possible; monitor and consider dose adjustments

Adverse Reactions: Rosiglitazone

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Edema, weight gain, increased cholesterol	Myalgia, bone fractures, sinusitis, headache	Heart failure, MI, anemia, hepatotoxicity, diabetic macular edema, hypoglycemia when used in combination with insulin or sulfonylureas

Efficacy Monitoring Parameters. Pre-prandial blood glucose between 70 and 130 mg/dL, HbA_{1c} <7%.

Toxicity Monitoring Parameters. Weight for assessment of edema, Hgb, LFTs; symptoms of hypoglycemia include nausea, sweating, and loss of consciousness; seek care for bone pain, yellowing of skin or eyes, eye pain, or shortness of breath. Eye exam.

Key Patient Counseling Points. Monitor blood glucose in frequent intervals (2-4 times/d). May take without regard to food. May require several weeks for max effect.

Clinical Pearls. Causes edema, which may exacerbate underlying heart failure, use with caution. Premenopausal anovalatory individuals may resume ovulation. Not for use in children. Thiazolidinediones are as effective as metformin, but have greater risk of adverse effects, so used as second line (both as monotherapy and in combination). Rosiglitazone has more CV effects than pioglitazone, so pioglitazone is preferred in this class. Released from REMS program in May 2014.

ROSUVASTATIN: Crestor

Class: HMG-CoA Reductase Inhibitor

Dosage Forms. **Oral Tablet:** 5 mg, 10 mg, 20 mg, 40 mg

Common FDA Label Indication, Dosing, and Titration.

1. Hyperlipidemia: Adults, 10-20 mg po daily, may titrate to 40 mg po daily; Children 10-17 y of age, 5-20 mg po daily, may titrate to 20 mg po daily
2. Disorder of cardiovascular system, primary prophylaxis, familial hypercholesterolemia, homozygous, hypertriglyceridemia, mixed lipidemia: 10-20 mg po daily, may titrate to 40 mg po daily

Off-Label Uses. None

MOA. HMG-CoA reductase inhibitors competitively inhibit conversion of HMG-CoA to mevalonate, an early rate-limiting step in cholesterol synthesis. A compensatory increase in LDL receptors, which bind and remove circulating LDL-cholesterol, results. Production of LDL-cholesterol can also decrease because of decreased production of VLDL-cholesterol or increased VLDL removal by LDL receptors.

Drug Characteristics: Rosuvastatin

Dose Adjustment Hepatic	Use with caution; contraindicated in active liver disease or unexplained increased LFTs	**Absorption**	F = 20%, food slows absorption
Dose Adjustment Renal	CrCl <30 mL/min, initial dose 5 mg po daily, may titrate to 10 mg po daily	**Distribution**	Vd = 134 L; 88% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Minimal hepatic
Pregnancy Category	X	**Elimination**	Fecal elimination is 90% with a half-life of 13-20 h
Lactation	Contraindicated	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to rosuvastatin, active liver disease, pregnancy or lactation	**Black Box Warnings**	None

40 mg

20 mg

10 mg

5 mg

AstraZeneca pictured

R

Medication Safety Issues: Rosuvastatin

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	atorvaSTATin	No

Drug Interactions: Rosuvastatin

Typical Agents	Mechanism	Clinical Management
Antacids	Decreased absorption of rosuvastatin	Separate coadministration by 2 h
Bile acid-binding resins	Decreased absorption of rosuvastatin	Give rosuvastatin 1 h before or 4 h after resin
Amiodarone, azole antifungals, protease inhibitors, fibrates, niacin, cyclosporine	Increased risk of myopathy or rhabdomyolysis	Avoid concurrent use, or monitor for myopathy and measure creatine kinase levels
Warfarin	Increased risk of bleeding	Monitor INR with addition or withdrawal of rosuvastatin

Adverse Reactions: Rosuvastatin

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Arthralgia	Abdominal pain, asthenia, constipation, diarrhea, indigestion, headache, increased liver enzymes, influenza-like symptoms, myalgia, nasopharyngitis, nausea, pharyngitis, rhinitis	Rhabdomyolysis, tendon rupture

Efficacy Monitoring Parameters. Total cholesterol, LDL-cholesterol, and triglycerides levels; HDL-cholesterol levels.

Toxicity Monitoring Parameters. Signs/symptoms of rhabdomyolysis (myalgias, dark urine, arthralgias, fatigue) or hepatotoxicity; LFTs should be performed at baseline, 12 wk after initiation of therapy, and every 6 mo thereafter; serum creatine kinase should be measured in patients experiencing muscle pain and in those receiving other drugs associated with myopathy.

Key Patient Counseling Points. Contact prescriber immediately if pregnancy occurs while taking rosuvastatin. Do not drink alcohol. Rosuvastatin does not take the place of diet and exercise to lower cholesterol levels.

Clinical Pearls. Lipid-level assessment should be done within 4 wk following dose initiation or titration. Consider holding rosuvastatin 4-7 d before major surgery as patient is at higher risk for occurrence of rhabdomyolysis. May increase risk of diabetes.

Merck pictured

Class: Vaccine, Live, Viral

Dosage Forms. Suspension for Oral Administration: Monovalent attenuated human rotavirus vaccine (Rotarix), pentavalent attenuated bovine rotavirus vaccine (RotaTeq)

Common FDA Label Indication, Dosing, and Titration.

1. Prophylaxis of viral gastroenteritis due to rotavirus infection: One dose po for all infants at 2 and 4 mo of age (Rotarix, 2 doses required), or 2, 4, and 6 mo of age (RotaTeq, 3 doses required); the 1st dose should be administered between 6 and 14 wk of age; do not start the series if infant >14 wk of age; all doses should be administered at least 4 wk apart and before infant reaches 24 wk of age

Off-Label Uses. None

Drug Characteristics: Rotavirus Vaccine, Live

Pregnancy Category	C	**ADME**	None known
Lactation	Infant risk is minimal	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to rotavirus vaccine or a component of the vaccine, severe combined immunodeficiency; Rotarix may contain latex; history of intussusception	**Black Box Warnings**	None

Medication Safety Issues: Rotavirus Vaccine, Live

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Rotarix, RotaTeq	No

Drug Interactions: Rotavirus Vaccine, Live

Typical Agents	Mechanism	Clinical Management
Moderate- to high-dose corticosteroids	Immunosuppression increases risk of infection caused by live virus and decreases vaccine efficacy	Defer or delay rotavirus vaccine administration until corticosteroid therapy has been discontinued
Immunosuppressing agents	Immunosuppression increases risk of infection caused by live virus and decreases vaccine efficacy	Defer or delay rotavirus vaccine administration until immunosuppressive therapy has been discontinued

Adverse Reactions: Rotavirus Vaccine, Live

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Vomiting, irritability, fever, otitis media	Diarrhea	Intussusception, anaphylaxis, seizures

Efficacy Monitoring Parameters. Prevention of viral gastroenteritis due to rotavirus infection.

Toxicity Monitoring Parameters. Fever, number of stools, abdominal pain.

Key Patient Counseling Points. Return to provider for each dose in the series. Contact a health-care provider right away if the child has diarrhea, blood in his stool, vomiting, high fever, or abdominal pain as these may be symptoms of intussusception.

Clinical Pearls. If the infant fails to swallow or vomits the vaccine dose, do not readminister the dose. Immunized infant may shed virus in stools. Hand washing after diaper changing is always recommended.

SAXAGLIPTIN: Onglyza

Class: Dipeptidyl Peptidase-4 Inhibitor, Antidiabetic

Dosage Forms. Oral Tablet: 2.5 mg, 5 mg

Common FDA Label Indication, Dosing, and Titration.

1. Diabetes mellitus: 2.5-5 mg po daily

Off-Label Uses. None

MOA. Saxagliptin is a dipeptidyl peptidase-4 (DPP-4) enzyme inhibitor that inhibits the degradation of incretin hormones by DPP-4, and enhances the function of GLP-1 and GIP to increase insulin release and decrease glucagon levels in the circulation in a glucose-dependent manner.

Drug Characteristics: Saxagliptin

Dose Adjustment Hepatic	Not required	**Absorption**	F = 50-75%, food has no effect on absorption
Dose Adjustment Renal	CrCl ≤50 mL/min, 2.5 mg po daily	**Distribution**	Vd = 2.7 L/kg; negligible protein binding
Dialyzable	Yes	**Metabolism**	Hepatic via CYP3A4/5 to metabolite with 50% activity of parent compound; substrate of P-glycoprotein
Pregnancy Category	B	**Elimination**	Renal elimination is 60% with a half-life of 2.5 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to saxagliptin	**Black Box Warnings**	None

Medication Safety Issues: Saxagliptin

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	Yes	SitaGLIPtin, SUMAtriptan	No

Drug Interactions: Saxagliptin

Typical Agents	Mechanism	Clinical Management
P-glycoprotein inducers	Increased saxagliptin transport reduces saxagliptin effectiveness	Monitor and consider dose increases of saxagliptin
P-glycoprotein inhibitors	Decreased saxagliptin transport increases risk of saxagliptin toxicity	Monitor and consider dose decreases of saxagliptin
CYP3A4/5 inducers	Increased saxagliptin metabolism reduces saxagliptin effectiveness	Monitor and consider dose increases of saxagliptin
CYP3A4/5 inhibitors	Decreased saxagliptin metabolism increases risk of saxagliptin toxicity	Reduce dose to 2.5 mg daily if concurrent strong CYP3A4/5 inhibitor. Monitor and consider dose decreases of saxagliptin for moderate CYP3A4/5 inhibitor
Corticosteroids (orally inhaled, systemic)	May diminish or increase hypoglycemic effect of saxagliptin	Monitor and consider saxagliptin dose adjustment
MAOIs	Stimulation of insulin secretion, hypoglycemic effects	Avoid concurrent use if possible; monitor and consider dose adjustments

Adverse Reactions: Saxagliptin

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Hypoglycemia	Headaches, nasopharyngitis, peripheral edema, nausea, diarrhea	Pancreatitis, hypersensitivity, acute renal failure, Stevens-Johnson syndrome, rhabdomyolysis

Efficacy Monitoring Parameters. Pre-prandial blood glucose between 70 and 130 mg/dL, HbA_{1c} <7%.

Toxicity Monitoring Parameters. Monitor renal function and amylase periodically. Seek medical attention if severe skin rash, severe abdominal pain, muscle weakness or pain, or decreased urine production.

Key Patient Counseling Points. Monitor blood glucose in frequent intervals (2-4 times/d). Take with morning meal if once-daily dosing. Take with morning and evening meal if twice-a-day dosing.

Clinical Pearls. Not for use in children. Metformin is first-line therapy for type 2 diabetes. Saxagliptin may be used as monotherapy in a patient with contraindications to metformin. Also available in combination dosage form with metformin. Incretin mimetics may increase risk of pancreatitis and pancreatic duct metaplasia.

SERTRALINE: Zoloft, Various

Class: SSRI Antidepressant

Dosage Forms. Oral Tablet: 25 mg, 50 mg, 100 mg; **Oral Solution, Oral Syrup:** 20 mg/mL

Northstar Rx generic pictured

Common FDA Label Indication, Dosing, and Titration.

1. Depression: 50 mg po daily, may titrate to 200 mg/d
2. OCD: Children 6-12 y of age, 25 mg po daily, may titrate to 200 mg/d; Children 13-17 y of age and Adults, 50 mg po daily, may titrate to 200 mg/d
3. Panic disorder, posttraumatic stress disorder, social phobia disorder: 25 mg po daily for 1 wk, then titrate to 50 mg po daily, may titrate to 200 mg/d
4. Premenstrual dysphoric disorder: 50 mg po daily continuously or only during luteal phase; may titrate to 100 mg/d

Off-Label Uses.

1. Binge eating disorder: 25 mg po daily after lunch × 3 d, then titrate to 50 mg po daily, may titrate to 200 mg/d
2. Bulimia nervosa: 50 mg po daily for 1 wk, may titrate to 200 mg/d
3. Generalized anxiety disorder: 25 mg po daily for 1 wk, may titrate to 200 mg/d

MOA. Sertraline is an SSRI that indirectly results in a downregulation of β-adrenergic receptors. It has no clinically important effect on noradrenergic or histamine receptors and no effect on MAO. It lacks stimulant, cardiovascular, anticholinergic, and convulsant effects.

Drug Characteristics: Sertraline

Dose Adjustment Hepatic	Lower dose or dose less frequently	**Absorption**	F = 100%, food has minimal effect on absorption
Dose Adjustment Renal	Not required	**Distribution**	Vd = 20 L/kg; 99% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Extensive hepatic via CYP2D6 to 1 active metabolite; CYP2D6 substrate; moderate inhibitor of CYP2B6, 2C19, and 2D6
Pregnancy Category	C	**Elimination**	Renal elimination is 40-45% with a half-life of 24 h
Lactation	Usually compatible	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to sertraline; concomitant use of pimozide, thioridazine, or MAOIs	**Black Box Warnings**	Suicidality, not approved for depression in children; approved for OCD in children >6 y

Medication Safety Issues: Sertraline

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Zocor, selegiline	No

Drug Interactions: Sertraline

Typical Agents	Mechanism	Clinical Management
CYP2D6 inhibitors	Decreased sertraline metabolism increases risk of sertraline toxicity	Monitor and consider dose decreases of sertraline
CYP2B6, 2C19, 2D6, substrates	Decreased substrate metabolism may result in substrate toxicity	Monitor and consider decreasing dose of substrate
Antiplatelet drugs, NSAIDs	Increased risk of bleeding	Monitor for bleeding
Triptans, SSRIs, dextroampheta-mine, tramadol, MAOIs, linezolid	Increased risk of serotonin syndrome	Monitor closely for symptoms of serotonin syndrome (rest-lessness, hyperthermia, hyper-ref exia, incoordination)

Adverse Reactions: Sertraline

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Diarrhea, fatigue, head-ache, insomnia, nausea	Abdominal pain, anxiety, bleeding, constipation, dizziness, diaphoresis, disor-der of ejaculation, indigestion, loss of appetite, rash, reduced libido, somno-lence, sweating, tremor, vomiting, weight gain, xerostomia	Serotonin syndrome, suicidal thoughts

Efficacy Monitoring Parameters. Improvement in symptoms of depression, panic disorder, OCD.

Toxicity Monitoring Parameters. Worsening of depression, suicidality, or unusual changes in behavior, especially at the initiation of therapy or with dosage increases or decreases; signs/symptoms of abnormal bleeding. Monitor CBC.

Key Patient Counseling Points. Avoid activities requiring mental alertness or coordination until drug effects are realized. Symptomatic improvement may not be seen for several weeks. Report worsening depression, suicidal ideation, unusual changes in behavior, or unusual bleeding. Avoid abrupt discontinuation; may precipitate withdrawal symptoms. Do not drink alcohol or use NSAIDs or aspirin while taking this drug.

Clinical Pearls. If intolerable withdrawal symptoms occur following a decrease in dose or therapy discontinuation, may need to resume the previous dose and taper at a more gradual rate. Oral concentrate must be diluted before administration. Medication guide required at dispensing.

SILDENAFIL: Viagra, Revatio, Various

Class: Erectile Dysfunction Agent, Pulmonary Hypertension Agent

Dosage Forms. Oral Tablet: 20 mg, 25 mg, 50 mg, 100 mg; **Oral Suspension:** 10 mg/mL

Pfizer pictured

Common FDA Label Indication, Dosing, and Titration.

1. Erectile dysfunction: 25-100 mg po prn 1 h prior to anticipated sexual activity
2. Pulmonary hypertension (WHO group I): 5-20 mg po tid

Off-Label Uses.

1. Pulmonary hypertension (WHO group II-IV): 5-20 mg po tid

MOA. Inhibition of phosphodiesterase type 5 (PDE5) by sildenafil increases the amount of cyclic guanosine monophosphate (GMP) enhancing erectile function and pulmonary vasculature relaxation. Penile erection during sexual stimulation is mediated by the release of nitric oxide (NO) from nerve terminals and endothelial cells, which stimulates the synthesis of cyclic GMP in smooth muscle cells. Cyclic GMP causes smooth muscle relaxation and increased blood flow into the corpus cavernosum and vasodilation in the pulmonary bed.

Drug Characteristics: Sildenafil

Dose Adjustment Hepatic	Avoid use in severe liver disease	**Absorption**	F = 41%, food has minimal effect on absorption
Dose Adjustment Renal	CrCl <30 mL/min, 25 mg po if used for ED. Not required for pulmonary artery hypertension (PAH)	**Distribution**	Vd = 105 L; 96% protein bound
Dialyzable	Unknown	**Metabolism**	Hepatic via CYP3A4/5
Pregnancy Category	B	**Elimination**	Renal elimination is 13% with a half-life of 4 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to phosphodiesterase inhibitors, concurrent nitrates, concurrent HIV protease inhibitors when used for treating pulmonary hypertension	**Black Box Warnings**	None

Medication Safety Issues: Sildenafil

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Silodosin, tadalafil	No

Drug Interactions: Sildenafil

Typical Agents	Mechanism	Clinical Management
CYP3A4/5 inducers	Increased sildenafil metabolism reduces sildenafil effectiveness	Monitor and consider dose increases of sildenafil
CYP3A4/5 inhibitors	Decreased sildenafil metabolism increases risk of sildenafil toxicity	Reduce dose to 25 mg if concurrent strong CYP3A4/5 inhibitors
α-Adrenergic agents	Additive hypotension	Monitor for hypotension and consider dose reductions
Nitrates	Additive hypotension, potentially severe	Contraindicated
Protease inhibitors	Increased concentration of sildenafil and increased risk of toxicity	Reduce dose of sildenafil to 25 mg every 48 h if used for ED; concurrent use is contraindicated if used for PAH

Adverse Reactions: Sildenafil

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Flushing, nausea, headache, visual disturbances, lack of blue/green color discrimination	Nasopharyngitis, angina, chest pain, hypotension, retinal hemorrhage	Myocardial infarction, seizures, strokes, sudden hearing loss, priapism

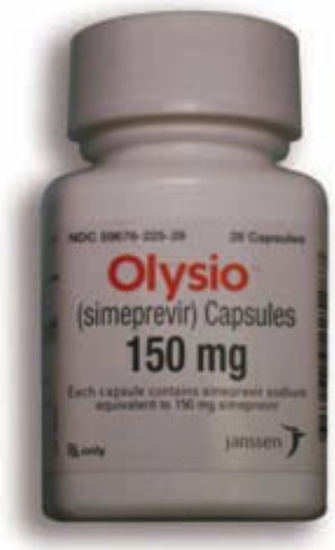
Efficacy Monitoring Parameters. Improvement in sexual function, improvement in respiratory status/functional status.

Toxicity Monitoring Parameters. Seek medical attention if severe skin rash, chest pain, erection lasting more than 4 h, tinnitus, dizziness, or shortness of breath.

Key Patient Counseling Points. Take 60 min prior to anticipated sexual activity, but do not take more frequently than once q24h.

Clinical Pearls. The choice between tadalafil, sildenafil, or vardenafil is largely one of patient preference; tadalafil would be indicated in those desiring "full-day coverage." Sexual stimulation is required to initiate the local release of nitric oxide; the inhibition of PDE5 has no effect in the absence of sexual stimulation. Dose-dependent increase in mortality in children using for PAH; use alternative agent if possible. Revatio is brand name for PAH indication.

SIMEPREVIR: Olysio



Class: Polymerase Inhibitor (Anti-HCV)

Dosage Forms. Oral Capsule: 150 mg

Common FDA Label Indication, Dosing, and Titration.

1. CHC infection in patients with HCV genotype 1a: 150 mg po daily with food as part of combination regimen with concomitant ribavirin and peginterferon alfa (duration 12 wk, followed by 12 or 36 additional weeks of peginterferon alfa and ribavirin alone depending on prior response status), or with sofosbuvir (duration 12 wk in patients without cirrhosis, or 24 wk in patients with cirrhosis; screening patients with HCV genotype 1a infection for the presence of virus with the NS3 Q80K polymorphism at baseline is strongly recommended, and alternative therapy should be considered for patients infected with HCV genotype 1a containing the Q80K polymorphism

Off-Label Uses. None

MOA. A direct-acting antiviral agent against the hepatitis C virus. It inhibits HCV NS3/4A protease, essential for viral replication, and acts as a chain terminator.

Drug Characteristics: Simeprevir

Dose Adjustment Hepatic	Not required	**Absorption**	F is unknown; food enhances AUC
Dose Adjustment Renal	Not required	**Distribution**	Protein binding >99%
Dialyzable	Unknown	**Metabolism**	Hepatic, CYP3A4/5 and P-glycoprotein substrate
Pregnancy Category	C (X in combination with ribavirin)	**Elimination**	Feces, 91%; <1% eliminated renally; half-life is 10-13 h
Lactation	Not recommended	**Pharmacogenetics**	HCV genotype determines treatment regimen
Contraindications	Because of ribavirin risk, do not use in pregnant women, or men whose female partners are pregnant	**Black Box Warnings**	None

Medication Safety Issues: Simeprevir

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	Do not chew or open capsules	No	No	No

Drug Interactions: Simeprevir

Typical Agents	Mechanism	Clinical Management
P-glycoprotein inhibitors	Decreased simeprevir transport increases risk of simeprevir toxicity	Monitor carefully and consider simeprevir dose reduction
P-glycoprotein inducers	Increased simeprevir transport decreases simeprevir eff cacy	Avoid concurrent use, or monitor carefully and consider simeprevir dose increases
CYP3A4/5 inhibitors	Decreased simeprevir metabolism and increased risk of simeprevir toxicity	Avoid concurrent use or consider dose increases of simeprevir
CYP3A4/5 inducers	Increased simeprevir metabolism and decreased simeprevir eff cacy	Avoid concurrent use or consider dose decreases of simeprevir

Adverse Reactions: Simeprevir

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Fatigue, headache, dizziness, insomnia, pruritus, rash, nausea, diarrhea, increased bilirubin, myalgia, dyspnea	Photosensitivity	None

Efficacy Monitoring Parameters. Improvement in signs and symptoms of hepatitis C infection. Monitor LFTs. Serum hepatitis C viral RNA levels prior and during treatment.

