PHARMACOLOGY · STUDY GUIDE

Exam 6 Study Guide

This guide covers chapters 11 and 12. Chapter 11 is water and the particles in it: diuretics, IV fluids, electrolyte replacement and antidotes, some of the highest-alert drugs a nurse handles. Chapter 12 is the airway, the cold and allergy aisle, and eye and ear drops, where technique is part of the drug. Work one chapter at a time. Read the "what to know" paragraphs, copy the tables by hand, then try each worked example with the steps covered. Finish each chapter with its ten self-test items. Any dose or number in a worked example is a practice calculation only, not dosing advice.

WHAT THIS GUIDE COVERS

- Chapter 11 · nephron segments and sodium handling, loop, thiazide, potassium-sparing, osmotic and carbonic anhydrase inhibitor diuretics, isotonic, hypotonic and hypertonic fluids, potassium, calcium and magnesium replacement rules, the hyperkalemia sequence, supportive care, activated charcoal and the antidote pairs.
- Chapter 12 · bronchoconstriction and inflammation, asthma versus COPD, rescue versus controller, SABAs, LABAs, anticholinergics, theophylline, inhaled corticosteroids, montelukast, biologics, inhaler technique and peak flow, antihistamines, decongestants, antitussives, glaucoma drops and eye and ear instillation.

CHAPTER 11

Diuretics, IV Fluids and Poisoning

Read it in full: **Chapter 11 in the textbook**. Practice it in the lab: **The Nephron** and **Electrolyte Replacement & Safety**.

What to know

The kidneys filter about 180 L a day and reabsorb about 99%. Diuretics do not pull fluid out; they **block sodium reabsorption**, and water follows sodium. Potency follows the segment: the proximal tubule reclaims about 65% of sodium, the thick ascending limb 20 to 25% (Na-K-2Cl), the distal tubule 5 to 10% (Na-Cl) and the collecting duct 2 to 3% (aldosterone and ADH).

Aldosterone trades sodium for potassium in the collecting duct, so loops and thiazides, which send extra sodium there, cause **hypokalemia**, and drugs that block the trade cause **hyperkalemia**.

Loop diuretics (furosemide, bumetanide, torsemide, ethacrynic acid) are the most potent, work within minutes IV, keep working in renal impairment, and are used for pulmonary edema and heart failure. They waste potassium, magnesium, calcium, sodium and chloride, cause dehydration and alkalosis, and are **ototoxic** if pushed fast (no faster than about 20 mg/min) or given with aminoglycosides. Ethacrynic acid is the non-sulfa choice.

Thiazides (hydrochlorothiazide, chlorthalidone) are moderate, first-line for hypertension, and the only diuretics that **retain calcium**. They raise glucose, uric acid, lipids and calcium and lower potassium, sodium and magnesium; hyponatremia causes falls in older adults. They fail below a GFR of about 30, except metolazone, which is added to a loop for resistance and drops potassium fast.

Potassium-sparing drugs: spironolactone and eplerenone block aldosterone (survival benefit in HFrEF; spironolactone for cirrhotic ascites; spironolactone causes gynecomastia); amiloride and triamterene block the sodium channel (triamterene can tint urine blue-green). Danger: **hyperkalemia**, so no salt substitutes or potassium supplements, and caution with ACE inhibitors and ARBs. **Mannitol** is osmotic, lowers ICP and eye pressure, needs an in-line filter, and can transiently cause pulmonary edema. **Acetazolamide** dumps bicarbonate and causes metabolic acidosis. Daily weight: 1 kg is about 1 L.

Tonicity is compared with serum (about 275 to 295 mOsm/kg). **Isotonic stays, hypotonic enters the cell, hypertonic exits the cell.** Dangers: isotonic overload, hypotonic cerebral edema, hypertonic overload. **0.9% NaCl** is the only fluid with blood and in large volumes causes hyperchloremic acidosis. **Lactated Ringer's** is avoided in liver failure and hyperkalemia and never runs with blood. **D5W** acts hypotonic once the dextrose is used, so it is not for resuscitation or raised ICP. **0.45% NaCl** is hypotonic, contraindicated in head injury and stroke. **3% NaCl** is high-alert; correct sodium no more than about 8 to 10 mEq/L in 24 hours to avoid osmotic demyelination.

