

This lesson is supported by an educational grant from Kaz.

Helping patients manage cough, cold and flu

INTRODUCTION

Cough, cold and flu are among the most commonly experienced conditions in adults and children, leading them to seek medical care.^{1,2} Patients and caregivers frequently seek the advanced practice clinician's advice for treating symptoms associated with cough, cold and flu, as well as preventing their spread. Advanced practice clinicians are easily accessible to help patients with self- and prescription-treatment options, as well as prevention techniques. This continuing-education lesson will provide information about the cause, treatment and prevention of cough, cold and flu in adults and children, including when referral for additional medical care is advised.

COUGH

Cough is often a symptom of cold and flu, but also can occur by itself. It is the most common symptom for which patients seek medical care.¹ Americans spent \$4.17 billion dollars on cough, cold and related products in 2009.³ Cough is an important defensive reflex that helps clear secretions, foreign particles and irritants from breathing passages.

Coughs may be voluntary or involuntary; each is controlled by different areas of the brain. There are three phases in the cough reflex: inhalation, followed by forced exhalation against a closed glottis, then violent air release from the lungs following glottis opening, usually accompanied by a distinctive sound.⁴ Cough is classified as acute, subacute or chronic, based upon its duration. Each are associated with common causes as noted in Table 1.⁵

Symptomatology

Coughs are described as productive or nonproductive.⁶ Productive coughs expel secretions from the respiratory tract and are often called "wet." Secretions can be clear or colored, with or without odor. Colored secretions may be caused by underlying bacterial infection or inflammatory disorders, while odors may result from anaerobic bacteria.⁶ Nonproductive, or dry coughs, are not accompanied by secretions. They are commonly associated with viral respiratory infections; gastrointestinal reflux disease, or GERD; cardiac disease; and angiotensin-converting enzyme, or ACE inhibitors.

Prevention

Preventing and treating cough depends upon its cause. For coughs due to ACE inhibitors, change of therapy is recommended.⁵ For coughs due to bacterial or viral infection and flu, practicing healthy habits and good hygiene can help prevent the spread of infection. See Table 2 for health and hygiene strategies to discuss with patients and caregivers.⁷ Viruses that cause colds and other infections can live up to three to four hours on contaminated skin or surfaces. A humidity level of 40% to 60% is recommended to minimize the survival of viruses in the air and on surfaces.⁸ The primary method of contracting viral infections is by touching one's mucous membranes with contaminated hands. Avoiding this, using proper hand-washing techniques and disinfecting surfaces can help prevent cough from infection. Hand sanitizers are an easy way to help prevent the spread of infection. Sanitizers with triclosan have been shown to reduce the spread of both bacterial and viral infections.⁹ Other ingredients (e.g., surfactants, allantoin and benzalkonium chloride formulation, ethyl alcohol, benzalkonium chloride, salicylic acid, pyroglutamic acid) used in sanitizers have

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This program is accredited for 1.25 (one and one-quarter) hours of continuing education credit, of which 0.75 (three-quarters) hour is considered pharmacology credit.

Program Goal: To improve the clinician's ability to provide patient education on the prevention and treatment of cough, cold and flu in children and adults.

Learning Objectives:

Upon completion of this program, the clinician should be able to:

1. Describe the epidemiology, etiology, symptomatology and therapeutic options available for treating cough, cold and flu in adults and children.
2. Counsel patients and caregivers on strategies that may help prevent cough, cold and flu.
3. Identify conditions and patient populations when nonpharmacologic options, including humidifiers and vaporizers, are appropriate.
4. Respond to commonly asked questions that patients and caregivers may have about prevention and treatment of cough, cold and flu, including special considerations for children, pregnant women and the elderly.
5. Distinguish between situations where self-care using nonprescription drug therapy for cough, cold and flu are appropriate and when additional treatment or referral is necessary.

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been shown to have various levels of activity against bacteria and viruses.¹⁰

Nonpharmacologic treatment options

Treatment of cough includes both nonpharmacologic and pharmacologic options. Nonpharmacologic options include nonmedicated lozenges, hydration and humidification. Pharmacologic options include cough suppressants or antitussives, and expectorants or protussives for patients with productive coughs. The advanced practice clinician needs to ask patients questions, including but not limited to how long they have had the

cough, whether it is productive or non-productive and what other chronic conditions they have in order to recommend appropriate treatment strategies.

Use of nonmedicated lozenges in adults and children old enough to avoid accidental swallowing can provide moisture to a dry throat and reduce irritation and coughing.⁶ Popsicles, preferably sugar-free, may be used in children as well. Hydration with water may make mucous in secretions less viscous and more easily expelled. Most adults should drink at least eight 8-oz. glasses of water daily. Children over 4 months may be

helped by drinking warm liquids, such as apple juice, broth or decaffeinated tea. The warm liquids may relax airways and also loosen mucous. Honey should not be added to liquids for children less than 1 year because of the risk of botulism bacterial growth.¹¹ Care should be taken in patients with lower respiratory tract infections, heart failure, renal failure or with other conditions where excess fluid could make the condition worse.