Toxicity Monitoring Parameters. In female patients and female partners of male patients, pregnancy tests should be done prior to and during treatment.

Key Patient Counseling Points. Must be taken in combination with other antiviral products, cannot be taken alone. Pregnancy warnings (due to ribavirin risk) for female patients and female partners of male patients. Avoid excessive sunlight and take precautions if exposed to sun. Take particular caution in patients of East Asian descent (higher risk of phototoxicity and rash).

Clinical Pearls. Astronomically expensive (approximately $80,000 per 12-wk course of therapy). Genetic category of HCV virus must be considered to determine appropriateness of treatment. Complicated stopping rules utilizing serum hepatitis C viral RNA levels (viral loads) used to determine overall length of treatment. Not recommended in patients who have failed simeprevir or other HCV protease inhibitor therapy in the past. Off-label dosing regimen for treatment of patients with HCV genotype 1 and 4 available.

SIMVASTATIN: Zocor, Various

Class: HMG-CoA Reductase Inhibitor

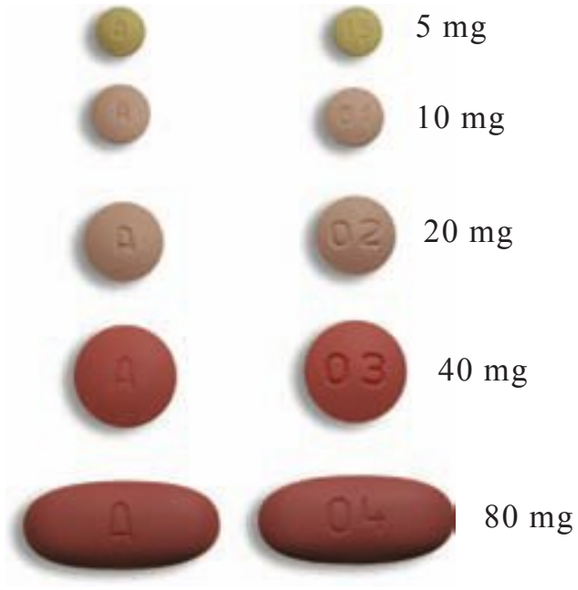
Dosage Forms. Oral Tablet: 5 mg, 10 mg, 20 mg, 40 mg, 80 mg

Common FDA Label Indication, Dosing, and Titration.

1. Hyperlipidemia: 20-40 mg po daily in the evening
2. Primary and secondary preventions of atherosclerotic cardiovascular disease: 20-40 mg po daily in the evening
3. Secondary prevention of cardiovascular events in patients with or at high risk for CAD: 5-40 mg po daily in the evening
4. Familial hypercholesterolemia (homozygous): Children (boys and postmenarchal girls 10-17 y of age), 10 mg po daily, may titrate to 40 mg po daily in the evening; Adults 20-40 mg po daily in the evening

Off-Label Uses. None

MOA. HMG-CoA reductase inhibitors competitively inhibit conversion of HMG-CoA to mevalonate, an early rate-limiting step in cholesterol synthesis. A compensatory increase in LDL receptors, which bind and remove circulating LDL-cholesterol, results. Production of LDL-cholesterol also can decrease because of decreased production of VLDL-cholesterol or increased VLDL removal by LDL receptors.



Northstar Rx generic pictured

Drug Characteristics: Simvastatin

Dose Adjustment Hepatic	Contraindicated in active liver disease	**Absorption**	F <5%
Dose Adjustment Renal	Severe renal impairment, initiate at 5 mg po daily	**Distribution**	95% protein bound
Dialyzable	Unknown	**Metabolism**	Extensive hepatic into 3 active metabolites; CYP3A4/5 substrate
Pregnancy Category	X	**Elimination**	Fecal elimination is 60%
Lactation	Contraindicated	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to simvastatin, active liver disease, pregnancy and lactation	**Black Box Warnings**	None

Medication Safety Issues: Simvastatin

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Zoloft, ZyrTEC atorvaSTATin	No

Drug Interactions: Simvastatin

Typical Agents	Mechanism	Clinical Management
CYP3A4/5 inducers	Increased simvastatin metabolism reduces simvastatin effectiveness	Monitor and consider dose increases of simvastatin
Moderate CYP3A4/5 inhibitors	Decreased simvastatin metabolism increases risk of simvastatin toxicity	With concurrent amiodarone, amlodipine, lomitapide, or ranolazine, *max* dose of simvastatin is 20 mg daily. With concurrent diltiazem, dronedarone or verapamil, *max* dose of simvastatin is 10 mg daily. Monitor and consider dose decreases of simvastatin if used with other inhibitors
Strong CYP3A4/5 inhibitors	Decreased simvastatin metabolism increases risk of simvastatin toxicity	Concurrent use contraindicated
Fibrates, niacin	Increased risk of myopathy or rhabdomyolysis	Avoid concurrent use, or monitor for myopathy and measure creatine kinase levels
Warfarin	Increased risk of bleeding and risk of rhabdomyolysis	Monitor INR with addition or withdrawal of simvastatin; monitor for myopathy and measure creatine kinase levels

Adverse Reactions: Simvastatin

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
	Abdominal pain, constipation, diarrhea, headache, increased liver enzymes, myalgia, nausea, rash	Rhabdomyolysis, myopathy, hepatotoxicity, tendon rupture, elevated HgA_{1c}, immune-mediated necrotizing myopathy

Efficacy Monitoring Parameters. Reduction in total cholesterol, LDL-cholesterol, and triglycerides levels; increase in HDL-cholesterol levels. Obtain baseline lipid panel, fasting lipid panel 4-12 wk after initiation of therapy and every 3-12 mo thereafter.

Toxicity Monitoring Parameters. Obtain baseline LFTs, SCr, and BUN. Repeat LFTs if signs of hepatotoxicity (fatigue, abdominal pain, yellowing of skin or sclera). Consider CPK in patients with symptoms of myopathy (pain cramping, weakness)

Key Patient Counseling Points. Contact prescriber immediately if pregnancy occurs. Do not drink alcohol. There are multiple significant drug-drug interactions with simvastatin. Consult a health-care professional prior to starting any new medications, including OTC and herbal drugs. Simvastatin does not take the place of lifestyle changes (diet, exercise) to lower cholesterol levels.

Clinical Pearls. May increase fasting blood glucose; however, cardiovascular benefits outweigh the risk of dysglycemia. Myopathy is related to both dose and interacting medications. Simvastatin 80 mg is limited to patients maintained on this dose >12 mo without myopathy or interacting medications. Patients not at LDL goal on 40 mg of simvastatin or requiring high-intensity therapy (eg, LDL >190 mg/dL) should receive alternative therapy.

SITAGLIPTIN: Januvia

Class: Dipeptidyl Peptidase-4 Inhibitor, Antidiabetic

Dosage Forms. Oral Tablet: 25 mg, 50 mg, 100 mg

Common FDA Label Indication, Dosing, and Titration.

1. Diabetes mellitus: 100 mg po daily

Off-Label Uses. None

MOA. Sitagliptin phosphate is a DPP-4 enzyme inhibitor that inhibits the degradation of incretin hormones by DPP-4, and enhances the function of GLP-1 and GIP to increase insulin release and decrease glucagon levels in the circulation in a glucose-dependent manner.

Merck 100 mg pictured

Drug Characteristics: Sitagliptin

Dose Adjustment Hepatic	Not required	**Absorption**	F = 87%, food has no effect on absorption
Dose Adjustment Renal	CrCl 30-50 mL/min, 50 mg po daily; CrCl <30 mL/min, 25 mg po daily	**Distribution**	Vd = 198 L; 38% protein bound
Dialyzable	Yes	**Metabolism**	Substrate of P-glycoprotein; not metabolized
Pregnancy Category	B	**Elimination**	Renal elimination is 87% with a half-life of 12 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to sitagliptin	**Black Box Warnings**	None

Medication Safety Issues: Sitagliptin

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	SitaGLIPtin	No	Yes	Janumet, saxagliptin	No

Drug Interactions: Sitagliptin

Typical Agents	Mechanism	Clinical Management
P-glycoprotein inducers	Increased sitagliptin transport reduces sitagliptin effectiveness	Monitor and consider dose increases of sitagliptin
P-glycoprotein inhibitors	Decreased sitagliptin transport increases risk of sitagliptin toxicity	Monitor and consider dose decreases of sitagliptin
Corticosteroids	May diminish or increase hypoglycemic effect of sitagliptin	Monitor and consider sitagliptin dose adjustment
MAOIs	Stimulation of insulin secretion, hypoglycemic effects	Avoid concurrent use if possible; monitor and consider dose adjustments

Adverse Reactions: Sitagliptin

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Hypoglycemia	Headaches, nasopharyngitis, nausea, diarrhea	Pancreatitis, hypersensitivity, acute renal failure, Stevens-Johnson syndrome, rhabdomyolysis

Efficacy Monitoring Parameters. Preprandial blood glucose between 70 and 130 mg/dL, HbA_{1c} <7%.

Toxicity Monitoring Parameters. Monitor renal function and amylase periodically. Seek medical attention if severe skin rash, severe abdominal pain, muscle weakness or pain, or decreased urine production.

Key Patient Counseling Points. Monitor blood glucose in frequent intervals (2-4 times/d). Take with morning meal if once-daily dosing. Take with morning and evening meal if twice-a-day dosing. When used in combination with insulin or sulfonylureas, risk of hypoglycemia may be increased.

Clinical Pearls. Not for use in children. Metformin is first-line therapy for type 2 diabetes. Sitagliptin may be used as monotherapy in a patient with contraindications to metformin. Also available in combination dosage form with metformin. Incretin mimetics may increase risk of pancreatitis and pancreatic duct metaplasia. Medication guide must be dispensed with this product.

SOLIFENACIN: Vesicare

Class: Urinary Antispasmodic; Anticholinergic Agent

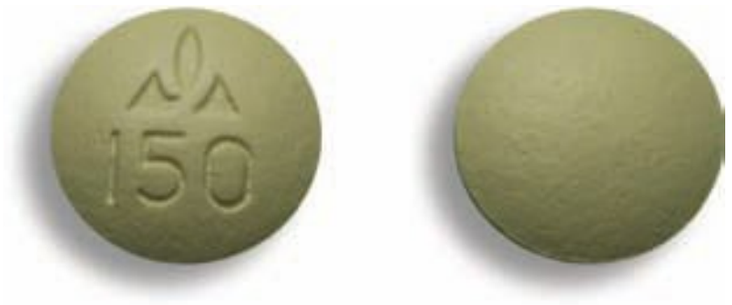
Dosage Forms. Oral Tablet: 5 mg, 10 mg

Common FDA Label Indication, Dosing, and Titration.

1. Overactive bladder: 5 mg po daily, may titrate to 10 mg po daily

Off-Label Uses. None

MOA. Solifenacin is a competitive muscarinic receptor antagonist. Muscarinic receptors play an important role in several major cholinergically mediated functions, including contractions of the urinary bladder smooth muscle and stimulation of salivary secretion.



GlaxoSmithKline 5 mg pictured

Drug Characteristics: Solifenacin

Dose Adjustment Hepatic	Moderate hepatic dysfunction, *max* dose of 5 mg po daily; severe hepatic dysfunction, avoid use	**Absorption**	F = 90%, food has no effect on absorption
Dose Adjustment Renal	CrCl <30 mL/min, *max* 5 mg po daily	**Distribution**	Vd = 600 L; 98% protein bound
Dialyzable	Unknown	**Metabolism**	Hepatic; CYP3A4/5 substrate
Pregnancy Category	C	**Elimination**	Renal elimination is 70% with a half-life of 45-68 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to solifenacin, gastric retention, uncontrolled glaucoma, urinary retention	**Black Box Warnings**	None

Medication Safety Issues: Solifenacin

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	VESIcare	Swallow tablet whole	No	Visicol	No

Drug Interactions: Solifenacin

Typical Agents	Mechanism	Clinical Management
CYP3A4/5 inducers	Increased solifenacin metabolism reduces solifenacin effectiveness	Monitor and consider dose increases of solifenacin
CYP3A4/5 inhibitors	Decreased solifenacin metabolism increases risk of solifenacin toxicity	Monitor and consider dose decreases of solifenacin
Anticholinergic agents	Additive anticholinergic adverse effects	Avoid concurrent use or monitor carefully for adverse effects
Agents that increase QT interval	Increased risk of QT prolongation (torsades de pointes, cardiac arrest)	Avoid concurrent use or monitor carefully

Adverse Reactions: Solifenacin

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Constipation, xerostomia, blurred vision	Abdominal pain, dizziness, indigestion, urinary retention	Angioedema, QT prolongation, exfoliative dermatitis

Efficacy Monitoring Parameters. Resolution of clinical signs of incontinence and urinary urgency and frequency.

Toxicity Monitoring Parameters. Seek medical attention for severe anticholinergic effects (severe dry mouth, cognitive impairment, constipation, vision changes). Monitor vital signs.

Key Patient Counseling Points. This drug may cause anticholinergic effects, including constipation, urinary retention, blurred vision, dyspepsia, or xerostomia. Heat prostration (due to decreased sweating) can occur when used in a hot environment and/or exercise.

Clinical Pearls. Patients should be advised to exercise caution in driving or other tasks that require alertness until the drug's effects have been determined. May cause decline in cognitive function, especially in the elderly.

SOFOSBUVIR: Sovaldi

Class: Polymerase Inhibitor (Anti-HCV)

Dosage Forms. Oral Tablet: 400 mg

Common FDA Label Indication, Dosing, and Titration.

1. Chronic hepatitis C (CHC) infection in monoinfected (HCV) or coinfected (HCV/HIV-1) patients: 400 mg po daily with concomitant ribavirin and/or peginterferon alfa (treatment regimen and duration based on HCV genotype and/or clinical scenario); HCV genotype 1 or 4, treat for 12 wk with ribavirin and peginterferon alfa; HCV genotype 2, treat for 12 wk with concomitant ribavirin; HCV genotype 3, treat for 24 wk with concomitant ribavirin
2. Patients with hepatocellular carcinoma awaiting liver transplantation: 400 mg po daily with concomitant ribavirin for 48 wk or until the time of liver transplantation, whichever occurs first

Off-Label Uses. None

MOA. A direct-acting antiviral agent against the hepatitis C virus. It inhibits HCV NS5B RNA-dependent RNA polymerase, essential for viral replication, and acts as a chain terminator.

Drug Characteristics: Sofosbuvir

Dose Adjustment Hepatic	Not required	**Absorption**	F is unknown; food has no effect on Cmax or AUC
Dose Adjustment Renal	Primary metabolite accumulates in renal dysfunction, but no dose adjustments are required	**Distribution**	Protein binding 61-65%
Dialyzable	Yes, hemodialysis	**Metabolism**	Hepatic, P-glycoprotein substrate
Pregnancy Category	B (X in combination with ribavirin)	**Elimination**	Renal, 78% as active metabolite; half-life of parent compound, 0.4 h; half-life of active metabolite, 27 h
Lactation	Not recommended	**Pharmacogenetics**	HCV genotype determines treatment regimen
Contraindications	Because of ribavirin risk, do not use in pregnant women, or men whose female partners are pregnant	**Black Box Warnings**	None

Medication Safety Issues: Sofosbuvir

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	No	No

Drug Interactions: Sofosbuvir

Typical Agents	Mechanism	Clinical Management
P-glycoprotein inhibitors	Decreased sofosbuvir transport increases risk of sofosbuvir toxicity	Monitor carefully and consider sofosbuvir dose reduction
P-glycoprotein inducers	Increased sofosbuvir transport decreases sofosbuvir efficacy	Avoid concurrent use, or monitor carefully and consider sofosbuvir dose increases

Adverse Reactions: Sofosbuvir

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Fatigue, headache, insomnia, chills, pruritus, rash, nausea, anemia	Diarrhea, thrombocytopenia increased LFTs	Pancytopenia, depression, suicidality

Efficacy Monitoring Parameters. Improvement in signs and symptoms of hepatitis C infection. Monitor SCr and LFTs. Serum hepatitis C viral RNA levels prior and during treatment.

Toxicity Monitoring Parameters. In female patients and female partners of male patients, pregnancy tests should be done prior to and during treatment.

Key Patient Counseling Points. Must be taken with ribavirin, and depending on viral genotype, peginterferon alfa. Pregnancy warnings (due to ribavirin risk) for female patients and female partners of male patients.

Clinical Pearls. Astronomically expensive (approximately $80,000 per 12-wk course of therapy). Must be used in combination with other treatments based on the viral genetic category (not the patient's genetic make-up). In patients who cannot tolerate interferon, off-label regimens have been recommended that include sofosbuvir and ribavirin alone. Off-label regimens are also recommended in patients with HCV genotype 5 and 6, and those patients who fail on treatments with sofosbuvir and/or ribavirin and peginterferon alfa.

SPIRONOLACTONE: Aldactone, Various

Class: Potassium-Sparing Diuretic; Selective Aldosterone Blocker

Dosage Forms. Oral Tablet: 25 mg, 50 mg, 100 mg

25 mg

Amneal generic pictured

50 mg

Actavis generic pictured

100 mg

Amneal generic pictured

Common FDA Label Indication, Dosing, and Titration.

1. Heart failure, NYHA class III-IV: 12.5-25 mg po daily, may titrate to *max* of 50 mg
2. Edema associated with heart failure: 100 mg po daily in single or divided doses, may titrate to 400 mg/d
3. Nephrotic syndrome: 100 mg po daily in single or divided doses, may titrate to 400 mg/d
4. Hypertension: 50-100 mg po daily in single or divided doses, may titrate to 400 mg/d
5. Hypokalemia: 25-100 mg po daily

Off-Label Uses.

1. Ascites, cirrhosis of liver: 100 mg po daily in single or divided doses, may titrate to 400 mg/d
2. Acne vulgaris: 50-200 mg po daily
3. Hirsutism: 50-200 mg po daily for 20 d/mo

MOA. Spironolactone is a steroidal competitive aldosterone antagonist that acts from the interstitial side of the distal and collecting tubular epithelium to block sodium-potassium exchange, producing a delayed and mild diuresis. The diuretic effect is maximal in states of hyperaldosteronism. Excretion of sodium and chloride excretion is increased; excretion of potassium and magnesium is decreased. Spironolactone has mild antihypertensive activity and has demonstrated a beneficial effect in NYHA class III and IV heart failure.

Drug Characteristics: Spironolactone

Dose Adjustment Hepatic	Alternate-day dosing may be considered	**Absorption**	F = 73%, food increases absorption
Dose Adjustment Renal	CrCl <30 mL/min, not recommended	**Distribution**	90% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Hepatic to active metabolites
Pregnancy Category	C	**Elimination**	Renal elimination is 47-57% with a half-life of 1.4 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to spironolactone, anuria, acute renal insufficiency, hyperkalemia	**Black Box Warnings**	Tumorigenic in animal models

Medication Safety Issues: Spironolactone

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Aldactazide	Avoid >25 mg/d in patients with heart failure or with a CrCl <30 mL/min

Drug Interactions: Spironolactone

Typical Agents	Mechanism	Clinical Management
Potassium-sparing diuretics	Increased risk of hypotension, hyperkalemia	Avoid concurrent use or monitor BP and serum potassium levels
ACE-Is, angiotensin receptor antagonists	Increased risk of hypotension, hyperkalemia, nephrotoxicity	Avoid concurrent use or monitor BP, SCr, and potassium levels
Eplerenone, potassium supplements, salt substitutes	Increased risk of hyperkalemia	Avoid concurrent use or monitor serum potassium levels
NSAIDs	Decreased antihypertensive effect of spironolactone, increased risk of hyperkalemia	Avoid concurrent use or monitor BP and potassium levels
Digoxin, sotalol	Increased risk of proarrhythmic effects	Monitor ECG and serum potassium and magnesium levels

Adverse Reactions: Spironolactone

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
	Breast tenderness, diarrhea, disorder of menstruation, gastritis, gynecomastia, headache, hyperkalemia, hyponatremia, impotence, lethargy, nausea, rash, stomach cramps, vomiting, urticaria	Cardiac arrhythmias, gastric hemorrhage

Efficacy Monitoring Parameters. Decreased BP, reduction in edema, weight.

Toxicity Monitoring Parameters. Monitor SCr, potassium levels, ECG if symptoms of hyperkalemia occur.