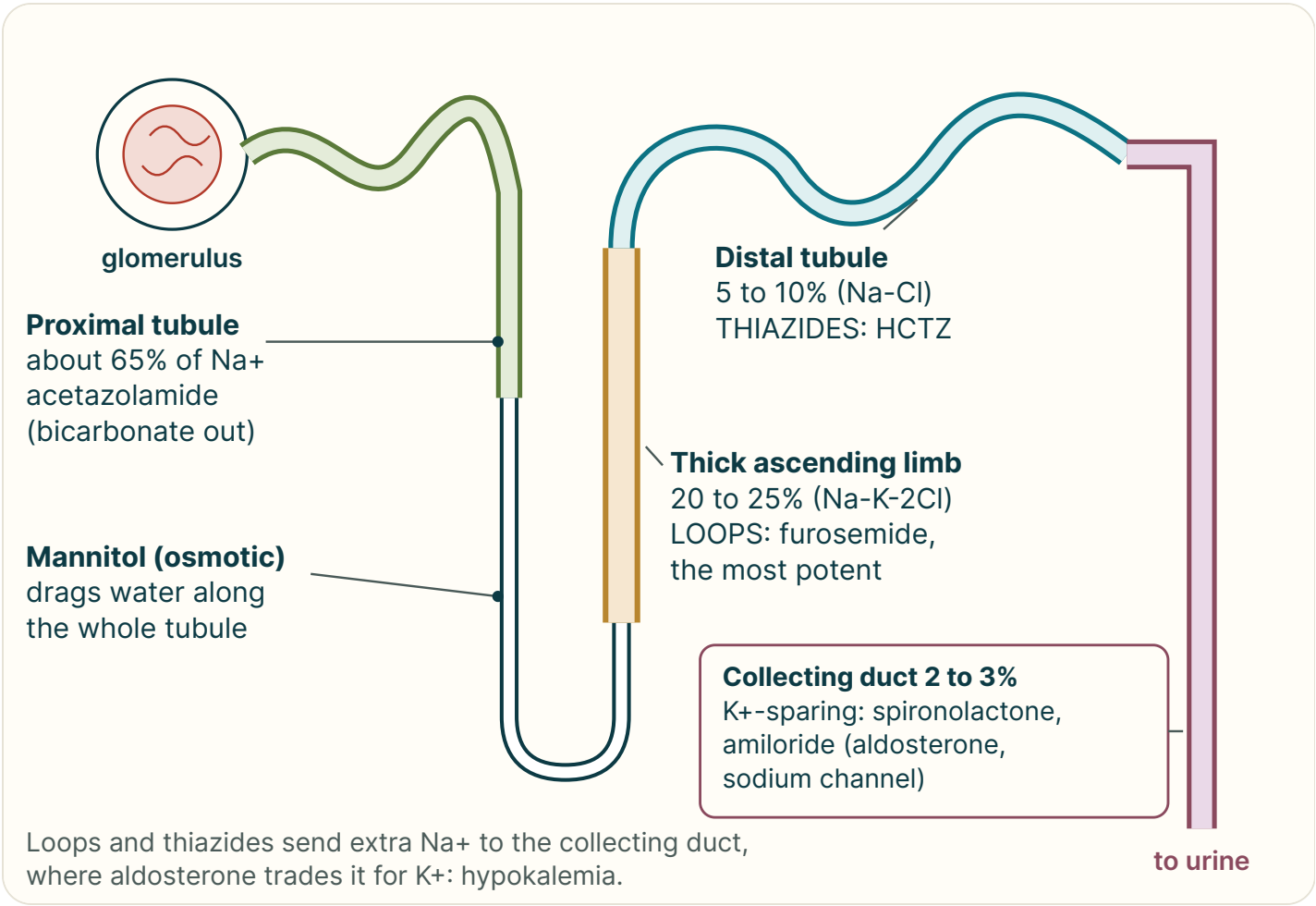
Signs of overload: crackles, bounding pulse, JVD, frothy cough, rising respiratory rate. Slow the infusion, sit the patient up, give oxygen and notify.

Potassium (3.5 to 5.0 mEq/L): **never IV push**; always diluted, on a pump, generally no faster than 10 mEq/h peripherally and no more concentrated than the facility maximum (commonly 10 mEq per 100 mL); confirm urine output (often at least 30 mL/h); watch the site. Low K+ flattens T waves, adds U waves and potentiates digoxin. High K+ peaks T waves and widens QRS. Hyperkalemia order: **stabilize** (IV calcium gluconate), **shift** (insulin with dextrose, sometimes albuterol), **eliminate** (binders, loop diuretic, dialysis).

Calcium (8.5 to 10.5 mg/dL total; check ionized if albumin is low): low calcium gives tingling, cramps, Trousseau and Chvostek signs, tetany, laryngospasm. Gluconate peripherally, chloride centrally; push slowly on a monitor; never with bicarbonate or phosphate; potentiates digoxin. **Magnesium** (1.5 to 2.5 mEq/L): fix it before potassium. Low magnesium causes hyperreflexia and torsades. During infusion, **loss of deep tendon reflexes** comes first, then respiratory depression, then arrest; calcium gluconate is the antidote.

