Assessment Points

System	Effect	Assessment by Hx	PE	Test
RESP	URI, cough, asthma		Tachypnea, diminished breath sounds	ABG, CXR
GI	Abdominal pain, diarrhea	N/V, diarrhea	Compensatory tachypnea, abdominal tenderness	Endoscopy, upper GI series, KUB, ABG
ENDO	Hyperglycemia, hypercholesterolemia			Glucose, lipid panel
HEME	Anemia, thrombocytopenia	Dyspnea, bleeding, bruising	Hematomata, petechiae	CBC, bleeding time
HEPAT	Hepatocellular damage	Nausea, emesis, anorexia	Hepatomegaly, jaundice	AST, ALT, alk phos, PT/INR, PTT
Toxicity				
CV	Angina pectoris, arrhythmia, decreased magnesium levels	Chest pain	Hypotension, dyspnea	ECG/lyte panels
DERM	Rash	Pruritus, excoriations	Acneiform, erythematous, pruritic, or eczematoid lesions	
RENAL	Interstitial nephritis, pyelonephritis	Oliguria, anuria, hematuria	Edema, rales, pruritis	BUN/Cr, UA, CXR
CNS	Headache, tinnitus, drowsiness, dizziness		Sweating, confusion, convulsions	

Key References: Esomeprazole strontium (esomeprazole strontium)—drug summary. PDR.net. <http://www.pdr.net/drug-summary/Esomeprazole-Strontium-esomeprazole-strontium-3332.2474>, 2016 (Accessed 07.07.16); Gouda BB, Lydon AM, Badhe A, et al.: A comparison of the effects of ranitidine and omeprazole on volume and pH of gastric contents in elective surgical patients, *Eur J Anaesthesiol* 21(4):260–264, 2004.

Perioperative Implications

- Relatively few in the periop period.
- May cause acute renal injury.

Possible Drug Interactions

- May displace protein-bound drugs (e.g., warfarin [Coumadin], diazepam [Valium], sulfonylureas, thiopental [Pentothal], methotrexate, phenytoin [Dilantin]), increasing concentration in the blood and thus augmenting their effects.
- Inhibition of CYP450 liver enzymes. For example, the action of clopidogrel (Plavix) is inhibited by blocking conversion to its active form.
- May decrease the absorption of ketoconazole, decreasing its effectiveness.

Anticipated Problems/Concerns

- Increased risk of *Clostridium difficile* infection.
- May increase risk of myocardial infarction.
- Increased risk of osteoporosis with prolonged use, leading to hip, wrist, or spine fractures; use caution in performing RA.
- Hypomagnesemia may present as tetany, seizures, and cardiac arrhythmias.
- Decreased acid production with prolonged use may decrease the absorption of vitamin B_{12}.

Pseudoephedrine

Lori B. Heller | Lee A. Fleisher

Uses

- An OTC sympathomimetic commonly used as a nasal decongestant or for opening obstructed eustachian ostia.
- Used in the symptomatic treatment of reactive airway disease; however, appears to be ineffective as a bronchodilator.
- Also used for treatment of ejaculatory dysfunction and as a starting material for illicit drug manufacturing.
- Abuse and addiction to OTC stimulants does occur, particularly in those with eating disorders or erratic work hours, such as truck drivers. Associated with myocardial injury and withdrawal symptoms in this setting.

Perioperative Risks

- Concern about the coadministration of other sympathomimetic agents because of the possibility of additive effects and increased toxicity.
- Pressor effects of pseudoephedrine are more pronounced in:
  - Hypertensive pts
  - Pts taking β-adrenergic blocking drugs
  - Pts taking SNRIs
- May increase heart irritability
- MAO inhibitors, by increasing the quantity of NE, potentiate pseudoephedrine's indirect pressor effects; infrequently, a hypertensive crisis may result.
- May also reduce the antihypertensive effects of reserpine and methyldopa.