Key Patient Counseling Points. May cause dizziness. Avoid driving, using machinery, or doing anything else that could be dangerous if not alert. Report signs/symptoms of hyperkalemia (muscle weakness, fatigue, bradycardia) and hyponatremia (confusion, dry mouth, thirst, weakness, hypotension, decreased urination). Avoid potassium supplements, foods/salt substitutes that are high in potassium. Avoid alcohol and NSAIDs.

Clinical Pearls. Reduce dose when used in combination with other diuretics. May use loading dose of 2-3 times the daily dose on first day for faster diuresis. Tablets smell like peppermint . . . no kidding.

SUMATRIPTAN: Imitrex, Various

Dr. Reddy's generic 100 mg pictured

Class: Antimigraine Serotonin Receptor Agonist

Dosage Forms. **Oral Tablet:** 25 mg, 50 mg, 100 mg; **Nasal Spray:** 5 mg/actuation

Common FDA Label Indication, Dosing, and Titration.

1. Migraine: Oral, 25-100 mg po at onset of migraine, may repeat after 2 h prn; *max* 200 mg/d; Nasal, 5-20 mg in 1 nostril, may repeat after 2 h; *max* 40 mg/d

Off-Label Uses. None

MOA. Sumatriptan binds with high affinity to serotonin (5HT) subtypes 1B, 1D, and 1F receptors. It has no significant affinity or pharmacological activity at adrenergic α_1, α_2, or β; dopaminergic D_1 or D_2; muscarinic; or opioid receptors. Serotonin receptor agonists are believed to be effective in migraine either through vasoconstriction (via activation of 5-HT_1 receptors located on intracranial blood vessels) or through activation of 5-HT_1 receptors on sensory nerve endings in the trigeminal system resulting in the inhibition of proinflammatory neuropeptide release.

Drug Characteristics: Sumatriptan

Dose Adjustment Hepatic	Hepatic dysfunction, *max* single dose 50 mg	**Absorption**	F = 15%, high-fat meal increases F
Dose Adjustment Renal	Not required	**Distribution**	Vd = 2.4 L/kg; 14-21% protein bound
Dialyzable	Unknown	**Metabolism**	Hepatic via monoamine oxidase
Pregnancy Category	C	**Elimination**	Renal elimination is 60% with a half-life of 2.5 h
Lactation	Usually compatible	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to sumatriptan, cerebrovascular syndromes, hemiplegic or basilar migraine, ischemic bowel disease, ischemic heart disease, peripheral vascular disease, severe hepatic impairment, uncontrolled hypertension	**Black Box Warnings**	None

Medication Safety Issues: Sumatriptan

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
STATdose	SUMAtriptan	No	No	ZOLMitriptan, sitaGLIPtin	No

Drug Interactions: Sumatriptan

Typical Agents	Mechanism	Clinical Management
SSRIs	Additive pharmacologic effects resulting in excessive serotonergic stimulation	Avoid concurrent use or monitor carefully for signs of serotonin syndrome
Other 5HT agonists	Additive pharmacologic effect leading to dangerous toxicity	Administration within 24 h of other serotonin agonists is contraindicated
MAOIs	Metabolism of sumatriptan inhibited by MAOI, increasing serotonin levels and risk of serotonin syndrome	Contraindicated
Ergot alkaloids	Enhanced vasoconstricting effects	Contraindicated

Adverse Reactions: Sumatriptan

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
	Nausea, asthenia, dizziness, somnolence	Angina, cardiac dysrhythmia, coronary arteriosclerosis, heart block, hypertension, acute myocardial infarction, aphasia, cerebral ischemia, stroke, dystonia, hemiplegia, neuropathy, transient ischemic attack, oculogyric crisis

Efficacy Monitoring Parameters. Resolution of clinical signs of migraine headache.

Toxicity Monitoring Parameters. Signs of ischemic bowel disease (eg, sudden severe abdominal pain, bloody diarrhea) or peripheral vascular disease, serotonin syndrome (eg, agitation, hallucinations, tachycardia, hyperthermia, labile BP, hyperreflexia, incoordination, diarrhea, nausea, and vomiting), ischemic cardiac syndrome, or hypertensive crisis.

Key Patient Counseling Points. Avoid activities requiring mental alertness or coordination until drug effects are realized, as this drug may cause dizziness or somnolence.

Clinical Pearls. Sumatriptan is also available in formulations for injectable administration, and as an oral dosage form in combination with naproxen. These agents are not for prophylaxis; only for the treatment of acute migraine headache. Several serotonin agonists ("triptans") exist for migraine, administered via a variety of routes (oral, inhaled, and injected). Each differs in onset and duration of action. If one agent is ineffective at *max* dose, recommend changing agents or route. Instruct patients to take a 2nd dose 2 or more h after the 1st, if needed, but no more than 200 mg/d. A transdermal form of sumatriptan was approved in 2013, but is not commercially available as of early 2015.

TACROLIMUS: Prograf, Astragraf XL, Various

Class: Calcineurin Inhibitor

Dosage Forms. **Oral Capsule:** 0.5 mg, 1 mg, 5 mg; **Oral Capsule, Extended Release:** 0.5 mg, 1 mg, 5 mg

Common FDA Label Indication, Dosing, and Titration.

1. Cardiac transplant rejection, prophylaxis: 0.075 mg/kg/d po in 2 divided doses, may titrate based on serum levels and tolerability
2. Liver transplant rejection, prophylaxis: Adults, 0.1-0.15 mg/kg/d po in 2 divided doses, may titrate based on clinical response, serum levels, and tolerability; Children, 0.15-0.2 mg/kg/d po in 2 divided doses, may titrate based on serum levels and tolerability
3. Renal transplant rejection, prophylaxis: Immediate release, 0.2 mg/kg/d po in 2 divided doses, may titrate based on serum levels and tolerability; extended release, 0.1-0.2 mg/kg/d po in 1 dose; may titrate based on serum levels and tolerability; immediate-release to extended-release conversion is 1:1

Off-Label Uses.

1. Lung, small bowel, transplant rejection; prophylaxis, graft-versus-host disease, prevention: Use liver transplant dose above
2. Treatment of graft-versus-host disease in allogeneic stem cell transplant: 0.06 mg/kg po twice daily

MOA. Tacrolimus binds to cyclophilin, which inhibits the antigenic response of helper T lymphocytes, which in turn reduces the production of interleukin-2 and suppresses interferon-γ. Inhibition of the immune response limits inflammation.

Sandoz generic 5 mg pictured

Drug Characteristics: Tacrolimus

Dose Adjustment Hepatic	Use doses at the lower end of the dosing range	**Absorption**	F = 14-32%, food decreases absorption
Dose Adjustment Renal	Use doses at the lower end of the dosing range	**Distribution**	Vd = 5-65 L/kg; 99% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Extensive hepatic; substrate of CYP3A4/5 and P-glycoprotein. P-glycoprotein inhibitor
Pregnancy Category	C	**Elimination**	Renal elimination is <1% with a half-life of 11 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to tacrolimus, concurrent ziprasidone use	**Black Box Warnings**	Risk of infection, risk of malignancies

Medication Safety Issues: Tacrolimus

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	Extended release	Yes	Gengraf, PROzac, sirolimus	No

Drug Interactions: Tacrolimus

Typical Agents	Mechanism	Clinical Management
CYP3A4/5 inducers	Increased tacrolimus metabolism reduces tacrolimus effectiveness	Monitor and consider dose increases of tacrolimus
CYP3A4/5 inhibitors	Decreased tacrolimus metabolism increases risk of tacrolimus toxicity	Monitor and consider dose decreases of tacrolimus
P-glycoprotein substrates	Decreased substrate transport and increased concentrations of substrates	Monitor and consider dose decreases of substrates
Amiloride, potassium-sparing diuretics	Increased risk of hyperkalemia	Avoid concurrent use
Aminoglycosides, amphotericin, cisplatin, gancyclovir	Increased risk of nephrotoxicity	Avoid concurrent use
Agents that increase QT interval	Increased risk of QT prolongation (torsade de pointes, cardiac arrest)	Ziprasidone contraindicated, others, avoid concurrent use or monitor carefully
Live vaccines	Risk of severe infections	Avoid concurrent use

Adverse Reactions: Tacrolimus

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Chest pain, hypertension, alopecia, diabetes, hyperglycemia, hyperkalemia, hypomagnesemia, hyperlipidemia, constipation, diarrhea, nausea, anemia, leukopenia, thrombocytopenia, infection, arthralgia, dizziness, headache, insomnia, neuropathy, myoclonus, seizure, nephrotoxicity, dyspnea, pleural effusions	Pruritus, elevated LFTs	Cardiomegaly, arrhythmia, Stevens-Johnson syndrome, increased risk of cancer, pancreatitis, acute renal failure

Efficacy Monitoring Parameters. Lack of signs of rejection (elevation in SCr for renal transplant, LFTs for liver transplant). Tacrolimus trough whole blood concentrations (target 5-20 ng/mL).

Toxicity Monitoring Parameters. Monitor electrolytes, FPG, BP and SCr, BUN, lipids, and CBC. Itching or hives, swelling of face, hands, mouth facial or throat, chest tightness, trouble breathing, blistering, peeling, or red skin rash, chest pain, change in urination, unusual bruising or bleeding, severe abdominal pain.

Key Patient Counseling Points. Take on an empty stomach. Avoid alcohol, grapefruit, and grapefruit juice. Many medications, OTC medications, and foods interact with tacrolimus. Monitor carefully.

Clinical Pearls. Tacrolimus is more effective in preventing acute rejection than cyclosporine for patients with liver and kidney transplants. When changing between brand and generic forms, monitor tacrolimus levels. Medication guide required when dispensing this medication. Topical formulation, used for dermatitis, also available.

TADALAFIL: Cialis, Adcirca

Class: Erectile Dysfunction Agent; Pulmonary Hypertension Agent

Dosage Forms. Oral Tablet: 2.5 mg, 5 mg, 10 mg, 20 mg

Common FDA Label Indication, Dosing, and Titration.

1. Erectile dysfunction: Daily use, Cialis only, 2.5-5 mg po daily; PRN use, 10-20 mg po 30 min prior to anticipated sexual activity, *max* frequency is once daily
2. Benign prostatic hyperplasia: Cialis only, 5 mg po daily; when combined with finasteride, tadalafil administration should be discontinued at or before 26 wk.
3. Pulmonary hypertension: Adcirca only, 40 mg po daily

Off-Label Uses. None

Lilly pictured

MOA. Inhibition of phosphodiesterase type 5 (PDE5) by tadalafil enhances erectile function by increasing the amount of cyclic GMP enhancing erectile function and pulmonary vasculature relaxation. Penile erection during sexual stimulation is mediated by the release of nitric oxide (NO) from nerve terminals and endothelial cells, which stimulates the synthesis of cyclic GMP in smooth muscle cells. Cyclic GMP causes smooth muscle relaxation and increased blood flow into the corpus cavernosum and vasodilation in the pulmonary bed.

Drug Characteristics: Tadalafil

Dose Adjustment Hepatic	Avoid use	**Absorption**	Well absorbed, food has no effect on absorption
Dose Adjustment Renal	CrCl 31-50 mL/min, *max* dose 10 mg q48h; CrCl <30 mL/min, *max* dose is 5 mg q72h	**Distribution**	Vd = 63-77 L; 94% protein bound
Dialyzable	Unknown	**Metabolism**	Hepatic, CYP3A4/5 substrate
Pregnancy Category	B	**Elimination**	Renal elimination is 36% with a half-life of 15-35 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to phosphodiesterase inhibitors, concurrent nitrates	**Black Box Warnings**	None

Medication Safety Issues: Tadalafil

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Sildenafil, vardenafil	No

Drug Interactions: Tadalafil

Typical Agents	Mechanism	Clinical Management
CYP3A4/5 inducers	Increased tadalafil metabolism reduces tadalafil effectiveness	Monitor and consider dose increases of tadalafil
CYP3A4/5 inhibitors	Decreased tadalafil metabolism increases risk of tadalafil toxicity	Max dose of 2.5 mg daily dose or 10 mg every 72 h as needed if concurrent strong CYP3A4/5 inhibitors. Monitor and consider dose decreases of tadalafil if concurrent moderate CYP3A4/5 inhibitors
α-adrenergic agents	Additive hypotension	Monitor for hypotension and consider dose reductions
Nitrates	Additive hypotension, potentially severe	Contraindicated

Adverse Reactions: Tadalafil

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Flushing, nausea, myalgia, headache	Nasopharyngitis, angina, chest pain, hypotension	Stevens-Johnson syndrome, myocardial infarction, seizures, strokes, sudden hearing loss

Efficacy Monitoring Parameters. Improvement in sexual function, BPH symptoms, or respiratory symptoms.

Toxicity Monitoring Parameters. Seek medical attention if severe skin rash, chest pain, erection lasting >4 h, tinnitus, dizziness, or shortness of breath.

Key Patient Counseling Points. If taking as needed, take 30 min prior to anticipated sexual activity. Do not take more frequently than once q24h. Avoid driving or other activities that require mental alertness until the drug's effects have been determined.

Clinical Pearls. The choice between tadalafil, sildenafil, and vardenafil is largely one of patient preference; tadalafil may be preferred in those desiring "full-day coverage." Sexual stimulation is required to initiate the local release of NO; the inhibition of PDE5 has no effect in the absence of sexual stimulation. Adcirca is FDA approved for pulmonary artery hypertension; Cialis is FDA approved for erectile dysfunction.

TAMSULOSIN: Flomax, Various

Boehringer Ingelheim 0.4 mg pictured

Class: α_1-Adrenergic Blocker

Dosage Forms. Oral Capsule: 0.4 mg

Common FDA Label Indication, Dosing, and Titration.

1. Benign prostatic hyperplasia: 0.4 mg po daily, may titrate to 0.8 mg po daily

Off-Label Uses.

1. Neurogenic bladder: 0.4 mg po daily
2. Bladder outlet obstruction symptoms: 0.4 mg po daily
3. Ureteral stones, expulsion: 0.4 mg po daily, discontinue after successful expulsion

MOA. Tamsulosin is closely related to quinazoline derivatives that selectively block postsynaptic α_1-adrenergic receptors. Total peripheral resistance is reduced through arterial and venous dilations. Reflex tachycardia that occurs with other vasodilators is infrequent because there is no presynaptic α_2-receptor blockade. The drugs also decrease total cholesterol, increase HDL-cholesterol, and may improve glucose tolerance and reduce left ventricular mass during long-term therapy. They increase urine flow in BPH by relaxing smooth muscle tone in the bladder neck and prostate.

Drug Characteristics: Tamsulosin

Dose Adjustment Hepatic	Not required	**Absorption**	F >90%, fasting increase F by 30%
Dose Adjustment Renal	Not required	**Distribution**	Vd = 16 L; 94-99% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Extensive hepatic; CYP3A4/5 substrate
Pregnancy Category	B	**Elimination**	Renal elimination is 10% with a half-life of 9-13 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to tamsulosin	**Black Box Warnings**	None

Medication Safety Issues: Tamsulosin

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	Yes	No	Flomax, terazosin	No

Drug Interactions: Tamsulosin

Typical Agents	Mechanism	Clinical Management
α_1-Blockers	Increases risk of hypotension	Contraindicated
CYP3A4/5 inducers	Increased tamsulosin metabolism reduces tamsulosin effectiveness	Monitor and consider dose increases of tamsulosin
CYP3A4/5 inhibitors	Decreased tamsulosin metabolism increases risk of tamsulosin toxicity	Avoid strong CYP3A4/5 inhibitors. Monitor and consider dose decreases of tamsulosin with concurrent moderate CYP3A4/5
Beta-blockers, calcium channel blockers, MAOIs	Increased risk of hypotension, especially with 1st dose	Monitor BP

Adverse Reactions: Tamsulosin

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Dizziness, headache, abnormal ejaculation, rhinitis	Asthenia, edema, fatigue, hypotension, nausea, somnolence, vertigo	Retinal detachment, priapism

Efficacy Monitoring Parameters. American Urological Association (AUA) Symptom Score, decrease in residual urine volume, increased urine flow.

Toxicity Monitoring Parameters. Sign/symptoms of hypotension, BP.

Key Patient Counseling Points. Administer 30 min after same meal daily as fasting increases bioavailability by 30%. Patient should avoid activities requiring coordination until drug effects are realized, as drug may cause vertigo or dizziness. Tell patient to rise slowly from a sitting/lying position, as this drug may cause orthostatic hypotension. Caution patient that syncope or loss of consciousness is possible with first dose or dose increases, especially if patient is in an upright position.

Clinical Pearls. Alpha-blockers commonly used for hypertension. Patients with both hypertension and BPH should avoid taking other α-adrenergic blocking agents while taking this drug.

TEMAZEPAM: Restoril, Various

Class: Benzodiazepine. C-IV

Dosage Forms. Oral Capsule: 7.5 mg, 15 mg, 22.5 mg, 30 mg

Common FDA Label Indication, Dosing, and Titration.

1. Insomnia: 7.5-30 mg po daily hs

Off-Label Uses. None

MOA. Temazepam is a minor metabolite of diazepam. Enhances the postsynaptic effect of the inhibitory neurotransmitter, γ-aminobutyric acid (GABA).

Sandoz generic 15 mg pictured

Mutual Pharmaceutical generic 7.5 mg pictured

Drug Characteristics: Temazepam

Dose Adjustment Hepatic	Not required	**Absorption**	Well absorbed, food has no effect on absorption
Dose Adjustment Renal	Not required	**Distribution**	Vd = 1.4 L/kg; 96% protein bound
Dialyzable	Unknown	**Metabolism**	Hepatic via multiple CYP pathways; contribution of each CYP is minor
Pregnancy Category	X	**Elimination**	Renal elimination is 80-90% with a half-life of 4-18 h
Lactation	Avoid	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to temazepam or other benzodiazepines, narrow-angle glaucoma, pregnancy	**Black Box Warnings**	None

Medication Safety Issues: Temazepam

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Vistaril, LORazepam	Avoid benzodiazepines (any type) for treatment of insomnia, agitation, or delirium

Drug Interactions: Temazepam

Typical Agents	Mechanism	Clinical Management
Alcohol, opioids, and other CNS depressants	Additive CNS and respiratory depression	Avoid if possible and consider dose reductions of both agents
Theophylline	Decreased benzodiazepine effectiveness via inhibition of adenosine receptors	Monitor and consider dose increases for benzodiazepines

Adverse Reactions: Temazepam

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Drowsiness, somnolence, impaired motor coordination	Hypotension, blurred vision, nausea, diarrhea, confusion, headache	Complex behavior, anaphylaxis, worsening of depression, angioedema, drug dependence

Efficacy Monitoring Parameters. Improved ability to fall asleep and sleep through night.

Toxicity Monitoring Parameters. Seek medical attention if severe drowsiness, thoughts of suicide, allergic reaction, or slow or irregular heartbeat. Monitor vital signs.

Key Patient Counseling Points. May cause drowsiness; avoid driving or other tasks requiring motor coordination. Avoid alcohol. Take 30 min prior to bedtime. May cause complex behaviors (driving, talking on phone, etc while not fully awake); bed partner should monitor and temazepam should be discontinued.

Clinical Pearls. Not for long-term use (usually 7-10 d only). Use caution in elderly, appear more sensitive to the effects; dose reductions of 50% have been recommended. Use CNS depressants with caution; may have additive effects. Avoid abrupt discontinuation after chronic use; may cause seizures.

TERAZOSIN: Hytrin, Various

Sandoz generic pictured

Class: α_1-Adrenergic Blocker

Dosage Forms. Oral Capsule: 1 mg, 2 mg, 5 mg, 10 mg

Common FDA Label Indication, Dosing, and Titration.

1. Benign prostatic hyperplasia: 1 mg po daily hs, may titrate to 20 mg/d
2. Hypertension: 1 mg po daily hs, may titrate to 20-40 mg/d

Off-Label Uses. None

MOA. Terazosin selectively blocks postsynaptic α_1-adrenergic receptors. Total peripheral resistance is reduced through arterial and venous dilations. Reflex tachycardia that occurs with other vasodilators is infrequent because there is no presynaptic α_2-receptor blockade. Increases urine flow in BPH by relaxing smooth muscle tone in the bladder neck and prostate.

Drug Characteristics: Terazosin

Dose Adjustment Hepatic	Lower doses may be required	**Absorption**	F = 90%, food delays but does not reduce absorption
Dose Adjustment Renal	Not required	**Distribution**	Vd = 25-30 L; 90-94% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Not metabolized
Pregnancy Category	C	**Elimination**	Renal elimination is 40% with a half-life of 9-12 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to terazosin	**Black Box Warnings**	None

Medication Safety Issues: Terazosin

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	No	Avoid use as an antihypertensive. High risk of orthostatic hypotension

Drug Interactions: Terazosin

Typical Agents	Mechanism	Clinical Management
Beta-blockers, calcium channel blockers, PDEIs other alpha-blockers, MAOI	Increased risk of hypotension, especially with first dose	Monitor BP

Adverse Reactions: Terazosin

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Asthenia, dizziness	Dyspnea, headache, impotence, nausea, nasal congestion, orthostatic hypotension, palpitations, peripheral edema, priapism, somnolence, syncope	Hepatotoxicity

Efficacy Monitoring Parameters. Decreased BP, improvement in obstructive urinary symptoms.

Toxicity Monitoring Parameters. Sign/symptoms of hypotension, increased HR, LFTs.