Poisoning: **supportive care first** (ABCs), then decontamination, then an antidote if one exists; call Poison Control (1-800-222-1222) early. **Activated charcoal** works within about an hour, is contraindicated with a depressed LOC or unprotected airway, and misses iron, lithium, alcohols and corrosives. Never induce vomiting.

Antidote pairs: acetaminophen and **acetylcysteine** (best within 8 to 10 hours; Rumack-Matthew nomogram); opioids and **naloxone** (wears off first); benzodiazepines and **flumazenil** (seizure risk); warfarin and **vitamin K** (PCC for life-threatening bleeding); heparin and **protamine** (give slowly); digoxin and **digoxin immune Fab**; organophosphates and **atropine plus pralidoxime**; iron and **deferoxamine** (vin rosé urine); dabigatran and idarucizumab; apixaban and rivaroxaban and 4 factor PCC (andexanet alfa was withdrawn in December 2025).



Potency follows the segment. The more sodium a segment reclaims, the stronger the diuretic that blocks it; downstream of loops and thiazides, potassium is lost.

LOCK THESE IN

- Diuretics block sodium reabsorption; potency: loop > thiazide > potassium-sparing.
- Furosemide IV no faster than about 20 mg/min (ototoxic). Thiazides fail below GFR 30.
- Spironolactone: hyperkalemia, no salt substitutes. Mannitol: in-line filter.
- Isotonic stays, hypotonic enters the cell, hypertonic exits the cell.
- NS only with blood; D5W is not for resuscitation; 3% NaCl: 8 to 10 mEq/L per day max.
- KCl never IV push; pump; 10 mEq/h peripheral; urine output first.
- Hyperkalemia: stabilize (calcium), shift (insulin + dextrose), eliminate.
- Magnesium toxicity: reflexes lost first; antidote calcium gluconate. Fix Mg before K.

Key terms and comparisons: diuretics and fluids

Item	Site or tonicity	Key effect	Nursing alert
Furosemide	Thick ascending limb	Most potent; works in CKD	Low K+, Mg; ototoxic fast
Hydrochlorothiazide	Distal tubule	Moderate; spares calcium	Low K+, Na; high glucose, urate
Spironolactone	Collecting duct (aldosterone)	Weak; HFrEF benefit	Hyperkalemia; gynecomastia
Mannitol	Whole tubule (osmotic)	Lowers ICP	In-line filter; overload
Acetazolamide	Proximal tubule	Dumps bicarbonate	Metabolic acidosis
0.9% NaCl	Isotonic	Stays extracellular	Only fluid with blood
Lactated Ringer's	Isotonic	Stays extracellular	Not in liver failure; not with blood
D5W	Hypotonic in the body	Free water	Not for resuscitation or raised ICP
0.45% NaCl	Hypotonic	Enters cells	Not with head injury
3% NaCl	Hypertonic	Pulls water from cells	8 to 10 mEq/L per 24 h max

Antidote pairs

Poison	Antidote	Key point
Acetaminophen	Acetylcysteine	Within 8 to 10 h; nomogram
Opioids	Naloxone	Shorter acting; re-sedation
Benzodiazepines	Flumazenil	Seizures in chronic or mixed use
Warfarin	Vitamin K (+ PCC)	Hours to work
Heparin	Protamine sulfate	Give slowly
Digoxin	Digoxin immune Fab	Low K+ potentiates
Organophosphates	Atropine + pralidoxime	PPE for staff
Iron	Deferoxamine	Charcoal does not bind iron
Magnesium (excess)	Calcium gluconate	Reflexes lost first

Worked examples

WORKED EXAMPLE 1 · A SAFE POTASSIUM INFUSION

A patient needs 40 mEq of KCl IV through a peripheral line. Pharmacy sends 40 mEq in 400 mL (10 mEq per 100 mL). Using the book's peripheral limit of 10 mEq/h, what is the fastest rate and shortest time? (Practice calculation; follow facility policy.)

STEP 1 · CHECK CONCENTRATION

10 mEq per 100 mL meets the common peripheral maximum.

STEP 2 · FIND THE TIME

40 mEq ÷ 10 mEq/h = **4 hours** at the fastest.

STEP 3 · FIND THE PUMP RATE

400 mL ÷ 4 h = **100 mL/h**.

STEP 4 · BEFORE STARTING

Confirm urine output, use a pump (never gravity, never push), and check the site often; potassium burns.

WORKED EXAMPLE 2 · IS URINE OUTPUT ENOUGH FOR POTASSIUM?