Overview/Pharmacology

- Acts directly on α- and, to a lesser degree, β-adrenergic receptors. Has an indirect effect by releasing NE from its storage sites.
- α-adrenergic effects result from inhibition of the production of cAMP by inhibiting the enzyme adenylyl cyclase, whereas β-adrenergic effects result from stimulation of adenylyl cyclase activity.
- Acts directly on α-receptors in the mucosa of the respiratory tract, producing vasoconstriction; this shrinks mucous membranes, thus reducing edema and congestion.
- May relax bronchial smooth muscle by stimulating β-adrenergic receptors, but this effect is not consistent.
- Readily and completely absorbed; elimination is predominantly renal and pH-dependent.

Drug Class/Dose

- Direct and indirect sympathomimetic
- Half-life is 6 h for standard preparation and 12 h for extended-release form.
- Adults and children ≥12 y of age: 60 mg q4–6h with a maximum dosage of 240 mg/d.
- Children 6–11 y of age: 30 mg q4–6h with a maximum dosage of 120 mg/d.
- Children 2–5 y of age: 15 mg q4–6h with maximum dosage of 60 mg/d.
- Children <2 of age: No USA FDA-approved dosing.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	Htn, dysrhythmias, cardiac irritability	Palpitations	BP/HR	ECG
HEENT	Mucosal vasoconstriction Reduction of volume of nasal mucosa Drainage of sinus secretions, opening of obstructed ostia	Nasal congestion Head stuffiness	Absence of hyperemia of nasal mucosa	
NEURO	Nervousness, excitability, restlessness, dizziness, weakness, insomnia, headaches, drowsiness		Tremors, anxiousness	
GU/RENAL	Urinary retention	Difficulty voiding, emptying bladder completely	Tachycardia, Htn	Bladder US, postvoid residuals
GI	N/V		Abdominal tenderness	

Key References: Kanfer I, Dowse R, Vuma V: Pharmacokinetics of oral decongestants, *Pharmacotherapy* 13(6 Pt 2):116S–128S, 1993; Werler MM: Teratogen update: pseudoephedrine, *Birth Defects Res A Clin Mol Teratol* 76(6):445–452, 2006.

Perioperative Implications

Preoperative Concerns
- Oral administration of usual doses to normotensive pts usually produces minimal effects.
- Possible Htn, tachycardia in sensitive pts.
- Those with concomitant hyperthyroidism, ischemic heart disease, or prostatic hypertrophy may be more at risk.
- May increase irritability of the heart muscle and result in multifocal PVCs.
- May be teratogenic; avoid use in pregnant pts if possible; avoid use in breastfeeding women.
- Geriatric pts may be especially sensitive.
- Overdose may cause hallucinations, CNS depression, seizures, and death.

Monitoring
- Routine

Induction
- Increased absorption of pseudoephedrine with antacid administration

Airway
- Improvement of airway edema and congestion related to mucosal hyperemia is often seen.

Maintenance
- Careful administration/titration of other sympathomimetic drugs

Regional Anesthesia
- Pts may be more prone to urinary retention with regional techniques that block sacral roots.

Postoperative Concerns
- Resumption of drug should not pose particular problems once vital signs are stable.

Anticipated Problems/Concerns
- Caution in administering other sympathomimetic agents.
- β-adrenergic blocking drugs may increase pressor effect.
- Antihypertensive effects of reserpine; methyldopa may be diminished.

Pyridostigmine Bromide

J. Lance LaFleur | Krishna Boddu | Lee A. Fleisher

Uses
- Therapy for MG, which is caused by decreased postsynaptic ACh receptors.
- Antagonism of nondepolarizing NMBDs.
- Therapy for glaucoma.
- Therapy for atony of GI and urinary tracts.

Perioperative Risks
- Muscarinic effects on GI, respiratory, and CV systems.
- Prolonged response to succinylcholine if administered shortly afterward by inhibition of pseudocholinesterase and increased postsynaptic depolarization.
- Paralysis may be prolonged by excessive doses, which can produce a depolarizing NMB

Pharmacology
- Oxydiaphoretic (acid-transferring) inhibitor of AChE.
- Transfers a carbamate group to AChE and forms a covalent bond at the esteratic site.
- Quaternary ammonium ion, which is poorly lipid soluble; does not effectively penetrate GI tract or blood-brain barrier (no CNS side effects).
- Onset is within 10–15 min (vs. 5–10 min for neostigmine); duration is 4 h (similar to neostigmine).
- 20% as potent as neostigmine.
- Renal excretion accounts for approximately 75% of elimination.
- Very large volume of distribution with extensive tissue storage.
- Oral bioavailability is 7.6 ± 2.4%.