Key Patient Counseling Points. Avoid activities requiring mental alertness or coordination until drug effects are realized, as drug may cause dizziness and somnolence. Rise slowly from a sitting/lying position, as this drug may cause orthostatic hypotension. May experience syncope or loss of consciousness with 1st dose. Take drug at bedtime to minimize side effects, especially the 1st dose. Avoid sudden discontinuation of drug, as this may cause rebound hypertension. Avoid alcohol while taking this drug.

Clinical Pearls. JNC 8 guidelines do not recommend the use of terazosin, or other alpha-blockers, for the treatment of hypertension. Clinical use should be restricted to the management of BPH.

TERBINAFINE: Lamisil, Various

Class: Antifungal

Dosage Forms. **Oral Tablet:** 250 mg; **Oral Granules:** 125 mg/packet

Common FDA Label Indication, Dosing, and Titration.

1. Onychomycosis due to dermatophyte: Tablet only, 250 mg po daily × 6 wk for fingernails and × 12 wk for toe nails
2. Tinea capitis: Granules only, Children <25 kg, but ≥4 y of age, 125 mg po daily; Children 25-35 kg, 187.5 mg po daily; Children >35 kg, 250 mg po daily

Northstar Rx generic 250 pictured

Off-Label Uses.

1. Cutaneous sporotrichosis: 500 mg po bid × 2-4 wk after all lesions have healed
2. Lymphocutaneous sporotrichosis: 500 mg po bid × 2-4 wk after all lesions have healed

MOA. Terbinafine is an allylamine antifungal that inhibits biosynthesis of ergosterol, an essential component of fungal cell membrane. This results in fungal cell death primarily due to the increased membrane permeability. Terbinafine has been shown to be active against most clinical infections of *T. mentagrophytes* and *T. rubrum*.

Drug Characteristics: Terbinaf ne

Dose Adjustment Hepatic	Hepatic dysfunction, use not recommended	**Absorption**	F = 40%, administration with food increases AUC by 20%
Dose Adjustment Renal	CrCl <50 mL/min, use not recommended	**Distribution**	Vd = 948 L with 99% protein binding
Dialyzable	Not dialyzable	**Metabolism**	Rapidly and extensively metabolized hepatically, substrate of CYP2C9, CYP1A2, CYP3A4/5, CYP2C8, and CYP2C19, all <10%. Strong CYP2D6 inhibitor
Pregnancy Category	B	**Elimination**	Renal elimination is 70% with a half-life of 22-26 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	Use with caution in poor CYP2D6 metabolizers
Contraindications	Hypersensitivity	**Black Box Warnings**	None

Medication Safety Issues: Terbinaf ne

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
AT	LamISIL	Do not chew granules	No	LaMICtal, Lomotil	No

Drug Interactions: Terbinaf ne

Typical Agents	Mechanism	Clinical Management
CYP2D6 substrates	Terbinafine is a CYP2D6 inhibitor and can reduce metabolism of substrates, increasing risk of toxicity	Avoid concurrent use or monitor for signs of toxicity and consider substrate dose reductions

Adverse Reactions: Terbinaf ne

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Diarrhea, headache	Rash, fever, increased LFTs	Cutaneous lupus erythematosus, erythema multiforme, Stevens-Johnson syndrome, agranulocytosis, neutropenia, pancytopenia, liver failure, systemic lupus erythematosus

Efficacy Monitoring Parameters. Resolution of infection.

Toxicity Monitoring Parameters. Seek medical attention if severe skin reactions occur; if therapy exceeds 6 wk, CBC, LFTs, are warranted.

Key Patient Counseling Points. Instruct patients to report signs/symptoms of rash, infection, or hepatotoxicity. Symptomatic improvement of nail beds may not be seen for several months. Granules should be sprinkled on a spoonful of pudding or other soft, nonacidic food (eg, mashed potatoes) and swallowed without chewing; do not mix granules with applesauce or other fruit-based foods.

Clinical Pearls. Several topical products containing terbinafine, including both prescription and OTC products, are also available for treatment of skin infections.

TESTOSTERONE: AndroGel, Androderm

Class: Androgen, C-III

Dosage Forms. **Transdermal Patch:** 2 mg/24 h, 4 mg/24 h; **Topical Gel:** 1%; 1.62%, 2%; **Transdermal Cream:** 2%; **Mucoadhesive for Buccal Application:** 30 mg; **Topical Solution:** 30 mg/actuation

Common FDA Label Indication, Dosing, and Titration.

1. Hypogonadism: 5 g gel (50 mg active drug) daily to clean, dry, intact skin, may titrate dose to 7.5-10 g daily; one 5 mg patch daily × 24 h, may titrate to 7.5 mg/d

Off-Label Uses. None

MOA. Testosterone is an endogenous androgen. Androgens are responsible for normal growth and development of male sex organs. Testosterone is involved in the growth and maturation of the prostate, seminal vesicles, penis, and scrotum; development of male hair distribution; laryngeal enlargement; vocal cord thickening; alterations in body musculature; and fat distribution.

Solvay Pharmaceuticals pictured

Drug Characteristics: Testosterone

Dose Adjustment Hepatic	Not required	**Absorption**	Approximately 10% of a topically administered dose is absorbed over 24 h
Dose Adjustment Renal	Not required	**Distribution**	98% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Minimal
Pregnancy Category	X	**Elimination**	Renal elimination is 90% with a half-life of 10-100 min
Lactation	Avoid	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to testosterone; men with breast or prostate cancer; women who are pregnant, who may become pregnant, or who are breast-feeding	**Black Box Warnings**	Secondary exposure

Medication Safety Issues: Testosterone

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
Pump, MC	No	No	No	T-Gel	Avoid unless indicated for moderate to severe hypogonadism

Drug Interactions: Testosterone

Typical Agents	Mechanism	Clinical Management
Warfarin	Testosterone suppresses clotting factors II, V, VII, and X, and competes with warfarin for plasma protein binding, increasing risk of bleeding	Avoid concurrent use, or increase warfarin monitoring

Adverse Reactions: Testosterone

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Benign prostatic hyperplasia, testicular atrophy, PSA increase	Acne, headache, gynecomastia, alopecia, impotence, aggressive behavior, hypertension	Edema, liver carcinoma, prostate cancer, polycythemia, hepatotoxicity, DVTs

Efficacy Monitoring Parameters. Development of secondary gender characteristics (hair growth, masculinization).

Toxicity Monitoring Parameters. Hematocrit levels should be monitored, especially in older men. Instruct patients to report signs and symptoms of unusual bleeding/bruising, rapid weight gain, edema, VTE (leg pain or redness) or liver toxicity (jaundice, dark urine, pale stools).

Key Patient Counseling Points. Gel to be applied to clean, dry, intact skin of the shoulders and upper arms and/or abdomen, but should not be applied to genitals. Gel should be allowed to dry well; swimming and showering should be avoided for 5-6 h after application. Patients should keep application site covered, as direct skin contact can transfer drug to others. Virilization has been reported in children who were secondarily exposed to testosterone gel (coming in contact with bare skin around gel application site). Male patients should report too frequent or persistent erections. Female sexual partners of patients using drug should report male-like changes.

Clinical Pearls. In addition to topical dosage forms (gel and patch), other dosage forms include subcutaneous implants and injectable, which are indicated for delayed puberty, breast cancer, female-to-male gender identity disorder, and others. Avoid other medications containing testosterone, including those purchased without a prescription in health food stores or on the Internet. The patch may contain metal; remove prior to MRIs.

TETANUS TOXOID: Daptacel, Adacel, Boostrix

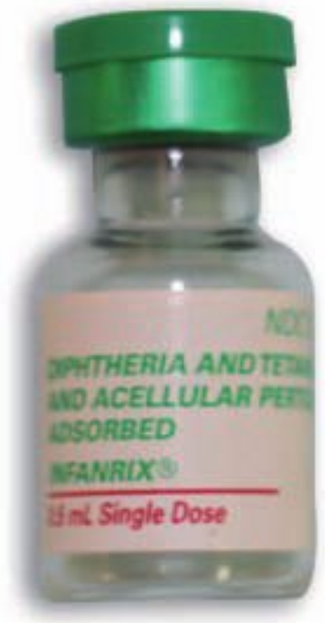
Class: Vaccine, Inactivated, Bacterial

Dosage Forms. Suspension for Intramuscular Injection: Adults and Children ≥7 y of age, available in combination with tetanus and diphtheria toxoids (Td) or combination with tetanus and diphtheria toxoids and acellular pertussis (Tdap); Children ≤6 y of age, available in combination with tetanus and diphtheria toxoids and acellular pertussis (DTaP), and in combination with other pediatric vaccines.

Common FDA Label Indication, Dosing, and Titration.

1. Prevention of tetanus: Children, all infants at 2, 4, 6, and 12-15 mo of age, and a 5th dose at 4-6 y of age, as primary series of DTaP; Tdap at 11-12 y of age; single dose of Tdap for all adults at next opportunity; Td every 10 y for adults

Off-Label Uses. None



Infanrix, GlaxoSmithKline pictured

Drug Characteristics: Tetanus Toxoid

Pregnancy Category	C	**ADME**	None known
Lactation	Caution advised; weigh risk and benefit	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to tetanus toxoid or a component of the vaccine (gelatin, latex, thimerosal)	**Black Box Warnings**	None

Medication Safety Issues: Tetanus Toxoid

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Adacel, Daptacel, Tdap, DTaP	No

Drug Interactions: Tetanus Toxoid

Typical Agents	Mechanism	Clinical Management
Moderate- to high-dose corticosteroids	Immunosuppression, reduced efficacy of vaccine	Delay tetanus toxoid administration until corticosteroid therapy has been discontinued if possible; clinical judgment
Immunosuppressing agents	Immunosuppression, reduced efficacy of vaccine	Delay tetanus toxoid administration until immunosuppressive therapy has been discontinued if possible

Adverse Reactions: Tetanus Toxoid

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Injection site reactions, including erythema and soreness. Fever, headache, fatigue, swelling of limb	GI symptoms	Anaphylaxis, swelling or severe arm pain, Guillain-Barré syndrome

Efficacy Monitoring Parameters. Prevention of tetanus, although antibody concentrations might be measured; routine measurement for vaccine response is not recommended.

Toxicity Monitoring Parameters. Monitor for syncope, fever after administration.

Key Patient Counseling Points. Return to provider for each dose in the series.

Clinical Pearls. Use the same brand of vaccine to complete the entire series, if possible. After childhood immunization, adults should substitute a 1 time dose of Tdap for Td booster then boost with Td (tetanus with diphtheria) vaccination every 10 y. Pregnant women should receive 1 dose of Tdap vaccine during each pregnancy, preferred during 27-36 wk gestation regardless of interval of last Td or Tdap vaccine. Individuals with wounds requiring medical attention should be vaccinated with Td if vaccination status is inadequate or unknown, or if >5 y since last vaccination.

THYROID: Armour Thyroid, Various

Forest Laboratories pictured

Class: Thyroid Supplement

Dosage Forms. Oral Tablet: 15 mg, 16.25 mg, 30 mg, 32.4 mg, 32.5 mg, 48.75 mg, 60 mg, 64.8 mg, 65 mg, 81.25 mg, 90 mg, 97.5 mg, 113.75 mg, 120 mg, 130 mg, 146.25 mg, 162.5 mg, 180 mg, 195 mg, 240 mg, 260 mg, 300 mg, 325 mg

Common FDA Label Indication, Dosing, and Titration.

1. Hypothyroidism: Dosing individualized based on clinical response and serum TSH levels; Infants birth to 6 mo of age, 4.8-6.8 mg/kg/d po daily; Infants 6-12 mo of age, 3.6-4.8 mg/kg/d po daily; Children 1-5 y of age, 3-3.6 mg/kg/d po daily; Children 6-12 y of age, 2.4-3 mg/kg/d po daily; Children >12 y of age, 1.2-1.8 mg/kg/d po daily; Adults, 15-120 mg po daily

Off-Label Uses. None

MOA. Thyroid hormone is a naturally derived thyroid replacement containing both levothyroxine (T_4) and liothyronine (T_3). The endogenous thyroid hormones, T_3 and T_4, diffuse into the cell nucleus and bind to thyroid receptor proteins attached to DNA. This hormone nuclear receptor complex activates gene transcription and synthesis of messenger RNA and cytoplasmic proteins.

Drug Characteristics: Thyroid

Dose Adjustment Hepatic	Not required	**Absorption**	F = 48-79%, increases with fasting
Dose Adjustment Renal	Not required	**Distribution**	99% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Approximately 80% of levothyroxine sodium is deiodinated into T_3 in the liver, kidney, and other tissues; it can also be metabolized by conjugation with glucuronides and sulfates and then enter into enterohepatic recirculation
Pregnancy Category	A	**Elimination**	Renal excretion is 50% with a half-life of 7 d
Lactation	Compatible	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to thyroid, nontoxic diffuse goiter or nodular thyroid disease, thyrotoxicosis, acute MI, treatment of obesity or weight loss, uncorrected adrenal insufficiency; may precipitate acute adrenal crisis	**Black Box Warnings**	Ineffective and potentially toxic when used for weight loss

Medication Safety Issues: Thyroid

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
NP, P	No	No	No	No	Avoid. Concerns about cardiac effects

Drug Interactions: Thyroid

Typical Agents	Mechanism	Clinical Management
Warfarin	Increased risk of bleeding	Monitor INR and consider warfarin does adjustments

Adverse Reactions: Thyroid

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
		Aggravation of preexisting cardiovascular disease, hyperthyroidism

Efficacy Monitoring Parameters. Serum TSH, T_3, and T_4 levels: resolution of symptoms of hypothyroidism, fatigue, edema, hair loss, cold intolerance, lethargy.

Toxicity Monitoring Parameters. Monitor patients with preexisting cardiovascular disease for exacerbation of symptoms.

Key Patient Counseling Points. You may have to take this medicine for 6-8 wk before your symptoms improve. Do not stop using this medicine suddenly without asking your doctor. You may need to slowly decrease your dose before stopping it completely. Take on an empty stomach, with water.

Clinical Pearls. T_3 normal range is 100-200 ng/dL. T_4 normal range is 4.5-11.2 mcg/dL. TSH level should be between 0.5 and 3.0 mIU/L in those successfully treated for a thyroid disorder. When used for weight loss, high doses may cause life-threatening adverse effects.

TIOTROPIUM: Spiriva

Class: Anticholinergic Bronchodilator

Dosage Forms. Inhalation Capsule: 18 mcg

Common FDA Label Indication, Dosing, and Titration.

1. COPD: Inhale contents of 1 capsule (18 mcg) daily using manufacturer-provided device (do not swallow capsules)

Off-Label Uses. None

MOA. Tiotropium is a long-acting antimuscarinic agent, which is often referred to as an anticholinergic. It has similar affinity to the subtypes of muscarinic receptors, M1 to M5. In the airways, it exhibits pharmacological effects through inhibition of M3-receptors at the smooth muscle leading to bronchodilation. The bronchodilation following inhalation of tiotropium is predominantly a site-specific effect.

Pfizer/Boehringer Ingelheim pictured

Drug Characteristics: Tiotropium

Dose Adjustment Hepatic	Not required	**Absorption**	After inhalation, well absorbed into the lung; <19.5% of dose is absorbed systemically
Dose Adjustment Renal	Not required	**Distribution**	Vd = 32 L/kg; 72% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Minimal
Pregnancy Category	C	**Elimination**	Renal elimination is 14% (unchanged) with a half-life of 5-6 d
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to tiotropium, ipratropium, or milk protein	**Black Box Warnings**	None

Medication Safety Issues: Tiotropium

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	Capsules for inhalation, not oral use	No	Inspra, Serevent	No

Drug Interactions: Tiotropium

Typical Agents	Mechanism	Clinical Management
Other anticholinergic agents	Additive effect with tiotropium	Avoid concurrent use

Adverse Reactions: Tiotropium

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Xerostomia, upper respiratory infection	Constipation, pharyngitis, sinusitis, headache, dysphonia, application site irritation	Bowel obstruction, cerebrovascular accident; bronchospasm

Efficacy Monitoring Parameters. Monitor pulmonary function tests, shortness of breath.

Toxicity Monitoring Parameters. Seek medical attention if severe anticholinergic side effects occur, including bladder obstruction, narrow angle glaucoma, prostatic hyperplasia, and urinary retention or difficulty.

Key Patient Counseling Points. Advise patients that this drug is not indicated for acute bronchospasm (rescue therapy). This drug may cause increased HR, dry mouth, constipation, urinary difficulty and retention, respiratory tract infection, and sinusitis. Warn patients that the drug capsules are for inhalation only and are not to be swallowed; instruct patients on the use of the inhalation device.

Clinical Pearls. Paradoxical bronchospasm has occurred with tiotropium; when it occurs, therapy should be permanently discontinued.

TIZANIDINE: Zanaflex, Various

Class: Centrally Acting Skeletal Muscle Relaxant, α_2-Agonist

Dosage Forms. **Oral Capsule:** 2 mg, 4 mg, 6 mg; **Oral Tablet:** 2 mg, 4 mg

Common FDA Label Indication, Dosing, and Titration.

1. Muscle Spasticity: 2 mg po up to tid, may titrate to 8 mg po q6-8h with *max* dose of 36 mg/d

Off-Label Uses.

1. Acute low back pain: 12 mg/d po alone or in combination with NSAIDs

MOA. Tizanidine is a centrally acting muscle relaxant. The drug is an imidazole derivative, structurally unrelated to other muscle relaxants. Tizanidine is an agonist of α_2-adrenergic receptors, which decreases spasticity by increasing presynaptic inhibition; however, it does not have antihypertensive properties.

Sandoz generic pictured

Drug Characteristics: Tizanidine

Dose Adjustment Hepatic	Use not recommended	**Absorption**	F = 40%, extensive first-pass metabolism; food increases extent of absorption of tablets by 30% but decreases extent of absorption of capsules by 10%
Dose Adjustment Renal	CrCl <25 mL/min, reduce dose	**Distribution**	Vd = 2.4 L/kg; 30% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Extensive (95%) hepatic metabolism to inactive metabolites, substrate of CYP1A2
Pregnancy Category	C	**Elimination**	Renal elimination is 60% with a half-life of 2 h
Lactation	Avoid	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to tizanidine; coadministration with CYP1A2 inhibitors	**Black Box Warnings**	None

Medication Safety Issues: Tizanidine

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	TiZANidine	No	No	tiaGABine	No

Drug Interactions: Tizanidine

Typical Agents	Mechanism	Clinical Management
CYP1A2 inhibitors	Inhibition of tizanidine metabolism and increased toxicity	Do not coadminister; select alternative antispasmodic
Phenytoin, fosphenytoin	Unknown mechanism; results in increased serum concentrations of phenytoin and resulting phenytoin toxicity	Monitor for signs of phenytoin toxicity and adjust dose accordingly
CNS depressants	Additive CNS depression	Avoid concurrent use

Adverse Reactions: Tizanidine

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Mild hypotension, xerostomia, asthenia, dizziness, somnolence, muscle weakness	Constipation, vomiting, dyskinesia, amblyopia, feeling nervous, syncope, depression	Myocardial infarction, thrombocytopenia, hepatitis, pulmonary embolism, hypersensitivity, death

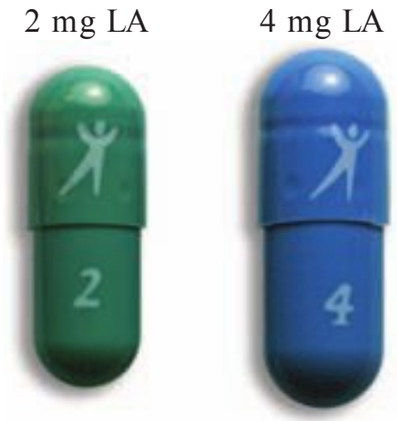
Efficacy Monitoring Parameters. Reduction in pain and muscle spasms, reduction in passive limb movement.

Toxicity Monitoring Parameters. Monitor BP, LFTs, SCr, CBC.

Key Patient Counseling Points. Be cautious of risk of dizziness and somnolence when initiating therapy; do not drive until effects of drug are known. Rise slowly from a lying/sitting position, as this drug may cause hypotension. May cause xerostomia (dry mouth) and asthenia (weakness).

Clinical Pearls. While this drug may be taken with or without food, patients should take the drug in the same way (fasting or fed) every time to avoid inconsistent absorption patterns and resulting changes in efficacy and adverse effects. Effect of food on extent of absorption differs for tablets and capsules. Abrupt discontinuation can cause rebound hypertension and tachycardia. Taper if used at high dose (20-28 mg daily) or for an extended period of time.

TOLTERODINE: Detrol, Detrol LA



Pfizer pictured

Class: Antimuscarinic

Dosage Forms. Oral Tablet: 1 mg, 2 mg; **Oral Capsule, Extended Release:** 2 mg, 4 mg

Common FDA Label Indication, Dosing, and Titration.

1. Bladder muscle dysfunction, overactive: Immediate release, 1-2 mg po bid; Extended release, 2-4 mg po daily; may titrate dose to tolerability and response

Off-Label Uses. None

MOA. Tolterodine, a competitive muscarinic receptor antagonist, has a high binding affinity for the cholinergic muscarinic receptors that mediates contraction of the urinary bladder and decreases salivation. The drug exerts its significant effects on the lower urinary tract by increasing the residual urine and decreasing detrusor pressure.