Over 8 hours a patient made 200 mL of urine. A common threshold before IV potassium is at least 30 mL/h. Should the infusion start?

STEP 1 · FIND THE HOURLY RATE

200 mL ÷ 8 h = **25 mL/h**.

STEP 2 · COMPARE

25 is below 30 mL/h.

STEP 3 · ACT

Hold the potassium and notify the provider. Potassium leaves through the kidney; giving it with low output stacks it up.

WORKED EXAMPLE 3 · TOO FAST A SODIUM CORRECTION

A patient with chronic hyponatremia on 3% NaCl has a sodium of 118 at 0800 and 129 at 2000. Is this safe?

STEP 1 · FIND THE CHANGE

129 − 118 = **11 mEq/L in 12 hours**.

STEP 2 · COMPARE

The book limits correction to about 8 to 10 mEq/L in 24 hours. 11 in only 12 hours exceeds it.

STEP 3 · ACT

Notify the provider now. Too-fast correction risks osmotic demyelination, an irreversible brain injury.

WORKED EXAMPLE 4 · HYPERKALEMIA IN ORDER

Mr. Petrossian has a potassium of 6.8 with peaked T waves. Orders include calcium gluconate, insulin with dextrose and a potassium binder. In what order, and why?

STEP 1 · STABILIZE

Calcium gluconate first. It does not lower potassium; it protects the heart membrane now.

STEP 2 · SHIFT

Insulin with dextrose next moves potassium into cells for a while. Watch the glucose.

STEP 3 · ELIMINATE

The **binder** (or a loop diuretic, or dialysis) actually removes potassium.

STEP 4 · MONITOR

Continuous cardiac monitoring and repeat potassium levels.

TRAPS PEOPLE FALL INTO

- **Thinking diuretics pull water out of the blood.** They block sodium reabsorption; water follows.
- **Ordering hydrochlorothiazide with a GFR of 22.** Thiazides fail below about 30; a loop works.
- **Hanging blood with lactated Ringer's.** Calcium clots the line. Use normal saline.
- **Using D5W to resuscitate.** It becomes free water and leaves the vessels.
- **Pushing potassium to fix a low level fast.** Never IV push. Ever.
- **Expecting calcium gluconate to lower potassium.** It stabilizes the heart; insulin and binders lower the level.
- **Giving charcoal to a drowsy patient or for iron.** Aspiration risk, and charcoal does not bind iron.

Chapter 11 self-test · ten items

1. Why is a loop diuretic more potent than a thiazide?

A. Loops are absorbed better from the gut
B. Loops block aldosterone in the duct
C. Thiazides work only in renal failure
D. The loop segment handles far more sodium

D. The loop segment handles far more sodium The thick ascending limb reclaims 20 to 25% of sodium; the distal tubule only 5 to 10%. Blocking the bigger job gives the bigger diuresis.

2. What is the main risk of giving IV furosemide too quickly?

A. Hyperkalemia
B. Hypoglycemia
C. Ototoxicity
D. Bradycardia

C. Ototoxicity Rapid IV furosemide can cause tinnitus and hearing loss, more so with aminoglycosides.

3. Which diuretic retains calcium?

A. Ethacrynic acid
B. Hydrochlorothiazide
C. Bumetanide (Bumex)
D. Furosemide (Lasix)

B. Hydrochlorothiazide Thiazides are the only diuretics that retain calcium. Loops waste it.

4. A patient on spironolactone and lisinopril uses a salt substitute. What lab is most concerning?

A. Potassium
B. Calcium
C. Sodium
D. Glucose

A. Potassium Salt substitutes are potassium chloride. Both drugs already hold potassium, so hyperkalemia is the risk.

5. Which fluid is contraindicated in a patient with a head injury?

A. 0.9% sodium chloride
B. 0.45% sodium chloride
C. 3% sodium chloride
D. Lactated Ringer's

B. 0.45% sodium chloride Hypotonic fluid moves water into cells and worsens cerebral edema. D5W behaves the same way.

6. A red cell transfusion is ready. Which fluid may run with it?

A. 0.45% sodium chloride
B. D5W
C. 0.9% sodium chloride
D. Lactated Ringer's

C. 0.9% sodium chloride Only normal saline is compatible with blood. Dextrose lyses cells and LR's calcium clots the line.

7. What is the correct first drug in symptomatic hyperkalemia with ECG changes?

A. IV calcium gluconate
B. A potassium binder
C. Oral potassium tablet
D. IV furosemide push

A. IV calcium gluconate Calcium stabilizes the heart membrane first. Shifting and removing potassium follow.

8. During a magnesium infusion, what is the earliest sign of toxicity?

A. Respiratory rate under 12
B. Hypotension and bradycardia
C. Sudden cardiac arrest
D. Loss of deep tendon reflexes

D. Loss of deep tendon reflexes Reflexes fade first, then breathing slows, then blood pressure and heart rate fall. Calcium gluconate is the antidote.