Drug Class/Mechanism of Action/Usual Dose
- Reversibly inhibits AChE, which increases the concentration of ACh at the motor endplate.
- May be administered PO, IV, or IM
- Dose is 0.1–0.4 mg/kg IV.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	Bradyarrhythmias, hypotension	Presyncope, angina, confusion	HR, BP, orthostasis	ECG
RESP	Increased secretions, bronchospasm	Dyspnea, wheezing	Auscultation	PFTs
GI	Increased secretions, increased motility, spasms	Diarrhea, abdominal pain	Palpation	Lytes

Key References: Barash PG, Cullen BF, Stoelting RK: *Clinical anesthesia*, ed 5, Philadelphia, 2006, Lippincott Williams and Wilkins, pp 297–300, 848; Blichfeldt-Lauridsen L, Hansen BD: Anesthesia and myasthenia gravis, *Acta Anaesthesiol Scand* 56(1):17–22, 2012.

Perioperative Implications

Preoperative Concerns
- In MG pts, skeletal muscle response to repetitive impulses is augmented by increased availability of Ach.
- Chronic administration in MG pts may alter effects of NMBDs, and some may consider omission or reduction of morning dose on the day of surgery.

Induction/Maintenance
- Although nicotinic effects are desirable, muscarinic effects should be attenuated by an anticholinergic (typically glycopyrrolate 0.05 mg per 1 mg of pyridostigmine).

Postoperative Period
- Incidence of recurarization in renal pts is not increased as clearance of both AChE inhibitors and NMBDs is similarly affected.
- MG pts taking >750 mg/d have greater potential for respiratory insufficiency.
- Myasthenic and cholinergic crises may occur after periop alterations in AChE inhibitor therapy.

Anticipated Problems/Concerns
- If maximal dose of pyridostigmine (0.4 mg/kg, or 20 mg in adults) fails to antagonize the residual blockade, it is not advisable to redose the AChE inhibitor, as this may lead to further motor weakness.
- Causes of inadequate antagonism include profound blockade, respiratory acidosis, hypokalemia, hypermagnesemia, hypothermia, verapamil, and antibiotics such as aminoglycosides and polypeptides.

Rifampin

Matthew B. Ellison | Matthew P. Jordan | Manuel C. Vallejo

Uses
- Antibiotic therapy for TB (yearly incidence 2.96:100,000 in USA) and *Neisseria meningitidis* infection (yearly incidence 0.3:100,000 in USA).
- Also used to treat Hansen disease (leprosy) and Legionnaires disease and as prophylaxis against *Haemophilus influenzae* type B.
- Treatment of opioid-induced pruritus associated with the cholestatic jaundice of malignancy
- Administered PO or IV
- 10% of pts receiving rifampin develop chemical hepatitis; 16 deaths per 500,000 receiving drug.

Perioperative Risks
- Hepatic dysfunction, most likely in presence of preexisting liver disease and when used in combination with other hepatotoxic agents like isoniazid.
- Decreased duration of action of narcotics and barbiturates due to P450 (CYP2D6) enzyme induction.
- Pts receiving antiarrhythmic therapy, digoxin, theophylline, phenytoin, or glucocorticoid therapy may need increased doses of these drugs due to enzyme induction.

Overview/Pharmacology
- Complex macrocytic antibiotic approved by FDA in 1971.
- Water-soluble at acidic pH; inhibits gram-positive and many gram-negative organisms, incl *Escherichia coli*, *Pseudomonas*, *Proteus*, *Klebsiella*, *Neisseria meningitidis*, *H. influenzae*, *Mycobacterium tuberculosis*.
- Increases in vitro activity of streptomycin and isoniazid.