Drug Characteristics: Tolterodine

Dose Adjustment Hepatic	Hepatic dysfunction, limit dose to 2 mg po daily	**Absorption**	F = 77%; no effect of food on absorption
Dose Adjustment Renal	CrCl 10-30 mL/min, limit dose to 2 mg po daily	**Distribution**	Vd = 113 L; >90% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Hepatic, CYP2D6 and CYP3A4/5 substrate
Pregnancy Category	C	**Elimination**	Renal elimination is 77% (10% unchanged) and 17% in feces (20% unchanged), with a half-life of 1.9-3.7 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	Consider lower dose in CYP2D6 poor metabolizers
Contraindications	Hypersensitivity to tolterodine, gastric retention, uncontrolled narrow-angle glaucoma, urinary retention	**Black Box Warnings**	None

Medication Safety Issues: Tolterodine

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
LA	No	Do not chew or crush LA formulation	No	Fesoterodine	No

Drug Interactions: Tolterodine

Typical Agents	Mechanism	Clinical Management
Amiodarone, propafenone, quinidine	Increased QT interval prolongation	Avoid concurrent use
CYP3A4/5 and CYP2D6 inhibitors	Decreased tolterodine metabolism increases risk of toxicity	Reduce dose to 2 mg po daily
CYP3A4/5 inducers	Increased tolterodine metabolism reduces tolterodine effectiveness	Monitor for efficacy and consider dose increases
Warfarin	Increased risk of bleeding	Monitor INR

Adverse Reactions: Tolterodine

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Xerostomia	Constipation, dizziness, headache, increased HR, indigestion, somnolence, vertigo, chest pain	Tachycardia, QT prolongation, angioedema, hallucinations

Efficacy Monitoring Parameters. Subjective improvement of urge incontinence (reduced desire to urinate), and urinary frequency.

Toxicity Monitoring Parameters. Assess renal and hepatic function at baseline; monitor vital signs.

Key Patient Counseling Points. Patients should avoid activities requiring mental alertness or coordination until drug effects are realized, as this drug may cause blurred vision, dizziness, and drowsiness. Swallow extended-release capsule whole; do not crush, break, or chew. In the presence of a high environmental temperature, heat prostration can occur with drug use (fever and heat stroke due to decreased sweating). If symptoms occur, the drug should be discontinued and supportive measures instituted.

Clinical Pearls. May note decline in cognitive function, particularly in elderly. Lifestyle changes can also improve urinary symptoms. Patients should lose weight and avoid beverages containing alcohol or caffeine. Long-acting product is generally better tolerated.

TOLVAPTAN: Samsca

Class: Vasopressin Antagonist

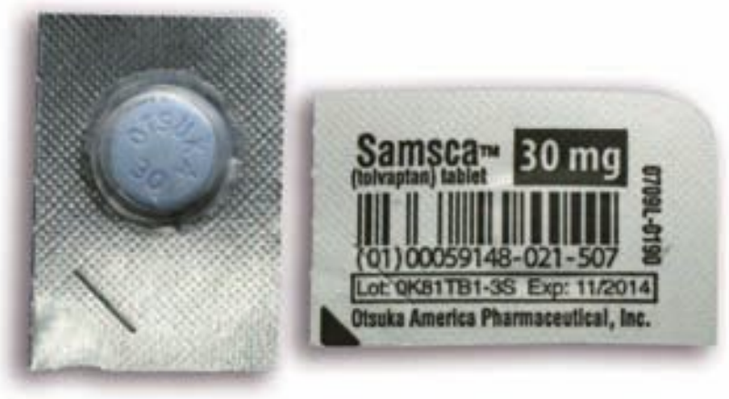
Dosage Forms. Oral Tablet: 15 mg, 30 mg

Common FDA Label Indication, Dosing, and Titration.

1. Hypervolemic or euvolemic hyponatremia: 15 mg po daily, may titrate to *max* of 60 mg po daily

Off-Label Uses. None

MOA. Tolvaptan is a selective vasopressin V_2-receptor antagonist with an affinity for the V_2-receptor that is 1.8 times that of native arginine vasopressin (AVP). When taken orally, tolvaptan antagonizes the effect of vasopressin and causes an increase in urine water excretion that results in an increase in free water clearance, a decrease in urine osmolality, resulting in the restoration of normal serum sodium levels.



Otsuka 30 mg pictured

Drug Characteristics: Tolvaptan

Dose Adjustment Hepatic	Avoid in liver disease	**Absorption**	F = 40%
Dose Adjustment Renal	Avoid use if CrCl <10 mL/min	**Distribution**	Vd = 3 L/Kg; 99% protein bound
Dialyzable	Not known	**Metabolism**	Hepatic, CYP3A4/5 substrate
Pregnancy Category	C	**Elimination**	Nonrenal routes with half-life of 2.8-12 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Anuria, concurrent use of strong CYP3A4/5 inhibitors, hypovolemic hyponatremia	**Black Box Warnings**	Initiate in hospital to monitor serum sodium. Too rapid correction (eg, >12 mEq/24 h) can results in seizures, coma and death; correct sodium gradually

Medication Safety Issues: Tolvaptan

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	No	No

Drug Interactions: Tolvaptan

Typical Agents	Mechanism	Clinical Management
CYP3A4/5 inducers	Increased tolvaptan metabolism reduces tolvaptan effectiveness	Monitor and consider dose increases of tolvaptan
CYP3A4/5 inhibitors	Decreased tolvaptan metabolism increases risk of tolvaptan toxicity	Concurrent strong CYP3A4/5 inhibitors is contraindicated, monitor and consider dose decreases of tolvaptan if concurrent moderate CYP3A4/5 inhibitors

Adverse Reactions: Tolvaptan

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Increased thirst, nausea, xerostomia, polyuria	Hyperglycemia, constipation, dizziness, dehydration	Hypovolemia, hepatic failure, osmotic demyelination syndrome

Efficacy Monitoring Parameters. Monitor serum sodium levels carefully; normalization of serum sodium is the efficacy parameter.

Toxicity Monitoring Parameters. Monitor for dehydration, serum electrolytes, neurologic status, signs and symptoms of syndrome of inappropriate antidiuretic hormone secretion. Monitor LFTs and discontinue if increased.

Key Patient Counseling Points. May be taken with or without food. Avoid fluid restriction for the first 24 h of therapy. Resume fluid restriction on discontinuation.

Clinical Pearls. Initiate and reinitiate therapy only in the hospital setting, monitoring serum sodium carefully. Should not be used for >30 d in patients with underlying liver disease.

TOPIRAMATE: Topamax, Various

Class: Anticonvulsant

Dosage Forms. **Oral Capsule, Sprinkle:** 15 mg, 25 mg; **Oral Tablet:** 25 mg, 50 mg, 100 mg, 200 mg; **Oral Capsule, Extended Release, 24 H**: 25 mg, 50 mg, 100 mg, 200 mg; **Oral Capsule, Extended Release, 24 H Sprinkle:** 25 mg, 50 mg, 100 mg, 150 mg, 200 mg

Forest Laboratories generic pictured

Common FDA Label Indication, Dosing, and Titration.

1. Partial or tonic-clonic seizure, monotherapy or adjunct: Children 2-16 y of age, 1-3 mg/kg/d (*max* 25 mg) po daily × 1 wk, may titrate to 5-9 mg/kg/d; Children ≥17 y of age and Adults, 25 mg po bid × 1 wk, may titrate to *max* of 200 mg po bid
2. Migraine prophylaxis: Immediate release only, initial 25 mg po daily × 1 wk, may titrate to *max* of 50 mg po bid

Off-Label Uses.

1. Cluster headache prophylaxis: 25 mg po daily, may titrate to *max* of 200 mg/d

MOA. The exact mechanisms by which topiramate exerts its anticonvulsant and migraine prophylaxis effects are unknown. Electrophysiological and biochemical evidence suggests that topiramate blocks voltage-dependent sodium channels, augments the activity of the neurotransmitter gamma-aminobutyrate at some subtypes of the GABA-A receptor, antagonizes the AMPA/kainate subtype of the glutamate receptor, and inhibits the carbonic anhydrase enzyme, particularly isozymes II and IV.

Drug Characteristics: Topiramate

Dose Adjustment Hepatic	Hepatic disease, adjust dose and monitor carefully for adverse effects	**Absorption**	F = 80%, no effect of food on absorption
Dose Adjustment Renal	CrCl <70 mL/min, reduce initial and incremental dose adjustments by 50%	**Distribution**	Vd = 0.6-0.8 L/kg; 15-41% protein bound
Dialyzable	Yes	**Metabolism**	Minor
Pregnancy Category	D	**Elimination**	Renal elimination is 70% unchanged with a half-life of 21 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity, alcohol use for the ER formulation (within 6 h prior to and 6 h after administration)	**Black Box Warnings**	None

Medication Safety Issues: Topiramate

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
XR	No	Qudexy XR may be opened and sprinkled on food. Do not open Trokendi XR capsule.	No	Sporanox, Toprol XL	No

Drug Interactions: Topiramate

Typical Agents	Mechanism	Clinical Management
Amitriptyline	Concomitant use of amitriptyline and topiramate may increase plasma concentrations of amitriptyline; mechanism unknown	Avoid concurrent use or adjust amitriptyline dose as necessary to avoid amitriptyline toxicity
Oral contraceptives	When used concurrently with estrogen-progestin combination contraceptives, AUC of the estrogenic component is decreased, reducing contraceptive efficacy	Avoid concurrent use or use an alternative nonhormonal contraceptive method of birth control

Adverse Reactions: Topiramate

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Ataxia, loss of appetite, nausea dizziness, impaired psychomotor performance, somnolence, fatigue, nystagmus, low serum bicarbonate	Disorder of language, diplopia, weight loss, depression, nausea, nephrolithiasis	Erythema multiforme, Stevens-Johnson syndrome, hypohidrosis, increased body temperature, metabolic acidosis, liver failure, glaucoma, myopia, suicidal ideation

Efficacy Monitoring Parameters. Decreased seizure frequency or frequency of migraine headaches.

Toxicity Monitoring Parameters. Monitor electrolytes, SCr, hydration, and occurrence of suicidal thoughts.

Key Patient Counseling Points. Avoid activities requiring mental alertness and coordination until drug effects are realized. Drug may cause dizziness and somnolence, especially if taken with alcohol or other CNS depressants. May cause nausea, diplopia, nervousness, confusion, and many other CNS effects. Do not discontinue drug abruptly, as this may cause increased seizure activity. Seek medical attention for new eye problems or high body temperature. May decrease sweating; avoid hot temperatures (including hot tubs and saunas).

Clinical Pearls. When adjusting dose, make small changes slowly ("start low and go slow") to avoid acute adverse effects.

TRAMADOL: Ultram, Various

Class: Opioid Analgesic. C-IV

Dosage Forms. **Oral Tablet:** 50 mg; **Oral Tablet, Extended Release:** 100 mg, 200 mg, 300 mg; **Oral Capsule, Extended Release:** 100 mg (composed of 25 mg immediate release followed by 75 mg extended release), 200 mg (composed of 50 mg immediate release followed by 150 mg extended release), 300 mg (composed of 50 mg immediate release followed by 250 mg extended release); **Oral Suspension:** 10 mg/mL; **Topical Cream:** 5%, 8%

Amneal generic 50 mg pictured

Common FDA Label Indication, Dosing, and Titration.

1. Pain, chronic, moderate to moderately severe: Immediate release, 50 mg po prn, may titrate to 200 mg/d; extended release, initial, 100 mg po daily, may titrate to 300 mg/d; to convert from immediate release, convert 1:1 and round down to nearest 100 mg dose

Off-Label Uses. None

MOA. Tramadol is a mu agonist and a weak inhibitor of serotonin and norepinephrine reuptake. Mu receptors are responsible for analgesia, respiratory depression, miosis, decreased GI motility, and euphoria. In the CNS, it promotes analgesia and respiratory depression by decreasing brain stem respiratory centers' response to carbon dioxide tension and electrical stimulation.

Drug Characteristics: Tramadol

Dose Adjustment Hepatic	Moderate or severe, immediate release, 50 mg po q12h; avoid extended-release formulation	**Absorption**	Immediate release: F = 75%, no food effect. Extended release: F = 70%, variable food effect
Dose Adjustment Renal	CrCl <30 mL/min, immediate release, extend interval to q12h (*max* dose of 200 mg po daily); avoid extended-release formulation	**Distribution**	Vd = 3 L; 20% protein bound
Dialyzable	Not dialyzable	**Metabolism**	>90% hepatic, CYP3A4/5 and CYP2D6 substrate
Pregnancy Category	C	**Elimination**	Renal elimination of 30%, with a half-life of 6 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	CYP2D6 poor metabolizers have higher concentrations of parent compound and may require lower doses
Contraindications	Hypersensitivity to tramadol or other opioids, paralytic ileus, respiratory depression, bronchial asthma	**Black Box Warnings**	None

Medication Safety Issues: Tramadol

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
ODT	TraMADol	Do not chew or crush ER	No	Tapentadol, Toradol, Trandate, traZODone, Voltaren	No

Drug Interactions: Tramadol

Typical Agents	Mechanism	Clinical Management
Barbiturates, benzodiazepines, centrally acting muscle relaxants, opioids, phenothiazines	Additive CNS depression	Monitor and consider dose adjustments
Buprenorphine, opioid agonists/antagonists, opioid antagonists	Precipitation of withdrawal symptoms	Avoid concurrent use with opioids
CYP3A4/5 inducers	Increased tramadol metabolism reduces tramadol efficacy	Consider dose increases of tramadol
CYP3A4/5 or CYP2D6 inhibitors	Decreased tramadol metabolism increases risk of tramadol toxicity	Consider dose decreases of tramadol
MAOIs	Additive respiratory depression, increased risk of serotonin syndrome	Contraindicated

Adverse Reactions: Tramadol

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Constipation, GI distress, dizziness, sedation, edema, sweating, pruritus, headaches, flushing	Dyspnea, xerostomia, depression, orthostatic hypotension	Cardiac arrest, physical dependence, tolerance, seizures, pancreatitis, suicidal ideation, anemia

Efficacy Monitoring Parameters. Relief of pain.

Toxicity Monitoring Parameters. Excessive drowsiness; decreased breathing, severe constipation, chest pain, dizziness, signs of tolerance. Monitor vital signs.

Key Patient Counseling Points. Use a stool softener and stimulant or laxative for preventing constipation if used chronically. May cause drowsiness; avoid driving or other tasks requiring motor coordination. Avoid alcohol and other CNS depressants.

Extended-release products must not be crushed or chewed, but may be taken with or without food, and always the same way to avoid variability in absorption.

Clinical Pearls. Tolerance and physical dependence may occur with chronic use; avoid abrupt discontinuation. Tramadol-related deaths have been reported in patients with histories of emotional disturbances; suicidal ideation/attempts; or tranquilizer, alcohol, and other CNS-active drug misuse. Suspension and creams are available in compounding kits.

TRAVOPROST: Travatan Z

Class: Prostaglandin, Antiglaucoma Agent

Dosage Forms. Ophthalmic Solution: 0.004%

Common FDA Label Indication, Dosing, and Titration.

1. Ocular hypertension: 1 drop in affected eyes daily in the evening
2. Open-angle glaucoma: 1 drop in affected eyes daily in the evening

Off-Label Uses. None

MOA. Travoprost is a prostaglandin F2-alpha analogue. It is believed to reduce intraocular pressure by increasing the outflow of aqueous humor. Studies suggest that the main mechanism of action is increased uveoscleral outflow, but the exact mechanism is unknown.

Alcon 0.004% solution pictured

Drug Characteristics: Travoprost

Dose Adjustment Hepatic	Not required	**Absorption**	Travoprost is absorbed through the cornea where the isopropyl ester prodrug is hydrolyzed to the acid form to become biologically active; systemic absorption following ocular instillation is very low
Dose Adjustment Renal	Not required	**Distribution**	Unknown
Dialyzable	Not dialyzable	**Metabolism**	Metabolized within the cornea; any entering systemic circulation is metabolized in the liver, extent unknown
Pregnancy Category	C	**Elimination**	Extent of renal elimination unknown, but half-life of 45 min
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity	**Black Box Warnings**	None

Medication Safety Issues: Travoprost

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Xalatan	No

Drug Interactions: Travoprost. None known

Adverse Reactions: Travoprost

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Blurred vision, hyperpigmentation of eyelid, iris pigmentation	Blepharitis, pain in eye, reduced visual acuity, foreign-body sensation	Cataract

Efficacy Monitoring Parameters. Reduction in IOP.

Toxicity Monitoring Parameters. Seek medical attention if symptoms of ocular irritation are severe.

Key Patient Counseling Points. Wash your hands and remove contact lenses before using the medicine. For administration, lie down or tilt your head back. With your index finger, pull down the lower lid of your eye to form a pocket. Hold the dropper close to your eye with the other hand. Drop the correct number of drops into the pocket made between your lower lid and eyeball. Gently close your eyes. Place your index finger over the inner corner of your eye for 1 min. Do not rinse or wipe the dropper or allow it to touch anything, including your eye. Put the cap on the bottle right away. Do not exceed once-daily dosing (may decrease efficacy). Separate administration of other ophthalmic agents by at least 5 min.

Clinical Pearls. Advise patients that there is a risk of permanent increased iris pigmentation associated with instillation of this product. May change length and number of eye lashes.

TRAZODONE: Desyrel, Oleptro, Various

Class: Antidepressant

Dosage Forms. **Oral Tablet:** 50 mg, 100 mg, 150 mg, 300 mg; **Oral Tablet, Extended Release:** 150 mg, 300 mg

Common FDA Label Indication, Dosing, and Titration.

1. Depression: Immediate release, 150 mg po daily in divided doses, may titrate to 400 mg/d; extended release, 150 mg po daily hs, may titrate to 375 mg/d

Off-Label Uses.

1. Insomnia: Adults, 50 po daily hs

MOA. The mechanism of antidepressant action is not fully understood, but suspected to be related to its potentiation of serotonergic activity in the CNS by inhibiting reuptake of serotonin. Trazodone also significantly blocks histamine (H_1) and α_1-adrenergic receptors.

Teva generic pictured

Mylan generic pictured

Drug Characteristics: Trazodone

Dose Adjustment Hepatic	Hepatic dysfunction, initial dose 25 mg po daily	**Absorption**	F = 65%; food increases absorption
Dose Adjustment Renal	Not required	**Distribution**	89-95% protein bound
Dialyzable	Not dialyzable	**Metabolism**	>90% hepatic; CYP3A4/5 substrate
Pregnancy Category	C	**Elimination**	Renal elimination is 70-75% and 21% in feces, with a half-life of 7-10 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity, use of MAOI	**Black Box Warnings**	Suicidal ideation, not for use in children

Medication Safety Issues: Trazodone

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	TraZODone	Do not crush or chew ER formulation	No	traMADol, ziprasidone	No

Drug Interactions: Trazodone

Typical Agents	Mechanism	Clinical Management
Amiodarone, agents that prolong QT interval	Increased risk of QT prolongation and torsades de pointes	Avoid concomitant use
CYP3A4/5 inhibitors	Decreased trazodone metabolism increases risk of trazodone toxicity	Consider lower trazodone dose; monitor for adverse effects
CYP3A4/5 inducers	Increased trazodone metabolism reduces trazodone efficacy	Monitor trazodone levels
Digoxin	Increased digoxin concentrations and risk of toxicity	Monitor digoxin levels
Fluoxetine, linezolid, paroxetine, venlafaxine	Increased risk of trazodone side effects or serotonin syndrome	Monitor for adverse effects

Adverse Reactions: Trazodone

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Dizziness, sedation, headache, nausea, somnolence, xerostomia	Backache, blurred vision, constipation, diarrhea, fatigue, feeling nervous, headache, hypotension, insomnia, syncope, tremor, vomiting	Bleeding risk, cardiac dysrhythmia, fractures, priapism, prolonged QT, serotonin syndrome, suicidal thoughts, torsade de pointes

Efficacy Monitoring Parameters. Improvement in depressive symptoms (depressed mood, suicidal thoughts or intent, change in appetite, lack of energy, change in sleep patterns, lack of pleasure/interest in usual activities, feeling of excessive guilt/worthlessness, psychomotor retardation or agitation, difficulties in thinking/concentration/memory).

Toxicity Monitoring Parameters. Worsening of depression, suicidality, or unusual changes in behavior, especially at the initiation of therapy or with dosage increases or decreases. Irregular HR in patients with cardiac disease and/or risk factors associated with QT prolongation. Signs/symptoms of peripheral edema, increased HR, signs/symptoms of liver damage. Monitor ECG, LFT, SCr, BUN, and vital signs.

Key Patient Counseling Points. Extended-release tablet may be broken in half, but do not chew or crush. Extended-release tablets should be taken on an empty stomach, but the immediate-release tablets should be taken with food. Patients should avoid driving and other activities requiring mental alertness or coordination until drug effects are realized, as this medicine may cause dizziness or somnolence. Report signs/symptoms of priapism immediately. Report use of MAOI within the past 14 d. Advise patients against sudden discontinuation of drug. Do not drink alcohol, or use barbiturates or other CNS depressants while taking this drug.