9. Activated charcoal will NOT bind which ingestion?

A. Aspirin
B. Iron tablets
C. Acetaminophen
D. A tricyclic

B. Iron tablets Charcoal misses iron, lithium, alcohols and corrosives. Iron is chelated with deferoxamine.

10. A patient wakes after naloxone and wants to leave. Why is that unsafe?

A. Naloxone raises blood pressure hours later
B. Naloxone causes delayed seizures later
C. Naloxone slowly turns into an opioid
D. Naloxone can wear off before the opioid

D. Naloxone can wear off before the opioid Naloxone is shorter acting than most opioids, so re-sedation can occur. Keep monitoring.

CHAPTER 12

Respiratory Drugs and Eye/Ear

Read it in full: **Chapter 12 in the textbook**. Practice it in the lab: **Rescue vs. Controller Inhalers** and **Glaucoma Drops & Instillation Technique**.

What to know

Bronchial smooth muscle constricts through **M3** muscarinic receptors (acetylcholine) and relaxes through **beta-2** receptors (epinephrine). Small changes in radius change resistance steeply, so small airways in toddlers make attacks more dangerous. **Asthma** is reversible bronchoconstriction on top of chronic eosinophilic inflammation; the inhaled steroid is the backbone. **COPD** is largely irreversible, smoking-driven and neutrophilic; long-acting bronchodilators are the backbone and inhaled steroids add pneumonia risk.

Two targets, two jobs. A **rescue** drug relaxes muscle now and does nothing for inflammation. A **controller** calms inflammation over days to weeks and does nothing in an attack. A silent chest, drowsiness, single-word speech or a normalizing CO_2 in a struggling asthmatic signals impending respiratory failure.

Albuterol (SABA) works in about 5 minutes and lasts 4 to 6 hours. Expect tremor, tachycardia, **hypokalemia** and hyperglycemia. **LABAs** (salmeterol, formoterol) last about 12 hours and are maintenance only; a LABA is **never used alone in asthma**, always with an ICS. **Ipratropium** (SAMA) and **tiotropium** (LAMA) block M3, are central in COPD, cause dry mouth, and should not mist into the eyes (narrow-angle glaucoma). Bronchodilator first, then the steroid. Rescue use more than twice a week (not counting pre-exercise doses) or night waking means poor control.

Theophylline has a narrow window, about 5 to 15 mcg/mL, with toxicity climbing above about 20: nausea, insomnia and tachycardia first, then dysrhythmias and seizures, with no antidote. Ciprofloxacin, cimetidine and erythromycin raise levels; smoking, rifampin and phenytoin lower them, so a smoker who quits can become toxic. Roflumilast reduces COPD exacerbations and is not a bronchodilator.

Inhaled corticosteroids (fluticasone, budesonide) are slow: days to start, 1 to 2 weeks for full effect, useless in an attack, taken daily even when well. Prevent **thrush and hoarseness** by rinsing and spitting after each dose and using a spacer. High long-term doses affect growth, bone, cataracts and glaucoma. Combination ICS/LABA inhalers keep the LABA from being used alone.

Montelukast is an evening oral leukotriene blocker with a boxed warning for neuropsychiatric events: ask about mood and sleep. Zileuton needs LFTs. Cromolyn is prophylaxis only. Omalizumab carries an anaphylaxis boxed warning, so observe and keep epinephrine ready. Steroid bursts over about 2 weeks are tapered; watch glucose.

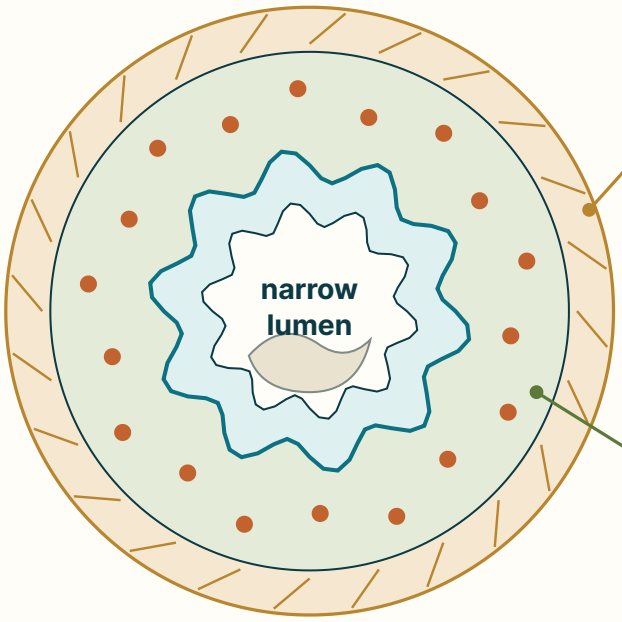
MDI technique: shake, breathe out, seal, press as a slow deep breath begins, hold about 10 seconds, wait about a minute between puffs; a spacer is the default. Dry powder inhalers need a fast, forceful breath and no exhaling into the device. Peak flow zones against personal best: **green 80 to 100%**, **yellow 50 to 79%**, **red under 50%**.