Humidification

Humidifiers may be used to increase the amount of moisture in inhaled air. In-

TABLE 1
Cough classification^{5,6}

Cough type	Duration	Causes	Signs and symptoms
Acute	More than three weeks	Viral upper respiratory tract infection	Sneezing, sore throat, rhinorrhea, low-grade temperature
		Pneumonia	Sneezing, sore throat, high fever, shortness of breath, chest pain
		Acute left ventricular failure	Wheezing, shortness of breath, fatigue, exercise intolerance
		Asthma	Wheezing or chest tightness, coughing at night, coughing in response to irritants
		Aspirating foreign bodies	Choking sounds
Subacute	Three to eight weeks	Post-infectious cough	Fever, paroxysm of coughing, post-tussive coughing, inspiratory "whooping" sound
		Bacterial sinusitis	Pressure or pain in the head or sinuses, post-nasal drip, fever, earache, tiredness, sore throat
		Asthma	Wheezing or chest tightness, coughing at night, coughing in response to irritants
Chronic	More than eight weeks	Upper airway cough syndrome	Mucus drainage from nose, frequent throat clearing
		Asthma	Wheezing or chest tightness, coughing at night, coughing in response to irritants
		Gastrointestinal reflux disease	Heartburn, worsening symptoms when laying down, improvement with acid-lowering drugs
		Chronic obstructive pulmonary disease	Productive cough most days of the month at least three months a year for at least two years
		Carcinoma	Blood-tinged sputum or coughing up frank blood, fatigue, weakness, chest pain, shortness of breath, weight loss, shoulder/arm/bone pain
		Left ventricular heart failure	Wheezing, shortness of breath, fatigue, exercise intolerance, edema
		Side effect of angiotensin-converting enzyme inhibitors	Check medication profile

TABLE 2

Healthy habits and hygiene practices^{7,8,9}

Habits	Hygiene
<ul style="list-style-type: none"> • Eat a balanced diet • Get enough sleep • Manage stress • Exercise moderately • Stop smoking or reduce frequency; avoid secondhand smoke 	<ul style="list-style-type: none"> • Avoid contact with infected people • Practice good hand-washing habits and techniques • Avoid touching • Disinfect surfaces

ing air humidity may clear secretions and soothe irritated airways. However, care should be taken not to over-humidify air, which may increase mold and dust mite activity, making allergies worse. A humidity level of 40% to 60% is recommended to minimize the survival of viruses and bacteria in the air and on surfaces, yet remain nonoptimal for mold and mites.⁸ There are different types of humidifiers and vaporizers, both cool and warm mist. Vaporizers are humidifiers that have a cup to place medicated liquids that create medicated vapor.⁶ All should be cleaned each day and disinfected weekly. Some prefer cool mist humidifiers and vaporizers because there is less risk for injury if they are tipped over. Distilled water should be used in cool mist devices, although some are now made with a demineralization cartridge to filter minerals from the water, making use of regular water possible. The differences in humidifiers and vaporizers include:

Cool moisture

- Evaporative humidifiers use a wick system to draw water from a reservoir while a fan blowing over the wick releases water into the air. Because they use cool mist, wicks may come treated with anti-bacterial agents, or water may have anti-bacterial additives or use UV technology to inhibit bacterial growth.¹¹
- Impeller humidifiers use a rotating disc to fling water at a comb-like diffuser. The diffuser breaks the water into fine droplets that float into the air.
- Ultrasonic humidifiers use a metal diaphragm vibrating at an ultrasonic

frequency to create water droplets. These humidifiers are usually silent.

Warm moisture

- Steam vaporizers boil water and release the warm steam into the room. This is the simplest and least expensive technology for humidification. Medicated inhalants may be used with the unit to help reduce coughs.
- Steam inhalers release the warm steam for cough-cold relief. The amount and temperature of the steam is controlled by the amount of cool air that mixes with the steam. There are two versions: one that heats the water electrically and can be used with medicated inhalant pads, and one that requires adding hot water and can be used with a liquid medicated inhalant.
- Warm mist humidifiers boil water in a small cup using an electrical heater element. This type of heater produces steam that is usually mixed with air in a cooling tower. Medicated inhalants may be used with the unit to help reduce coughs.