Clinical Pearls. Antidepressants increased the risk of suicidal thinking and behavior in children, adolescents, and young adults in short-term studies with major depressive disorder (MDD) and other psychiatric disorders. This risk must be balanced with the clinical need. Monitor patients closely for clinical worsening, suicidality, or unusual changes in behavior.

TRIAMCINOLONE NASAL: Nasacort AQ

Class: Intranasal Adrenal Glucocorticosteroid

Dosage Forms. Nasal Spray: 55 mcg/actuation

Common FDA Label Indication, Dosing, and Titration.

1. Perennial or seasonal allergic rhinitis: Children 2-5 y of age, 1 spray/nostril daily, *max* of 110 mcg/d; Children 6-12 y of age, 1 spray/nostril daily, *max* of 220 mcg/d; Children >12 y of age and Adults, initial, 2 spray/nostril daily, *max* of 220 mcg/d; maintenance, 1 spray/nostril daily, *max* of 110 mcg/d

Off-Label Uses. None

MOA. Triamcinolone has anti-inflammatory, antipruritic, and vasoconstrictive properties. Corticosteroids are thought to act by the induction of phospholipase A2 inhibitory proteins, lipocortins, resulting in suppression of the immune system. It is postulated that these proteins control the biosynthesis of potent mediators of inflammation such as prostaglandins and leukotrienes by inhibiting the release of their common precursor, arachidonic acid.

Sanofi-Aventis pictured

Drug Characteristics: Triamcinolone Nasal

Dose Adjustment Hepatic	Not required	**Absorption**	<2% of dose absorbed systemically after nasal administration
Dose Adjustment Renal	Not required	**Distribution**	Not absorbed
Dialyzable	Not dialyzable	**Metabolism**	Not absorbed
Pregnancy Category	C	**Elimination**	Not absorbed
Lactation	Usually compatible	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity	**Black Box Warnings**	None

Medication Safety Issues: Triamcinolone Nasal

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	NasalCrom, do not use TAC as an abbreviation for triamcinolone	No

Drug Interactions: Triamcinolone Nasal. None known

Adverse Reactions: Triamcinolone Nasal

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Nasal irritation and burning, headache, pharyngitis	Epistaxis, taste perversion	Severe hypersensitivity, glaucoma, pneumonia, secondary hypocortisolism; osteoporosis

Efficacy Monitoring Parameters. Control of rhinitis signs and symptoms.

Toxicity Monitoring Parameters. While only small amounts of triamcinolone reach systemic circulation, BMD and growth and development in children should be monitored. Routine ophthalmologic examinations should be performed. Monitor for signs and symptoms of adrenal suppression and infection.

Key Patient Counseling Points. Advise patients on the proper administration technique for this product. Instruct patients to monitor for signs of toxicity, especially adrenal insufficiency.

Clinical Pearls. Injectable, oral inhalation, and topical dosage forms of triamcinolone also available for treatment of other allergic disorders. While oral antihistamines (either OTC or prescription) remain the mainstay for treatment of rhinitis, nasal steroids are a recommended option if symptoms are severe, unresolved with oral antihistamines, or if oral antihistamines cause undesirable adverse effects. Available OTC.

TRIAMCINOLONE TOPICAL: Various

Class: Topical Corticosteroid

Dosage Forms. **Topical Cream:** 0.025%, 0.1%, 0.5%; **Topical Lotion:** 0.025%, 0.1%; **Topical Ointment:** 0.025%, 0.05%, 0.1%, 0.5%

Common FDA Label Indication, Dosing, and Titration.

1. Skin disorders: Apply thin layer topically to affected area daily or bid

Off-Label Uses. None

MOA. Triamcinolone has anti-inflammatory, antipruritic, and vasoconstrictive properties. Corticosteroids are thought to act by the induction of phospholipase A2 inhibitory proteins, lipocortins. It is postulated that these proteins control the biosynthesis of potent mediators of inflammation such as prostaglandins and leukotrienes by inhibiting the release of their common precursor, arachidonic acid.

Fougera generic 0.025% cream pictured

Drug Characteristics: Triamcinolone Topical

Dose Adjustment Hepatic	Not required	**Absorption**	Minimal absorption unless covering large surface area or covering areas lacking skin integrity
Dose Adjustment Renal	Not required	**Distribution**	Not absorbed
Dialyzable	Not dialyzable	**Metabolism**	Not absorbed
Pregnancy Category	C	**Elimination**	Not absorbed
Lactation	Usually compatible	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity	**Black Box Warnings**	None

Medication Safety Issues: Triamcinolone Topical

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Ketalar	No

Drug Interactions: Triamcinolone Topical. None known

Adverse Reactions: Triamcinolone Topical

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
	Dry skin, burning sensation, stinging, pruritus/atrophy at site of administration	HPA suppression has been reported when used with occlusive dressings over larger surface areas

Efficacy Monitoring Parameters. Improvement in clinical signs of skin disorder.

Toxicity Monitoring Parameters. Seek medical attention if severe skin irritation or symptoms worsen after administration.

Key Patient Counseling Points. Apply thin layer to affected area of skin. Skin should be clean and intact at site of application. Avoid contact with eyes and do not ingest by mouth. Avoid occlusive dressings or tight-fitting clothes over site of administration.

Clinical Pearls. Large number of dosage formulations (foams, gels, shampoos, etc), both by prescription and OTC, are available. Oral and inhaled formulations, administered for systemic action, also available and used for similar indications as other oral corticosteroids. Application to large surface areas, prolonged use, and occlusive dressings increase risk of systemic absorption and toxicity; pediatric patients are more susceptible to systemic absorption. TAC is an error-prone abbreviation; avoid.

TRIAMTERENE/HYDROCHLOROTHIAZIDE: Dyazide, Maxzide, Various

Class: Potassium Sparing/Thiazide Diuretic Combination

Dosage Forms. Oral Capsule: (Triamterene/Hydrochlorothiazide) 37.5 mg/25 mg, 50 mg/25 mg; **Oral Tablet:** (Triamterene/Hydrochlorothiazide) 37.5 mg/25 mg, 50 mg/25 mg, 75 mg/50 mg

Sandoz generic pictured

Common FDA Label Indication, Dosing, and Titration.

1. Edema: 37.5 mg/25 mg, 1-2 tablets or capsules po daily
2. Hypertension: 37.5 mg/25 mg, 1 tablet or capsule po daily, may titrate to 75 mg/50 mg po daily

Off-Label Uses. None

MOA. Triamterene acts directly from the distal tubular lumen on active sodium exchange for potassium and hydrogen, producing a mild diuresis that is independent of aldosterone concentration. Antihypertensive activity is inconsistent and less pronounced than with thiazides or spironolactone. Hydrochlorothiazide is a thiazide diuretic that increases sodium and chloride excretion by interfering with their reabsorption in the cortical diluting segment of the nephron; a mild diuresis of slightly concentrated urine results.

Drug Characteristics: Triamterene/Hydrochlorothiazide

Dose Adjustment Hepatic	Not required	**Absorption**	F = 60-80% for hydrochlorothiazide, 30-70% for triamterene; food delays absorption
Dose Adjustment Renal	CrCl <25 mL/min, avoid use	**Distribution**	Hydrochlorothiazide is 40% protein bound, distribution limited to extracellular f uid space and kidneys; protein binding is 55-67% for triamterene
Dialyzable	Hydrochlorothiazide is not dialyzable; triamterene is removed by dialysis	**Metabolism**	Hydrochlorothiazide is not metabolized; extensive liver metabolism for triamterene
Pregnancy Category	C	**Elimination**	Hydrochlorothiazide is eliminated 50-70% unchanged in urine, with a half-life of 10-12 h; triamterene is eliminated in urine (5-10% unchanged), with a half-life of 4.3-6.5 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to hydrochlorothiazide, sulfonamides or triamterene; concomitant use of potassium supplements, potassium-containing salt substitutes, or other potassium-sparing diuretics; or in patients with anuria, acute/ chronic renal insufficiency, or hyperkalemia	**Black Box Warnings**	Hyperkalemia

Medication Safety Issues: Triamterene/Hydrochlorothiazide

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
-25	No	No	No	Diazoxide, Dynacin	No

Drug Interactions: Triamterene/Hydrochlorothiazide

Typical Agents	Mechanism	Clinical Management
Aliskiren, ACE-Is, angiotensin-receptor blockers, potassium-sparing diuretics	Increased risk of hypotension, hyperkalemia	Avoid concurrent use or monitor BP and serum potassium levels
Eplerenone, potassium supplements, salt substitutes	Increased risk of hyperkalemia and cardiac arrhythmias	Avoid concurrent use or monitor serum potassium levels
Calcium supplements	Increased risk of hypercalcemia	Avoid concurrent use or monitor serum calcium levels
Antidiabetic medications	Decreased hypoglycemic effect	Monitor FBG
NSAIDs	Decreased antihypertensive and diuretic effect, increased risk of nephrotoxicity	Avoid concurrent use or monitor BP and SCr

Adverse Reactions: Triamterene/Hydrochlorothiazide

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Hypotension, dizziness, headache	Altered sense of taste, cramps, constipation, diarrhea, dry mouth, hyperglycemia, hyperuricemia, hypokalemia, hypomagnesemia, hyponatremia, impotence, loss of appetite, nausea, orthohypotension, photosensitivity, rash, tachycardia, urticaria, vomiting	Cardiac arrhythmias, hepatitis, hyperkalemia, gout, pancreatitis, Stevens-Johnson syndrome, decreased visual acuity

Efficacy Monitoring Parameters. Decreased BP, reductions in edema.

Toxicity Monitoring Parameters. Altered serum and urine electrolytes (calcium, magnesium, potassium, sodium), decreased renal function (increased SCr or decreased urine output), increased serum uric acid or blood glucose. Seek medical attention if skin rash, yellowing of eyes or skin, decreased urine output or symptoms of gout occur.

Key Patient Counseling Points. May cause dizziness. Avoid foods that are high in potassium, potassium supplements or potassium-containing salt substitutes. Avoid alcohol and NSAIDs. May cause photosensitivity; use sunscreen. Use with caution in patients with sulfonamide allergy.

Clinical Pearls. Safety and effectiveness not established in children.

TRIMETHOPRIM (TMP)/SULFAMETHOXAZOLE (SMZ): Bactrim, Septra, Various

Class: Sulfonamide Antibiotic

Dosage Forms. **Oral Tablet:** (SMZ/TMP) 400 mg/80 mg (single strength), 800 mg/160 mg (double strength); **Oral Suspension:** (SMZ/TMP) 200 mg/40 mg/5 mL

Amneal generic pictured

Common FDA Label Indication, Dosing, and Titration.

1. Acute infective exacerbation of COPD: 800 mg SMZ and 160 mg TMP po bid × 21 d
2. HIV infection, *Pneumocystis* pneumonia: 1600 mg SMZ and 320 mg TMP po bid × 21 d
3. HIV infection, *Pneumocystis* pneumonia, prophylaxis: Adults, 800 mg SMZ and 160 mg TMP po daily; Children ≥1 mo of age, 750 mg/m^2/d SMZ and 150 mg/m^2/d TMP in 2 divided doses po 3 times/wk on consecutive days
4. Traveler's diarrhea: 800 mg SMZ and 160 mg TMP po bid × 5 d
5. Urinary tract infection: Adult, 800 mg SMZ and 160 mg TMP po bid × 10-14 d; Children ≥2 mo of age, 8 mg/kg TMP component/d po bid × 10 d

Off-Label Uses.

1. Sinusitis: 800 mg SMZ and 160 mg TMP po bid × 10-14 d

MOA. SMZ competitively inhibits the synthesis of dihydropteric acid (an inactive folic acid precursor) in microorganisms. TMP inhibits the enzymatic reduction of dihydrofolic acid to tetrahydrofolic acid. The combination is active against many bacteria and *P. carinii*. TMP/SMZ has in vitro activity against methicillin-resistant *S. aureus* (MRSA), but clinical success has been variable and unpredictable.

Drug Characteristics: Trimethoprim/Sulfamethoxazole

Dose Adjustment Hepatic	Not required	**Absorption**	F = 90%, no effect of food on absorption
Dose Adjustment Renal	CrCl 15-30 mL/min, reduce dose by 50%; CrCl <15 mL/min, avoid, or reduce by 50% and increase interval to 24 h	**Distribution**	CSF
Dialyzable	Hemodialysis requires supplemental dose	**Metabolism**	Hepatic metabolism >90%, trimethoprim is CYP2C9 and CYP3A4/5 substrate. Trimethoprim is moderate inhibitor of CYP2C8 and CYP2C9
Pregnancy Category	D	**Elimination**	SMZ: renal elimination 10-30% with a half-life of 8-11 h; TMP: renal elimination 50-75% with a half-life of 6-17 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	Individuals with G6PD deficiency are more likely to develop hemolytic anemia caused by SMZ/TMP
Contraindications	Hypersensitivity to sulfonamides, children <2 mo, pregnant patients at term, megaloblastic anemia due to folate deficiency	**Black Box Warnings**	None

Medication Safety Issues: Trimethoprim/Sulfamethoxazole

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
DS	No	No	No	Bacitracin, Bactine, Bactroban	No

Drug Interactions: Trimethoprim/Sulfamethoxazole

Typical Agents	Mechanism	Clinical Management
Antiarrhythmic agents, agents that prolong the QT interval	Increased risk of QT prolongation and other cardiac events	Avoid concurrent use or monitor carefully and consider dose reductions
CYP2C8 and CYP2C9 substrates	TMP is a CYP2C8 and CYP2C9 inhibitor, decreased metabolism of substrates, increases risk of substrate toxicity	Consider decreased dose of CYP2C8 and CYP2C9 substrates
CYP3A4/5 and CYP2C9 inducers	Increased TMP metabolism reduces TMP efficacy	Monitor and consider dose increases of TMP
CYP3A4/5 and CYP2C9 inhibitors	Decreased TMP metabolism increases risk of TMP toxicity	Monitor and consider dose decreases of TMP
Methotrexate	Increased toxicity of methotrexate through synergistic antifolate effects of TMP	Avoid concurrent use or consider methotrexate dose reduction or monitoring methotrexate levels

Adverse Reactions: Trimethoprim/Sulfamethoxazole

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Diarrhea, nausea	Skin rash	Severe hypersensitivity, renal failure, hepatic failure, pancytopenia, arrhythmias, Stevens-Johnson syndrome, hyperkalemia, hypoglycemia, hemolytic anemia

Efficacy Monitoring Parameters. Resolution of signs of infection within 2-3 d. Decreased episodes of *Pneumocystis* pneumonia.

Toxicity Monitoring Parameters. Monitor potassium in those with concurrent ACI-Is. Monitor FPG with concurrent sulfonylureas. CBC monthly if using for PCP prophylaxis. Seek medical attention for severe diarrhea, dark urine, yellowing of skin or eye, unusual bruising or bleeding, blistering skin rash, or shortness of breath.

Key Patient Counseling Points. Complete full course of therapy. For the suspension, shake well and store at room temperature. Symptoms should improve within 2-3 d; if they worsen, seek follow-up with health-care practitioner. May cause photosensitivity; use sunscreen. Maintain adequate hydration during therapy to prevent kidney complications.

Clinical Pearls. Avoid use in patients with G6PD deficiency (increased risk of hemolytic anemia). Preferred agent for *Pneumocystis* pneumonia prevention in HIV-infected patients when CD4 count is <200.

VALACYCLOVIR: Valtrex, Various

Class: Viral DNA Polymerase Inhibitor

Dosage Forms. Oral Tablet: 500 mg, 1000 mg

Ranbaxy generic 500 mg pictured

Common FDA Label Indication, Dosing, and Titration.

1. Genital herpes simplex: Initial episode, 1 g po bid × 10 d; recurrent, 500 mg bid × 3 d
2. Genital herpes simplex: Suppressive therapy, immunocompetent, 1 g po daily; HIV infected, 500 mg po bid
3. Herpes zoster, shingles: 1 g po tid × 7 d
4. Varicella: Children ≥2 y of age, 20 mg/kg po tid × 5 d
5. Herpes labialis (cold sores): 2 g po bid × 1 d

Off-Label Uses.

1. CMV prophylaxis in allogeneic stem cell transplant: 2 g po qid
2. Herpes simplex or varicella zoster in cancer patients: Prophylaxis, 500 mg po bid-tid; treatment, 1 g po tid

MOA. Valacyclovir is a prodrug of acyclovir. Acyclovir is an acyclic nucleoside analogue of deoxyguanosine that is selectively phosphorylated by the virus-encoded thymidine kinase to its monophosphate form. Cellular enzymes then convert the monophosphate to the active antiviral acyclovir triphosphate, which inhibits viral DNA synthesis by incorporation into viral DNA, resulting in chain termination. Acyclovir has potent activity against herpes simplex virus (HSV) I and II and varicella-zoster virus (VZV).

Drug Characteristics: Valacyclovir

Dose Adjustment Hepatic	Not required	**Absorption**	F = 10-20%, no effect of food on absorption
Dose Adjustment Renal	Moderate: increase interval to q8h; Severe: increase interval to q12h	**Distribution**	Placenta, CSF, kidney, brain, lung, heart
Dialyzable	Hemodialysis removes 60% of dose. Administer dose after dialysis	**Metabolism**	Hepatic; valacyclovir is rapidly and nearly completely converted to acyclovir and l -valine by first-pass effect; acyclovir is hepatically metabolized to a very small extent by aldehyde oxidase and by alcohol and aldehyde dehydrogenase
Pregnancy Category	B	**Elimination**	Renal elimination is 61-90% with a half-life of 2-3 h
Lactation	Compatible	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity	**Black Box Warnings**	None

Medication Safety Issues: Valacyclovir

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	ValACYclovir	No	No	Acyclovir, valGANciclovir, vancomycin	No

Drug Interactions: Valacyclovir

Typical Agents	Mechanism	Clinical Management
Phenytoin, fosphenytoin, valproic acid	Decreased absorption and lower plasma concentration of phenytoin	Monitor phenytoin levels and adjust if necessary
Varicella virus vaccine	Decreased vaccine effectiveness via antagonism	Avoid concurrent use

Adverse Reactions: Valacyclovir

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Malaise, headache, increased LFTs	Nausea, vomiting	Severe hypersensitivity, renal failure, TTP

Efficacy Monitoring Parameters. Resolution or prevention of clinical signs of infection (lesions).

Toxicity Monitoring Parameters. Seek medical attention if decreased urination, unusual bruising or bleeding, blistering skin rash, or shortness of breath. Monitor CBC, LFTs, and SCr.

Key Patient Counseling Points. Symptoms should improve within 2-3 d; if they worsen, seek follow-up with health-care practitioner. If using for prophylaxis, this medication should reduce the number of breakouts.

Clinical Pearls. Not indicated for children <2 y of age. Use caution with concurrent nephrotoxins. Not for use in adults with chicken pox (varicella). Drug of choice for herpes zoster infection. Improved oral bioavailability over acyclovir, allowing bid dosing of valacyclovir (compared to 5 times/d dosing of acyclovir).

VALSARTAN: Diovan

Class: Angiotensin II Receptor Antagonist

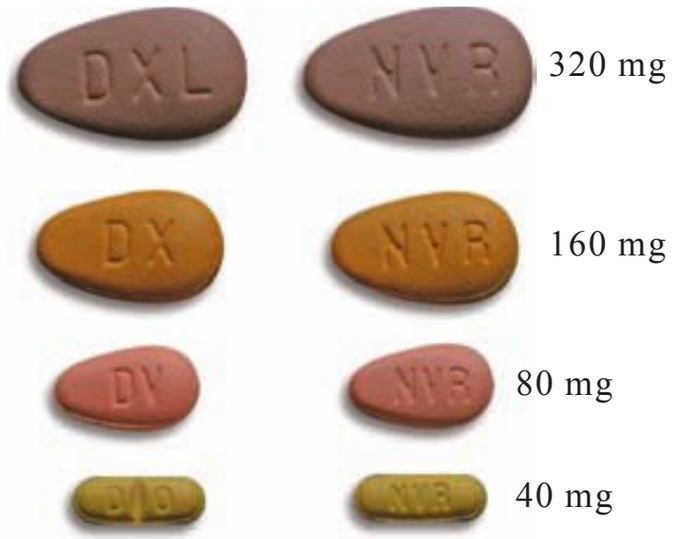
Dosage Forms. Oral Tablet: 40 mg, 80 mg, 160 mg, 320 mg

Common FDA Label Indication, Dosing, and Titration.

1. Heart failure: 40 mg po bid, may titrate to 320 mg/d
2. Hypertension: 80-160 mg po daily, may titrate to 320 mg po daily
3. Myocardial infarction: 20 mg po bid, may titrate to 320 mg po daily

Off-Label Uses. None

MOA. Valsartan is a selective, reversible, competitive antagonist of the angiotension II receptor, which is responsible for the physiologic effects of angiotensin II, including vasoconstriction, aldosterone secretion, sympathetic outflow, and stimulation of renal sodium reabsorption.