Antihistamines block H1, work best before exposure, and **do not treat anaphylaxis**. First generation (diphenhydramine, hydroxyzine, promethazine) sedate and are anticholinergic (Beers list in older adults). Promethazine can cause gangrene if it extravasates and is contraindicated under 2. Second generation (loratadine, cetirizine, fexofenadine) barely sedate; fexofenadine is taken with water, not fruit juice. Intranasal steroids are the best drugs for allergic rhinitis; aim away from the septum.

Decongestants are alpha agonists. Pseudoephedrine raises BP and heart rate; oral phenylephrine is essentially ineffective. Topical sprays (oxymetazoline): **3 days maximum** or rebound congestion. Dextromethorphan can add to serotonin syndrome. Codeine is contraindicated under 12. **Benzonatate** is swallowed whole and stored locked. Guaifenesin needs fluids. Acetylcysteine smells of rotten eggs; have suction ready. OTC cough and cold combinations are not for young children.

Intraocular pressure is production minus outflow. **Latanoprost** increases outflow, is first-line at bedtime, and darkens the iris and lengthens lashes. **Timolol** reduces production and is absorbed systemically: bradycardia and bronchospasm, so screen for asthma, COPD and heart block and teach **punctal occlusion**. Brimonidine is avoided in infants. Dorzolamide and acetazolamide are sulfonamides. Pilocarpine opens the angle in acute angle-closure, an emergency with a red, hard, painful eye.

Eye drops: one drop into the conjunctival sac, tip touches nothing, close gently, press the inner corner 1 to 2 minutes, wait at least 5 minutes between different drops, ointments last. Ear drops: ophthalmic drops may go in the ear but **otic drops never go in the eye**; warm the drops; pinna **up and back** for adults and children over about 3, **down and back** for younger children; lie on the unaffected side 3 to 5 minutes. Neomycin-containing drops are contraindicated with a perforated eardrum or tubes.



smooth muscle (outer ring)
inflamed wall with eosinophils (dots)

Rescue: relax the muscle now

albuterol (beta-2 agonist):
works in about 5 min, lasts 4 to 6 h
ipratropium blocks M3 (constrictor)
does nothing for inflammation

Controller: calm inflammation

inhaled steroids: 1 to 2 weeks
LABA only with an ICS in asthma
montelukast (evening)
does nothing in an attack

Two targets, two jobs. Rescue drugs relax the muscle now; controllers calm the inflamed wall over days to weeks.

LOCK THESE IN

- M3 constricts, beta-2 relaxes. Rescue = albuterol; controller = ICS.
- Albuterol: tremor, tachycardia, low K+, high glucose.
- Never a LABA alone in asthma.
- Theophylline 5 to 15 mcg/mL; smoking cessation raises the level.
- ICS: rinse and spit, spacer; days to weeks to work.
- Peak flow: green 80 to 100%, yellow 50 to 79%, red under 50%.
- Antihistamines do not treat anaphylaxis. Topical decongestants: 3 days max.
- Timolol drops: systemic bradycardia and bronchospasm; punctal occlusion. Otic drops never in the eye.

Key terms and comparisons: airway drugs

Class	Prototype	Role	Nursing alert
SABA	albuterol	Rescue, about 5 min	Tremor, low K+, high glucose
LABA	salmeterol, formoterol	Maintenance, 12 h	Never alone in asthma
SAMA	ipratropium	Acute add-on	Keep mist out of eyes
LAMA	tiotropium	COPD maintenance	Dry mouth, retention
Methylxanthine	theophylline	Last-line	5 to 15 mcg/mL; seizures
ICS	fluticasone	Controller backbone	Rinse and spit; spacer
Leukotriene blocker	montelukast	Oral add-on	Neuropsychiatric boxed warning
Mast cell stabilizer	cromolyn	Prophylaxis only	Before exposure
Anti-IgE	omalizumab	Severe asthma	Anaphylaxis; observe