Novartis pictured

Drug Characteristics: Valsartan

Dose Adjustment Hepatic	Not required	**Absorption**	F = 25%, food does not affect absorption
Dose Adjustment Renal	Not required	**Distribution**	Vd = 17 L; 95% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Minimal liver metabolism
Pregnancy Category	D	**Elimination**	Renal elimination is 7-13% and bile elimination is 89% with a half-life 6-9 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity, pregnancy	**Black Box Warnings**	Pregnancy

Medication Safety Issues: Valsartan

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Losartan, Valstar	No

Drug Interactions: Valsartan

Typical Agents	Mechanism	Clinical Management
Potassium-sparing diuretics	Increased risk of hypotension, hyperkalemia	Avoid concurrent use or monitor BP and serum potassium levels
ACE-Is	Increased risk of hypotension, hyperkalemia, nephrotoxicity	Avoid concurrent use or monitor BP, SCr, and potassium levels
Potassium supplements, salt substitutes	Increased risk of hyperkalemia and cardiac arrhythmias	Avoid concurrent use or monitor serum potassium level
NSAIDs	Decreased antihypertensive and natriuretic effect of valsartan, increased risk of nephrotoxicity	Avoid concurrent use or monitor BP and SCr
Diuretics	Increased risk of postural hypotension due to hypovolemia	Monitor BP; rise from seated position slowly

Adverse Reactions: Valsartan

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Dizziness	Back pain, cough, diarrhea, drowsiness, headache, hyperkalemia, hypotension, nausea, nephrotoxicity, rash, tachycardia	Angioedema, rhabdomyolysis

Efficacy Monitoring Parameters. Decreased BP, signs/symptoms of heart failure.

Toxicity Monitoring Parameters. Signs/symptoms of hypotension, tachycardia, angioedema (swelling of the face, eyes, lips, tongue, or throat), hyperkalemia (confusion, body weakness, uneven heartbeat, or numbness/tingling in hands or feet), reduction in urination, jaundice, or skin rash. Monitor vital signs, weight, LFTs.

Key Patient Counseling Points. Do not discontinue abruptly. Use potassium supplements or salt substitutes only under medical supervision. This medicine may cause dizziness. Avoid driving, using machinery, or doing anything else that could be dangerous if not alert. Recommend avoiding alcohol and NSAIDs while taking this drug.

Clinical Pearls. ARBs can cause injury or death to the developing fetus when used during 2nd and 3rd trimesters. Therapy should be stopped as soon as possible when pregnancy is detected. In hypertensive patients with chronic kidney disease, either an ACE-I or ARB is recommended as first-line therapy to improve kidney outcomes. While ACE-Is are recommended as first-line therapy, in patients with heart failure or with ST-elevation myocardial infarctions, ARBs are recommended for patients unable to tolerate ACE-Is.

VARDENAFIL: Levitra, Staxyn

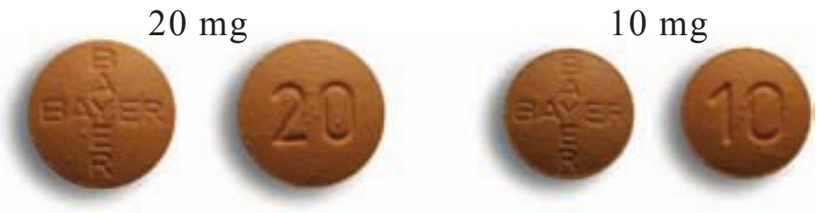
Class: Erectile Dysfunction Agent

Dosage Forms. Oral Tablet: 2.5 mg, 5 mg, 10 mg, 20 mg; **Oral Dispersible Tablet:** 10 mg

Common FDA Label Indication, Dosing, and Titration.

1. Erectile dysfunction: 10-20 mg po 60 min prior to anticipated sexual activity; *max* frequency is once daily

Off-Label Uses. None



Bayer pictured

MOA. Inhibition of phosphodiesterase type 5 (PDE5) by vardenafil enhances erectile function by increasing the amount of cyclic GMP. Penile erection during sexual stimulation is mediated by the release of nitric oxide (NO) from nerve terminals and endothelial cells, which stimulates the synthesis of cyclic GMP in smooth muscle cells. Cyclic GMP causes smooth muscle relaxation and increases blood flow into the corpus cavernosum.

Drug Characteristics: Vardenafil

Dose Adjustment Hepatic	Moderate hepatic impairment, decrease dose to 5-10 mg po prior to anticipated sexual activity; severe impairment, avoid use	**Absorption**	F = 15%, minimal food effect, water reduces the absorption of orally disintegrating tablet, take without liquid
Dose Adjustment Renal	Not required, but avoid use in dialysis patients	**Distribution**	Vd = 209 L; 95% protein bound
Dialyzable	Not dialyzable	**Metabolism**	90-95% hepatic, CYP3A4/5 substrate
Pregnancy Category	B	**Elimination**	<2-6% renal elimination with a half-life of 4-6 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to PDE inhibitors, concurrent nitrates	**Black Box Warnings**	None

Medication Safety Issues: Vardenafil

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	Dispersible tablet	No	Sildenafil, tadalafil	No

Drug Interactions: Vardenafil

Typical Agents	Mechanism	Clinical Management
α-Adrenergic agents	Additive hypotension	Monitor for hypotension and consider dose reductions
CYP3A4/5 inducers	Increased vardenafil metabolism reduces vardenafil efficacy	Consider dose increases of vardenafil
CYP3A4/5 inhibitors	Decreased vardenafil metabolism increases risk of vardenafil toxicity	Reduce vardenafil dose to 2.5 mg q72h if concurrent strong inhibitors and 5 mg q24h if moderate inhibitors
Nitrates	Additive hypotension, potentially severe	Contraindicated

Adverse Reactions: Vardenafil

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Flushing, headache	Nasopharyngitis, angina, chest pain, hypotension	Myocardial infarction, seizures, strokes, sudden hearing loss, priapism

Efficacy Monitoring Parameters. Improvement in sexual functioning.

Toxicity Monitoring Parameters. Seek medical attention if chest pain, erection lasting >4 h, tinnitus, dizziness, shortness of breath.

Key Patient Counseling Points. Take 60 min prior to anticipated sexual activity. Do not take more frequently than once q24h. The orally disintegrating tablet should be placed on tongue immediately upon removal from packaging; the tablet should be taken whole and not crushed or split, do not take with any liquids. Oral tablet can be taken without regard to food. If erection lasts >4 h, seek medical attention.

Clinical Pearls. The choice between tadalafil, sildenafil, or vardenafil is largely one of patient preference; tadalafil would be indicated in those desiring "full-day coverage." Sexual stimulation is required to initiate the local release of NO; the inhibition of PDE5 has no effect in the absence of sexual stimulation.

VARENICLINE: Chantix

Class: Smoking Cessation Agent

Dosage Forms. Oral Tablet: 0.5 mg, 1 mg

Common FDA Label Indication, Dosing, and Titration.

1. Smoking cessation: Initial dose, 0.5 mg po daily × 3 d, then 0.5 mg po bid × 4 d, then 1 mg po bid for the following 11 wk; may repeat additional 12 wk treatment if patient has not stopped smoking, and if patient has stopped, may increase likelihood of long-term abstinence

Off-Label Uses. None

MOA. Varenicline binds with high affinity and selectivity at α4β2 neuronal nicotinic acetylcholine receptors. Its efficacy in smoking cessation is believed to be the result of activity at α4β2 subtype of the nicotinic receptor where its binding produces agonist activity, while simultaneously preventing nicotine binding to these receptors.

Pfizer pictured

Drug Characteristics: Varenicline

Dose Adjustment Hepatic	Not required	**Absorption**	F = 99%, food has no effect on absorption
Dose Adjustment Renal	CrCl <30 mL/min, initial dose 0.5 mg po daily, and titrate up to 0.5 mg po bid; patients with end-stage renal disease, use with caution at *max* dose of 0.5 mg po daily	**Distribution**	20% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Minimal metabolism
Pregnancy Category	C	**Elimination**	Renal elimination is 92% unchanged with a half-life of 24 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity	**Black Box Warnings**	Neuropsychiatric effects, weigh risk/benefit

Medication Safety Issues: Varenicline

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	No	No

Drug Interactions: Varenicline

Typical Agents	Mechanism	Clinical Management
Bupropion, H_2-antagonsits, quinolone antibiotics, trimethoprim	May increase varenicline serum concentration via unknown mechanisms	Monitor for adverse effects and consider dose decreases

Adverse Reactions: Varenicline

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Dream disorder, nausea, headache, insomnia	Constipation, f atulence, vomiting	Abnormal behavior, suicidal thoughts, angioedema, hypersensitivity reactions, increased risk of accidents, increased risk of cardiovascular related events

Efficacy Monitoring Parameters. Abstinence from tobacco

Toxicity Monitoring Parameters. Seek medical attention if patient experiences severe abnormal behavior or suicidal thoughts.

Key Patient Counseling Points. Take drug after eating and with a full glass (8 oz) of water. If agitation, depressed mood, changes in behavior or thinking, or suicidal ideation, stop taking and contact health-care provider. May be used with other nicotine replacement products to help alleviate withdrawal from nicotine.

Clinical Pearls. Serious neuropsychiatric symptoms have been reported in patients being treated with varenicline. It may occur in patients without a history of psychiatric illness, although patients with bipolar disorder, depression, schizophrenia, or suicidal ideation appear to be at increased risk. Patients who continue to smoke are also at increased risk. FAA has banned its use in pilots and air traffic controllers. Patients and health-care providers should weigh the risks of taking varenicline against the benefits of smoking cessation. In a recent meta-analysis, there was an increased, but not statistically significant, incidence of major adverse cardiovascular events (a combined outcome of cardiovascular-related death, nonfatal myocardial infarction, and nonfatal stroke) in patients using varenicline when compared to placebo. Dispense with FDA-approved medication guide.

VARICELLA VACCINE, LIVE: Varivax

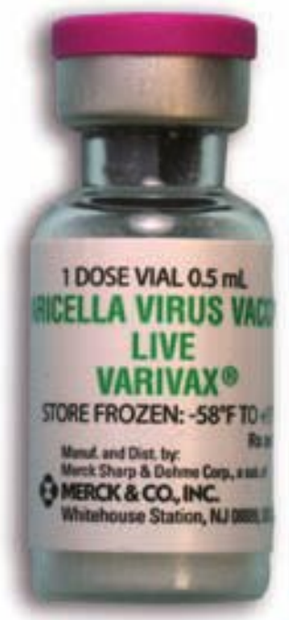
Class: Vaccine, Live, Viral

Dosage Forms. **Lyophilized Powder for Subcutaneous Injection:** 0.5 mL after reconstitution with diluent supplied; also available in combination with measles, mumps, and rubella vaccine

Common FDA Label Indication, Dosing, and Titration.

1. Prevention of varicella infection: Adults, 2 doses separated by at least 4 wk; Children, 1 dose at 12 mo of age with a 2nd dose at 4-6 y of age, prior to entering school

Off-Label Uses. None



Merck pictured

Pregnancy Category	Contraindicated	**ADME**	None known
Lactation	Infant risk is likely minimal	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to varicella vaccine or a component of the vaccine; immunosuppression; pregnancy	**Black Box Warnings**	None

Medication Safety Issues: Varicella Vaccine, Live

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	V-ZIG	No

Drug Interactions: Varicella Vaccine, Live

Typical Agents	Mechanism	Clinical Management
Aspirin, salicylates	Increased risk of Reye syndrome	Avoid giving salicylates to children for the 6 wk following varicella vaccine administration
Moderate- to high-dose corticosteroids	Immunosuppression and increased risk of infection by vaccine	Delay varicella vaccine administration until corticosteroid therapy has been discontinued
Immunosuppressing agents, including cyclosporine, cancer chemotherapy	Immunosuppression and increased risk of infection by vaccine	Delay varicella vaccine administration until immunosuppressive therapy has been discontinued
Immune globulin or blood products	Interference with immune response to live vaccines	Delay varicella vaccine administration for a period of time depending on type and dose of immune globulin or blood product

Adverse Reactions: Varicella Vaccine, Live

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Injection site reactions, including erythema and soreness. Headache, irritability, and somnolence	Fever, rash, GI symptoms, lymphadenopathy	Thrombocytopenia, anaphylaxis, herpes zoster, febrile seizure

Efficacy Monitoring Parameters. Prevention of varicella infection, although antibody concentrations might be measured; routine measurement for vaccine response is not recommended.

Toxicity Monitoring Parameters. Monitor for fever and rash.

Key Patient Counseling Points. Some children may experience mild fever and rash 7-10 d after vaccine administration.

Clinical Pearls. Varicella vaccine contains the same vaccine virus as zoster vaccine, but the doses are dramatically different and are not interchangeable. Indicators of varicella immunity include birth in the United States before 1980, physician-documented history of disease, laboratory evidence of immunity, or 2 doses of varicella vaccine after 12 mo of age. Individuals born in the United States before 1980 can be considered immune to varicella unless health-care personnel, immunocompromised, or pregnant woman. Transmission of the vaccine virus to susceptible individuals without serious lasting consequences has been documented. If not administered simultaneously, varicella vaccine must be separated by at least 4 wk from other live vaccines. Febrile seizure is more common with the combination measles-mumps-rubella-varicella vaccine compared to MMR and varicella vaccines given as separate injections. Pregnant women exposed to varicella should not receive vaccine; instead, should receive varicella zoster immune globulin.

VENLAFAXINE: Effexor, Effexor XR, Various

Class: Antidepressant, Serotonin/Norepinephrine Reuptake Inhibitor

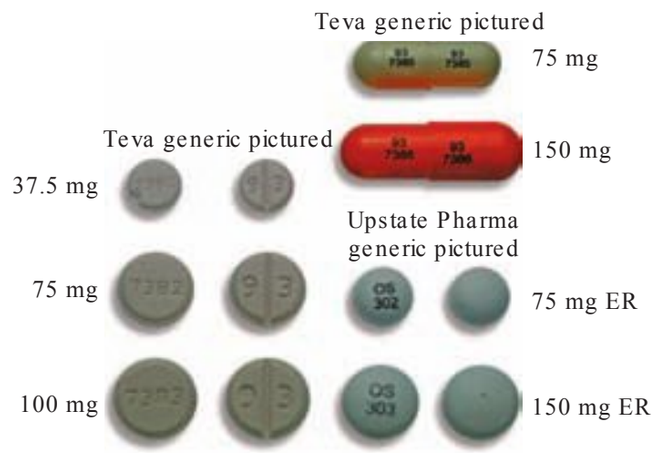
Dosage Forms. **Oral Capsule, Extended Release:** 37.5 mg, 75 mg, 150 mg; **Oral Tablet:** 25 mg, 37.5 mg, 50 mg, 75 mg, 100 mg; **Oral Tablet, Extended Release:** 37.5 mg, 75 mg 150 mg, 225 mg

Common FDA Label Indication, Dosing, and Titration.

1. Generalized anxiety disorder: Extended release, 37.5-75 mg po daily, may titrate to 225 mg/d
2. Depression: Immediate release, 75 mg po daily in 2-3 divided doses, may titrate to 225 mg/d; extended release, 37.5-75 mg po daily, may titrate to 225 mg/d
3. Panic disorder: Extended release, 37.5 mg po daily × 7 d, then 75 mg po daily, then may titrate to 225 mg/d
4. Social anxiety disorder: Extended release, 75 mg po daily

Off-Label Uses.

1. OCD: Immediate release, 25 mg po tid, may titrate to 300 mg/d
2. Hot flashes: 37.5-75 mg po daily



MOA. Potent reuptake inhibitor of serotonin and norepinephrine but lacks effects on muscarinic, α-adrenergic, or histamine receptors.

Drug Characteristics: Venlafaxine

Dose Adjustment Hepatic	Mild-moderate liver impairment, decrease dose by 25-50%; severe impairment, avoid	**Absorption**	F = 12.6% (immediate release), 45% (extended release); no effect of food on absorption
Dose Adjustment Renal	Mild-moderate renal impairment, decrease dose by 25-50%; dialysis, decrease dose by 50%	**Distribution**	Vd = 7.5 L; 27-30% protein bound
Dialyzable	Not dialyzable	**Metabolism**	87% hepatic, CYP2D6 and CYP3A4/5 substrate
Pregnancy Category	C	**Elimination**	Renal elimination is 87% (82% as metabolites, 5% unchanged) with a half-life of 5 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	Venlafaxine metabolized to an active metabolite by CYP2D6. Poor CYP2D6 metabolizers have higher concentrations of venlafaxine, but similar clinical effects.
Contraindications	Hypersensitivity; MAOIs	**Black Box Warnings**	Suicidal ideation

Medication Safety Issues: Venlafaxine

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
XR	No	Do not crush, chew ER formulations. Capsule may be sprinkled on food	No	No	No

Drug Interactions: Venlafaxine

Typical Agents	Mechanism	Clinical Management
Agents that prolong the QT interval	Increased risk of cardiotoxicity	Avoid concurrent use
Anticoagulants, antiplatelet drugs, NSAIDs	Increased risk of bleeding	Monitor for bleeding, avoid concurrent use if possible
CYP3A4/5, CYP2D6 inhibitors	Decreased venlafaxine metabolism increases risk of venlafaxine toxicity	Avoid concurrent use or monitor for adverse effects; consider dose decrease
CYP3A4/5 inducers	Increased venlafaxine metabolism reduces venlafaxine efficacy	Monitor for efficacy and consider dose increase
Dextroamphetamine, SSRIs, sumatriptan, tramadol, trazodone, zolmitriptan, linezolid	Increased risk of serotonin syndrome	Monitor closely for symptoms of serotonin syndrome, linezolid contraindicated

Adverse Reactions: Venlafaxine

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Dizziness, headache, insomnia, nausea, somnolence, xerostomia	Anxiety, asthenia, bleeding, blurred vision, diaphoresis, hypertension, hyponatremia, hypercholesterolemia, sexual dysfunction, tremor, vomiting, weight loss, sexual dysfunction	GI hemorrhage, hepatotoxicity, serotonin syndrome, suicidal thoughts

Efficacy Monitoring Parameters. Improvement in depression, anxiety, and panic symptoms.

Toxicity Monitoring Parameters. Worsening of depression, suicidality, or unusual changes in behavior, especially at the initiation of therapy or with dosage increases or decreases; signs/symptoms of abnormal bleeding; signs/symptoms of serotonin syndrome; monitor BP, LFT, serum cholesterol levels, in case of severe impairment at baseline and periodically during therapy; signs/symptoms of hyponatremia, especially in patients on concomitant diuretics, volume-depleted patients, and elderly.

Key Patient Counseling Points. Take venlafaxine with food, but avoid alcohol. Extended-release capsules and tablets should be swallowed whole. Contents of extended-release capsules may be sprinkled on food and swallowed without chewing, followed by water. Symptomatic improvement may not be evident for a few weeks. Do not discontinue drug abruptly, as this may precipitate withdrawal symptoms such as dysphoric mood, irritability, and agitation. Avoid activities requiring mental alertness; may cause dizziness or somnolence.

Clinical Pearls. May convert to extended-release capsules or tablets based on nearest equivalent dose (mg/d) of stable immediate-release dose.

VERAPAMIL: Calan, Calan SR, Isoptin SR, Various

Class: Calcium Channel Blocker

Dosage Forms. **Oral Tablet:** 40 mg, 80 mg, 120 mg; **Oral Tablet, Extended Release:** 120 mg, 180 mg, 240 mg; **Oral Capsule, Extended Release:** 100 mg, 120 mg, 180 mg, 200 mg, 240 mg, 300 mg, 360 mg

Common FDA Label Indication, Dosing, and Titration.

1. Angina: Immediate release, 80-120 mg po tid; extended release, 180 mg po daily hs, may titrate to 480 mg po daily
2. Atrial arrhythmia or paroxysmal supraventricular tachycardia prophylaxis: Immediate release, 240-320 mg/d in 3-4 divided doses, may titrate to 480 mg/d in nondigitalized patients
3. Hypertension: Immediate release, 80 mg po tid, may titrate to 360-480 mg/d; extended release, 180-200 mg po daily hs, may titrate to 400-480 mg po daily; sustained release 180 mg po daily in am, may titrate to 240-480 mg/d

Off-Label Uses. None

MOA. Inhibits calcium "slow channels" on vascular smooth muscle and myocardium producing relaxation of muscle and vasodilation. Increases myocardial oxygen delivery and slow conduction through the AV node.