Aisle and eye drugs

Drug	Key effect	Nursing alert
Diphenhydramine	1st gen H1	Sedation; Beers list
Loratadine, fexofenadine	2nd gen H1	Little sedation; fexofenadine with water
Pseudoephedrine	Oral decongestant	Raises BP and HR
Oxymetazoline	Topical decongestant	3 days max
Benzonatate	Numbs stretch receptors	Swallow whole; lock away
Guaifenesin	Expectorant	Needs fluids
Latanoprost	Increases outflow	Bedtime; iris darkening
Timolol (eye)	Reduces production	Bradycardia, bronchospasm
Brimonidine	Production down, outflow up	Not in infants

Worked examples

WORKED EXAMPLE 1 · PEAK FLOW ZONES FROM A PERSONAL BEST

Jordan's personal best peak flow is 400 L/min. Find the green, yellow and red zones. Today he blows 290.

STEP 1 · GREEN

80% of 400 = 320. Green is **320 to 400**.

STEP 2 · YELLOW

50% of 400 = 200; 79% of 400 = 316. Yellow is **200 to 316**.

STEP 3 · RED

Under 200.

STEP 4 · TODAY

290 is in the **yellow** zone: take the rescue inhaler and follow the written action plan.

WORKED EXAMPLE 2 · IS THE ASTHMA CONTROLLED?

Over the past week Ms. Farah used albuterol on 5 days: twice before soccer and on 3 other days for symptoms. She also woke one night needing it. Is her asthma controlled?

STEP 1 · REMOVE PRE-EXERCISE DOSES

Doses taken before exercise are not counted. That leaves 3 symptom days.

STEP 2 · COMPARE

More than twice a week means poor control.

STEP 3 · NIGHT WAKING

Night use is never subtracted, and even one such night triggers a step-up review.

STEP 4 · ACT

Report it; the controller regimen needs review. Check inhaler technique and adherence first.

WORKED EXAMPLE 3 · THEOPHYLLINE AFTER QUITTING SMOKING

Mr. Delacroix, on a steady theophylline dose at home, stops smoking on admission. Three days later he is nauseated, sleepless and tachycardic. What happened?

STEP 1 · NAME THE MECHANISM

Smoking induces CYP1A2. Stopping removes the induction, so clearance falls.

STEP 2 · PREDICT THE LEVEL

On an unchanged dose the level rises, likely above the 5 to 15 mcg/mL target.

STEP 3 · ACT

Hold per order, check a level, notify, and watch for dysrhythmias and seizures. There is no antidote.

WORKED EXAMPLE 4 · TWO EYE DROPS AND AN OINTMENT

At 0800 a patient is due timolol drops, dorzolamide drops and an antibiotic ointment in the same eye. Plan the sequence.

STEP 1 · FIRST DROP

0800: one drop of timolol in the conjunctival sac; close gently; punctal occlusion 1 to 2 minutes.

STEP 2 · WAIT

At least 5 minutes, so the second drop does not wash out the first.

STEP 3 · SECOND DROP

About 0805: dorzolamide, same technique.

STEP 4 · OINTMENT LAST

After another wait, the ointment goes last because it seals the surface and blurs vision.

TRAPS PEOPLE FALL INTO

- **Using the steroid inhaler during an attack.** ICS is a controller. Albuterol is rescue.
- **Calling albuterol tremor an allergy.** It is beta stimulation; warn the patient ahead.
- **Treating a quiet chest as improvement.** It may mean airflow is too low to wheeze.
- **Giving salmeterol alone for asthma.** LABA monotherapy is linked to asthma deaths.
- **Giving an antihistamine first for anaphylaxis.** Epinephrine treats anaphylaxis.
- **Using oxymetazoline for a week.** Three days maximum, or rebound congestion.
- **Pulling an infant's pinna up and back.** Down and back for young children.

Chapter 12 self-test · ten items

1. Which receptor, when blocked, relieves bronchoconstriction in COPD?

A. Alpha-1 adrenergic
B. H1 histamine
C. Beta-2 adrenergic
D. M3 muscarinic

D. M3 muscarinic Acetylcholine at M3 constricts bronchial muscle. Ipratropium and tiotropium block it.

2. A patient on continuous albuterol nebulization for two hours needs which lab watched?

A. Serum sodium
B. Serum potassium
C. Serum albumin
D. Serum calcium

B. Serum potassium Beta-2 stimulation drives potassium into cells, causing hypokalemia. Glucose rises too.

3. Keisha, 16, has just been diagnosed with asthma. Which new prescription needs a call to the prescriber?

A. Fluticasone inhaler daily
B. Fluticasone/salmeterol daily
C. Salmeterol inhaler alone
D. Albuterol inhaler as needed

C. Salmeterol inhaler alone A LABA is never used alone in asthma; it must be paired with an inhaled corticosteroid.

4. A patient on theophylline starts ciprofloxacin. What is expected?

A. Theophylline level rises
B. Theophylline level falls
C. No change in level
D. Ciprofloxacin level falls

A. Theophylline level rises Ciprofloxacin inhibits CYP1A2, so theophylline accumulates toward toxicity.

5. What prevents thrush from an inhaled corticosteroid?

A. Swallow water after every puff
B. Use it right before the albuterol
C. Rinse the mouth and spit after each dose
D. Take it only when wheezing is present