Mylan generic pictured


Mylan generic 120 mg pictured


Teva generic 240 mg pictured

Drug Characteristics: Verapamil

Dose Adjustment Hepatic	Reduce dose by 20-50%	**Absorption**	F = 13-65%; no affect of food on absorption
Dose Adjustment Renal	Not required	**Distribution**	Vd = 3.89 L/kg; 86-94% protein bound
Dialyzable	Not dialyzable	**Metabolism**	70% and occurs by CYP3A4/5, moderate inhibitor of CYP3A4/5
Pregnancy Category	C	**Elimination**	Renal elimination is 70% (3-4% unchanged) and 9-16% in feces, with a half-life of 4-12 h
Lactation	Compatible	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to verapamil; symptomatic hypotension (systolic BP <90 mm Hg); 2nd- or 3rd-degree AV heart block, sick sinus syndrome; severe left ventricular dysfunction (ejection fraction <30%)	**Black Box Warnings**	None

Medication Safety Issues: Verapamil

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
SR, PM	No	Do not crush or chew sustained or extended-release products	Yes (IV only)	Colace	No

Drug Interactions: Verapamil

Typical Agents	Mechanism	Clinical Management
Amiodarone, beta-blockers	Increased risk of bradycardia, heart block (amiodarone), sinus arrest, AV conduction disturbances (beta-blockers)	Avoid concurrent use in patients with sick sinus syndrome or AV block or monitor BP and HR
CYP3A4/5 inhibitors	Decreased verapamil metabolism increases the risk of verapamil toxicity	Avoid concurrent use or monitor for adverse effects
CYP3A4/5 inducers	Increased verapamil metabolism decreases verapamil efficacy	Monitor for efficacy; consider dose increase
CYP3A4/5 substrates	Increased substrate concentration and increased substrate toxicity via inhibition of CYP3A4/5 by verapamil	Avoid narrow therapeutic index concurrent medications; otherwise monitor and consider dose reductions
Disopyramide	May aggravate or precipitate heart failure	Avoid giving disopyramide 48 h before or for 24 h after verapamil

Adverse Reactions: Verapamil

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Gingival hyperplasia	Bradyarrhythmia, constipation, dizziness, fatigue, headache, hypotension, indigestion, nausea, palpitations, peripheral edema, rash, syncope, elevated liver enzymes	Congestive heart failure, heart block, hepatotoxicity, pulmonary edema

Efficacy Monitoring Parameters. Decreased BP, improvement in HR and rhythm, reduction in chest pain, decreased number of weekly angina attacks, reduction in use of nitroglycerin for chest pain.

Toxicity Monitoring Parameters. Signs/symptoms of heart failure, decreased HR, signs/symptoms of liver toxicity. Exacerbations of angina pectoris or acute coronary insufficiency; while tapering chronic therapy, especially in patients with ischemic heart disease. Monitor LFTs, ECG, and vital signs.

Key Patient Counseling Points. Do not crush or chew extended-release products. Contents of extended-release capsules may be sprinkled on food and swallowed without chewing, followed by water. Instruct patient to report symptomatic hypotension, bradyarrhythmia, peripheral edema, or syncope. Advise patients against sudden discontinuation of drug, as this may precipitate hypertensive rebound/crisis. Rise slowly from a sitting or lying position to avoid dizziness.

Clinical Pearls. Not approved in children <18 y of age.

VILAZODONE: Viibryd

Class: Antidepressant, SSRI/5-HT_{1A} Receptor Partial Agonist

Dosage Forms. Oral Tablet: 10 mg, 20 mg, 40 mg

Common FDA Label Indication, Dosing, and Titration.

1. Depression: Adults, 10 mg po once daily × 7 d, then 20 mg po once daily × 7 d, then 40 mg po daily

Off-Label Uses. None

MOA. Vilazodone inhibits CNS neuron serotonin uptake, with minimal or no effect on reuptake of norepinephrine or dopamine. It binds selectively with high affinity to 5-HT_{1A} receptors (altered in depression and anxiety patients) and is a 5-HT_{1A} receptor partial agonist.

Drug Characteristics: Vilazodone

Dose Adjustment Hepatic	Not required	**Absorption**	F = 72% with food; food increases AUC 50%
Dose Adjustment Renal	Not required	**Distribution**	Widely distributed; 96-99% protein bound
Dialyzable	Not dialyzable	**Metabolism**	Hepatic, CYP3A4/5 substrate
Pregnancy Category	C	**Elimination**	Renal elimination (primarily as metabolites), with a half-life of 25 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity; concurrent use of MAOI	**Black Box Warnings**	Suicidal thinking and suicidal behavior

Medication Safety Issues: Vilazodone

Suf xes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Lurasidone, paliperidone, risperidone, ziprasidone	No

Drug Interactions: Vilazodone

Typical Agents	Mechanism	Clinical Management
CYP3A4/5 inducers	Increased vilazodone metabolism reduces vilazodone effectiveness	Monitor and consider dose increases of vilazodone
CYP3A4/5 inhibitors	Decreased vilazodone metabolism increases risk of vilazodone toxicity	Monitor and consider dose decreases of vilazodone
Triptans, SSRIs, dextroamphetamine, tramadol, MAOIs	Increased risk of serotonin syndrome	Monitor closely for symptoms of serotonin syndrome (restlessness, hyperthermia, hyperref exia, incoordination)

Adverse Reactions: Vilazodone

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Diarrhea, nausea	Palpitations, dizziness, insomnia, fatigue, drowsiness, restlessness, migraine, sedation, xerostomia, arthralgia, sexual dysfunction	Hyponatremia, serotonin syndrome

Efficacy Monitoring Parameters. Reduction in symptoms of depression.

Toxicity Monitoring Parameters. Signs and symptoms of withdrawal upon abrupt dose reduction or discontinuation. Signs and symptoms of serotonin syndrome or akatheisia. Monitor for suicidal ideation.

Key Patient Counseling Points. Patient should avoid activities requiring mental alertness or coordination until drug effects are realized. Advise patient that symptomatic improvement may not be seen for a few weeks. Advise patient against sudden discontinuation of drug. Patient may take with or without food, but should always take drug consistently. Patient should not drink alcohol or large amounts of grapefruit juice while taking this drug. Avoid concomitant use with MAO inhibitors.

Clinical Pearls. Safety and efficacy not established in pediatric patients <18 y of age.

WARFARIN: Coumadin, Various

Class: Anticoagulant, Vitamin K Antagonist

Dosage Forms. Oral Tablet: 1 mg, 2 mg, 2.5 mg, 3 mg, 4 mg, 5 mg, 6 mg, 7.5 mg, 10 mg

Common FDA Label Indication, Dosing, and Titration.

1. Multiple FDA-labeled indications, all dosed similarly, including atrial fibrillation; myocardial infarction; prosthetic cardiac valve component embolism; pulmonary embolism; thrombosis, postmyocardial infarction; venous thromboembolism: Initial, 2-5 mg po daily, adjust dose based on INR; usual maintenance 2-10 mg po daily

Off-Label Uses.

1. Prevention of transient ischemic attacks: Initial, 2-5 mg po daily, adjust dose based on INR; usual maintenance 2-10 mg po daily

MOA. Warfarin prevents the conversion of vitamin K back to its active form from vitamin K epoxide. This impairs formation of the vitamin K–dependent clotting factors II, VII, IX, and X (prothrombin) and proteins C and S (physiologic anticoagulants).

Taro generic pictured

Drug Characteristics: Warfarin

Dose Adjustment Hepatic	Initial dose should be <5 mg po daily, adjust dose based on INR	**Absorption**	F = 100%; no effect of food on absorption
Dose Adjustment Renal	Not required	**Distribution**	Vd = 0.14 L/kg; protein binding 99%
Dialyzable	Not dialyzable	**Metabolism**	>90% hepatic, CYP2C9 substrate
Pregnancy Category	X	**Elimination**	Renal elimination of metabolites is 92% with a half-life of 20-60 h
Lactation	Compatible	**Pharmacogenetics**	CYP2C9 and VKORC1 genetic variation may be useful in initial dosing of warfarin
Contraindications	Hypersensitivity, bleeding tendencies recent or potential surgery, uncontrolled hypertension; pericarditis or pericardial effusion; bacterial endocarditis; noncompliant patients, eclampsia/preeclampsia, threatened abortion, pregnancy	**Black Box Warnings**	Bleeding

Medication Safety Issues: Warfarin

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	Yes	Avandia	No

Drug Interactions: Warfarin

Typical Agents	Mechanism	Clinical Management
Agents with a risk of bleeding, antiplatelet agents, direct thrombin inhibitors, NSAIDs, acetaminophen, others	Additive effects and increased risk of bleeding	Monitor for signs/symptoms of bleeding; measure INR and avoid concurrent use if possible
CYP2C9 inhibitors	Decreased warfarin metabolism increases risk of warfarin toxicity	Use caution with concomitant therapy; monitor INR and adjust warfarin dose
CYP2C9 inducers	Increased warfarin metabolism decreases warfarin efficacy	Use caution with concomitant therapy; monitor INR and adjust warfarin dose
Sucralfate	Inhibits warfarin absorption	Separate administration by 1-2 h

Adverse Reactions: Warfarin

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Bleeding	Anemia, epistaxis, rash	Hemorrhage (particularly GI tract), purple toe syndrome, tissue necrosis

Efficacy Monitoring Parameters. Measure initial INR after the first 2-3 doses and subsequently at intervals no longer than every 4 wk, once stable dose has been achieved; may monitor every 12 wk in stable patients, use clinical judgment; patients at high risk of bleeding require more frequent monitoring. INR target and therapeutic range depend on indication. Atrial fibrillation/atrial flutter: target 2.5 (range 2-3); prosthetic heart valves: target 2.5 (range 2-3); mechanical mitral or aortic valve: target 3 (range 2.5-3.5); myocardial infarction, ST segment elevation: target 3 (2.5-3.5, with aspirin); venous thromboembolism, prophylaxis and treatment (including pulmonary embolism, DVT, hip/knee arthroplasty): target 2.5 (range 2-3).

Toxicity Monitoring Parameters. Signs/symptoms of bleeding, CBC, LFT, stool guaiac test.

Key Patient Counseling Points. Report signs/symptoms of hemorrhage, skin and tissue necrosis. Avoid situations/activities in which cuts, bruising, or injury is likely to occur. Many significant drug-drug interactions, consult health-care professional prior to new prescription or OTC use. Avoid alcohol, cranberry products, and drastic changes in vitamin K consumption from diet (cruciferous vegetables).

Clinical Pearls. Patients often managed in pharmacist-run anticoagulation clinics. Consult local protocols. Excessive anticoagulation with warfarin can be corrected with vitamin K. Pharmacogenetic testing for initial dosing of warfarin decreases the time required to achieve a therapeutic INR, but improved clinical efficacy and decreased adverse effects have not been achieved; therefore pharmacogenetic testing is not routine.

ZIPRASIDONE: Geodon

Class: Second-Generation Antipsychotic

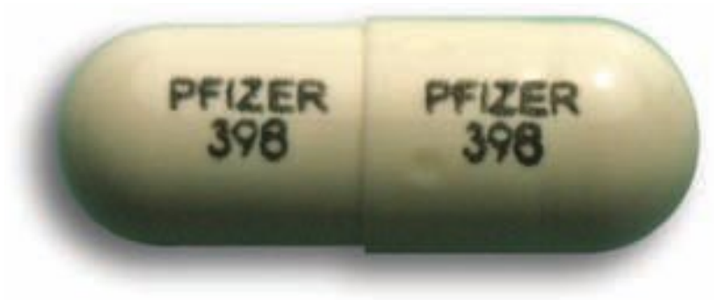
Dosage Forms. Oral Capsule: 20 mg, 40 mg, 60 mg, 80 mg

Common FDA Label Indication, Dosing, and Titration.

1. Bipolar disorder, acute manic or mixed episodes, monotherapy, or adjunct to lithium or valproate: 40-80 mg po bid
2. Schizophrenia: 20 mg po bid, may titrate to 40-100 mg bid

Off-Label Uses.

1. Psychosis and agitation related to Alzheimer dementia: 20-80 mg po bid



Pfizer 60 mg pictured

MOA. Ziprasidone is an atypical antipsychotic drug with a very high ratio of 5-HT_{2A} to dopamine-2 blockade, suggesting a very low risk of extrapyramidal effects. In addition, it is a 5-HT_{1A} agonist and inhibits reuptake of both serotonin and norepinephrine like antidepressants. The clinical value of the latter 2 effects is not established.

Drug Characteristics: Ziprasidone

Dose Adjustment Hepatic	Not required	**Absorption**	F = 60%; food increases absorption twofold
Dose Adjustment Renal	Not required	**Distribution**	Vd = 1.5 L/kg; >99% protein bound
Dialyzable	Not dialyzable	**Metabolism**	>95% and occurs by aldehyde oxidase
Pregnancy Category	C	**Elimination**	Renal elimination is 20% (<1% unchanged) and 66% in feces (<4% unchanged), with a half-life of 7 h
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to ziprasidone; acute or recent myocardial infarction; uncompensated heart failure; QT prolongation, including congenital long QT syndrome; concomitant administration of other drugs that cause QT prolongation	**Black Box Warnings**	Elderly patients with dementia are at increased risk of death

Medication Safety Issues: Ziprasidone

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	TraZODone	Avoid use for behavioral problems of dementia unless nonpharmacologic options have failed and patient is threat to self or others

Drug Interactions: Ziprasidone

Typical Agents	Mechanism	Clinical Management
Agents that increase QT interval	Increased risk of cardiotoxicity (QT prolongation, torsades de pointes, cardiac arrest)	Concomitant use contraindicated
Carbamazepine	Decreased ziprasidone concentrations	Use with caution; monitor ziprasidone efficacy

Adverse Reactions: Ziprasidone

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Dizziness, extrapyramidal disease, headache, nausea, somnolence	Abnormal vision, akathisia, anxiety, asthenia, constipation, diarrhea, indigestion, rash, spasmodic movement, tremor, weight gain, vomiting, xerostomia	Bone marrow depression, diabetes, neuroleptic malignant syndrome, prolonged QT interval, syncope, tardive dyskinesia, torsades de pointes

Efficacy Monitoring Parameters. Improvement in signs and symptoms of schizophrenia or manic or mixed episodes associated with bipolar disorder.

Toxicity Monitoring Parameters. FPG and CBC at baseline and periodically during therapy; patients at high risk for suicide should be closely supervised during therapy. Monitor vital signs, including temperature.

Key Patient Counseling Points. Take with food but avoid alcohol. Avoid activities requiring mental alertness or coordination, as this medicine may cause dizziness and somnolence. Use caution with activities leading to an increased core temperature, such as strenuous exercise, exposure to extreme heat, or dehydration. Rise slowly from a sitting/supine position, as drug may cause orthostatic hypotension. Report signs/symptoms of bradycardia, arrhythmia, tardive dyskinesia, or neuroleptic malignant syndrome.

Clinical Pearls. Safety and effectiveness in pediatric patients have not been established. Elderly patients with dementia-related psychosis treated with atypical antipsychotic drugs are at an increased risk of death compared to placebo. Not approved for dementia-related psychosis.

ZOLPIDEM: Ambien, Various

Class: Nonbarbiturate Hypnotic

C-IV

Dosage Forms. **Oral Tablet:** 5 mg, 10 mg; **Oral Tablet, Extended Release:** 6.25 mg, 12.5 mg; **Sublingual Tablet:** 1.75 mg, 3.5 mg, 5 mg, 10 mg; **Oromucosal Spray:** 5 mg/actuation

Common FDA Label Indication, Dosing, and Titration.

1. Insomnia, short-term treatment: Immediate release, spray or sublingual, 1.75-5 mg (females), 3.5-10 mg (males) po daily hs; extended release, 6.25 mg (females), 6.25-12.5 mg (males) po daily hs

Off-Label Uses. None

MOA. Zolpidem binds the benzodiazepine receptor but is structurally different from a benzodiazepine. Sedative and hypnotic effects due to increased chloride conductance, neuronal hyperpolarization, inhibition of action potential, and decrease in neuronal excitability.

Wockhardt generic 5 mg pictured

Drug Characteristics: Zolpidem

Dose Adjustment Hepatic	Moderate or severe hepatic failure: reduce dose by 50%	**Absorption**	F = 70%, food decreases absorption; Cmax and AUC increased ~45% in females
Dose Adjustment Renal	Not required	**Distribution**	Vd = 0.54 L/kg; 93% protein bound
Dialyzable	Not dialyzable	**Metabolism**	>99% hepatic, CYP3A4/5 (60%) and CYP2C9 (20%) substrate, other CYPs with small contributions
Pregnancy Category	C	**Elimination**	Renal elimination is <1% with a half-life of 3 h
Lactation	Usually compatible	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity	**Black Box Warnings**	None

Medication Safety Issues: Zolpidem

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
CR	No	Do not crush or chew ER tablets or SL tablet	No	Abilify, Ativan	Avoid chronic use (>90 d)

Drug Interactions: Zolpidem

Typical Agents	Mechanism	Clinical Management
Benzodiazepines, CNS depressants, TCAs	Additive CNS depression	Avoid if possible and consider dose reductions of both agents
Bupropion, desipramine, sertraline, venlafaxine	Increased risk of hallucinations	Avoid if possible and consider dose reductions of both agents
CYP3A4/5 inhibitors	Decreased zolpidem metabolism increases risk of zolpidem toxicity	Avoid concurrent use or consider dose reductions
CYP3A4/5 inducers	Increased zolpidem metabolism decreases efficacy	Avoid concurrent use or consider dose increases

Adverse Reactions: Zolpidem

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Dizziness, drowsiness, headache	Chest pain, blurred vision, nausea, diarrhea, confusion, impaired motor coordination, somnolence	Tachycardia, complex behavior, abnormal thinking, behavior changes, anaphylaxis, worsening of depression, angioedema, drug dependence

Efficacy Monitoring Parameters. Improved ability to fall asleep and sleep through the night. Increased daytime alertness.

Toxicity Monitoring Parameters. Seek medical attention if severe drowsiness, thoughts of suicide, allergic reaction, irregular respiratory rate, fast or irregular heartbeat.

Key Patient Counseling Points. Take on an empty stomach. May cause drowsiness; avoid driving or other tasks requiring motor coordination. Avoid alcohol. Take immediately prior to bedtime. May interfere with complex behaviors (driving, talking on phone, etc, while not fully awake); bed partner should monitor irregular respiratory rate for abnormalities.

Clinical Pearls. Not for long-term use (usually 7-10 d only). Use caution in elderly, appear more sensitive to the effects; dose reductions of 50% have been recommended. Use of CNS depressants with caution, may have additive effects. Recommended dose for immediate-release products was recently lowered from 10 to 5 mg and from 12.5 to 6.25 mg for extended-release products in women to reduce risk of morning somnolence. Dispense with medication safety guide.

ZOSTER VACCINE, LIVE: Zostavax

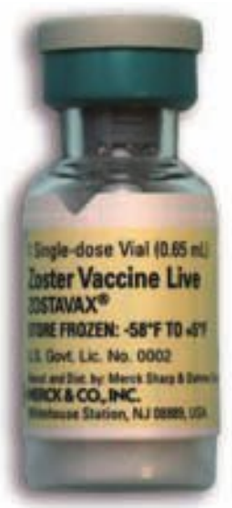
Class: Vaccine, Live, Viral

Dosage Forms. Suspension for Subcutaneous Injection: 0.65 mL after reconstitution

Common FDA Label Indication, Dosing, and Titration.

1. Prevention of herpes zoster (zoster, shingles): Adults, single dose for adults ≥50 y of age

Off-Label Uses. None



Merck pictured

Drug Characteristics: Zoster Vaccine, Live

Pregnancy Category	Contraindicated	**ADME**	None known
Lactation	Weigh risks and benefits	**Pharmacogenetics**	None known
Contraindications	Hypersensitivity to zoster vaccine or a component of the vaccine; immunosuppression; pregnancy	**Black Box Warnings**	None

Medication Safety Issues: Zoster Vaccine, Live

Suffixes	Tall Man Letters	Do Not Crush	High Alert	Confused Names	Beers Criteria
No	No	No	No	Zovirax	No

Drug Interactions: Zoster Vaccine, Live

Typical Agents	Mechanism	Clinical Management
Moderate- to high-dose corticosteroids	Immunosuppression and increased risk of infection by vaccine virus	Delay zoster vaccine administration until corticosteroid therapy has been discontinued
Immunosuppressing agents; azathioprine, chemotherapy, cyclosporine	Immunosuppression and increased risk of infection by vaccine virus	Delay zoster vaccine administration until immunosuppressive therapy has been discontinued
Pneumococcal polysaccharide vaccine (PPSV23)	Immunological interference	Concomitant administration with PPSV23 lowers antibody concentrations to zoster vaccine; clinical consequences are unknown and no change in efficacy observed if administered simultaneously; separate vaccines by 4 wk if follow-up assured
Antiviral agents	Neutralization of the vaccine virus; theoretical	Hold antiviral therapy for 1 d prior to and 14 d following zoster vaccine administration

Adverse Reactions: Zoster Vaccine, Live

Common (>10%)	Less Common (1-10%)	Rare but Serious (<1%)
Injection site reactions, including erythema and soreness	Headache, f u-like symptoms	Anaphylaxis, Guillain-Barré syndrome

Efficacy Monitoring Parameters. Prevention of herpes zoster (shingles).

Toxicity Monitoring Parameters. None.

Key Patient Counseling Points. About 1 in 3 individuals develops a rash at the injection site, which resolves after a few days with no treatment. The zoster vaccine is not 100% effective in preventing zoster. However, the disease and its consequences are less severe in immunized individuals who develop zoster.

Clinical Pearls. A history of chicken pox need not be obtained prior to zoster vaccine administration as birth before 1980 is considered evidence of varicella immunity. Consider administering the vaccine to 50-59-year-olds who are anticipating immunosuppressive therapy and those with HIV. Single dose recommended for all adults aged ≥60 y without regard to history of shingles; zoster vaccine may be administered to individuals on inhaled, topical, or intra-articular steroids or low-dose oral steroids; treated with low-dose methotrexate (<0.4 mg/kg/wk) or 6-mercaptopurine (<1.5 mg/kg/d), anticipating immunosuppressive therapy if vaccine can be administered at least 14 d prior or on antiviral therapy if it is stopped 1 d prior to vaccine administration and held for 14 d. Zoster vaccine can be administered to individuals with HIV if no manifestations of AIDS and CD4 count >200/mm^3.