C. Rinse the mouth and spit after each dose Rinse and spit removes steroid deposited in the mouth. A spacer also cuts deposition.

6. Which teaching fits a dry powder inhaler?

A. Shake it well before each dose
B. Breathe in fast and forcefully
C. Use a spacer with every dose
D. Exhale into it before inhaling

B. Breathe in fast and forcefully DPIs need a fast, forceful breath to break up the powder. Exhaling into them clumps the dose.

7. A parent reports nightmares and agitation in a child on montelukast. What is the concern?

A. A sign that an asthma attack is coming
B. A need for a higher dose at night
C. An expected effect that will soon pass
D. A boxed-warning neuropsychiatric effect

D. A boxed-warning neuropsychiatric effect Montelukast carries a boxed warning for agitation, depression, sleep disturbance and suicidal thinking.

8. A patient has used oxymetazoline daily for three weeks and cannot breathe through his nose without it. What is this?

A. Rebound congestion
B. Allergic rhinitis flare
C. Sinus infection
D. Nasal polyps

A. Rebound congestion Topical decongestant use beyond 3 days causes rhinitis medicamentosa.

9. A patient with asthma is prescribed timolol eye drops. What is the concern?

A. A brown iris color change
B. Longer, darker eyelashes
C. Systemic bronchospasm
D. A lasting metallic taste

C. Systemic bronchospasm Timolol drains into the circulation and can cause bronchospasm and bradycardia. Iris change and lash growth belong to latanoprost.

10. How is the pinna positioned for ear drops in a 2-year-old?

A. Down and back
B. Straight down
C. Up and forward
D. Up and back

A. Down and back Young children's canals angle differently, so the pinna is pulled down and back. Adults: up and back.

ONE PAGE

Cram sheet

Everything from chapters 11 and 12 in one place. Cover the right column and see if you can rebuild each row.

Diuretics, fluids, electrolytes, antidotes

Item	Fact	Note
Sodium reclaimed	PCT 65%, loop 20 to 25%, DCT 5 to 10%, CD 2 to 3%	Potency follows
Furosemide	No faster than about 20 mg/min IV	Ototoxic; low K+, Mg
Thiazides	Fail below GFR 30	Retain calcium
Spironolactone	Hyperkalemia	No salt substitutes
Mannitol	ICP	In-line filter
Serum osmolality	About 275 to 295 mOsm/kg	Tonicity reference
3% NaCl	8 to 10 mEq/L per 24 h max	Osmotic demyelination
Potassium	3.5 to 5.0; never push; 10 mEq/h peripheral	Urine output first
Hyperkalemia	Calcium, then insulin + dextrose, then binder	Stabilize, shift, eliminate
Calcium	8.5 to 10.5 mg/dL	Gluconate peripheral; not with bicarb
Magnesium	1.5 to 2.5 mEq/L	Reflexes first; calcium antidote
Charcoal	Within about 1 h	Not with low LOC; misses iron, lithium
Poison Control	1-800-222-1222	Call early

Respiratory, eye and ear

Item	Fact	Note
Albuterol	About 5 min; 4 to 6 h	Rescue
LABA	12 h	Never alone in asthma
Poor control	Rescue use more than 2 days a week	Any night waking: review
Theophylline	5 to 15 mcg/mL	Smoking lowers; cipro raises
ICS	1 to 2 weeks for full effect	Rinse and spit
Inhaler order	Bronchodilator first, then steroid	Few minutes apart
Peak flow	Green 80 to 100, yellow 50 to 79, red under 50%	Of personal best
Antihistamines	Before exposure	Not for anaphylaxis
Topical decongestant	3 days max	Rebound
Codeine	Not under 12	CYP2D6
Latanoprost	Bedtime; increases outflow	Iris darkening
Timolol drops	Punctal occlusion 1 to 2 min	Bradycardia, bronchospasm
Eye drops	5 min between; ointment last	One drop
Ear drops	Adult up and back; child under 3 down and back	Warm; otic never in eye

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