Some humidifiers use a germ-free process that uses a patented ultraviolet light technology to kill up to 99.999% of bacteria, mold and fungus in the unit's water. The technology is available in both cool and warm moisture units. When using medicated inhalants, usually made with menthol or camphor, refer to product-specific directions on use. Use of these products is not recommended in children under 2 years. Commonly used inhalant

examples are Vicks VapoSteam[®] and Kaz[®] Inhalant Liquid, which contain camphor as a cough suppressant, along with other essential oils. Other products may contain aromatic oils only. Advanced practice clinicians may help patients and caregivers find an appropriate inhalant and discuss proper dosing for humidification.

Pharmacologic therapy

Pharmacotherapy for cough consists of oral and topical anti-tussives, oral expectorants and antibiotics in cases where cough is caused by an underlying bacterial infection. FDA-approved over-the-counter systemic anti-tussives include codeine, dextromethorphan and diphenhydramine. Hydrocodone is approved for prescription use.¹¹ Authors of a 2008 Cochrane review of over-the-counter medications for acute cough in children and adults in ambulatory settings concluded there is no good evidence for or against the effectiveness of their use.¹² Table 3 outlines names, dosages, side effects and drug interactions for oral anti-tussive and expectorants. For coughs due to other chronic conditions, such as asthma or chronic bronchitis, oral or inhaled corticosteroids and inhaled broncodilators may be appropriate.

Codeine, dextromethorphan and diphenhydramine are indicated for the suppression of nonproductive cough caused by chemical or mechanical respiratory tract irritation. Guaifenesin is indicated for symptomatic relief of acute, ineffective productive cough. It should not be used for chronic cough associated with chronic lower respiratory tract diseases, such as asthma; chronic obstructive pulmonary disease, or COPD; emphysema; or smoker's cough. The American College of Chest Physicians has evidence-based guidelines for the diagnosis and management of cough.¹³ Advanced practice clinicians may access these guidelines at: Chestjournal.chestpubs.org/content/129/1_suppl/1S.full. Advanced practice clinicians should be aware that in recent years dextromethorphan has been increasingly used for

illicit purposes, particularly by adolescents. Food and Drug Administration panels considered moving dextromethorphan to prescription status due to its potential for abuse but voted against the recommendation in September 2010, citing lack of evidence that making it prescription-only would curb abuse.¹⁴

Topical anti-tussives approved by the FDA include camphor and menthol. Most topical anti-tussive formulations contain 4.7% to 5.3% camphor and 2.6% to 2.8% menthol in rub, cream or ointment formulations.⁶ These products are rubbed on the throat or chest in a thick layer up to three times a day. Examples include Vicks® VapoRub®, BabyRub and Mentholatum® Chest Rub.

Special considerations for children, pregnant women and elderly

In 2007 and 2008, the FDA reviewed data related to the effects of pediatric use of OTC cough-and-cold medications in response to a citizen petition that raised concerns about their safe use in children. In October 2007, the Nonprescription Drugs Advisory and Pediatric Advisory committees voted to recommend these products not be used in children younger than 2 years of age, as well as recommended against their use in children ages 2 to 6 years.¹⁵ In October 2008, the FDA held a press conference with the Consumer Healthcare Products Association announcing that the leading cough-and-cold manufacturers had agreed to a voluntary label change that would adjust

the recommended age restriction for pediatric cough-and-cold medicine use from 2 years old to 4 years old. Many manufacturers have relabeled products not to be used in children younger than 6 years. These changes followed a January 2008 FDA public health advisory that recommended that these drugs not be used to treat infants and children younger than 2 years of age because serious and potentially life-threatening side effects can occur. The American Academy of Pediatrics, or AAP, also recommends the use of fluids and humidity to control cough in children based upon its determination that no well-controlled studies are available to support the safety and efficacy of codeine and dextromethorphan in children.¹⁶

TABLE 3

Oral anti-tussives and expectorants^{6,17}

Drug	Common trade names	Adults/children >12 years	Children 6 to 12 years
Codeine*		10 mg to 20 mg every four to six hours	5 mg to 10 mg every four to six hours
Dextromethorphan*	Delsym®, Robitussin® Cough Long-Acting, Triaminic® Children's Cough Long-Acting, Vicks® 44® Cough Relief	10 mg to 20 mg every four hours, or 30 mg every six to eight hours	5 mg to 10 mg every four hours, or 15 mg every six to eight hours
Diphenhydramine HCl	Benadryl®	25 mg to 50 mg every six to eight hours (max 300 mg/day)	12.5 mg to 25 mg every four to six hours (max 150 mg/day)
Guaifenesin	Humibid® Maximum Strength, Mucinex®, Robitussin®, Tussin® Expectorant	200 mg to 400 mg every four hours Extended release: 600 mg to 1,200 mg every 12 hours (max 2.4 g/day)	100 mg to 200 mg every four hours (max 1.2 g/day)
Guaifenesin in combination with codeine	Cheratussin AC, Robitussin® AC	Based upon formulation	Based upon formulation
Guaifenesin in combination with dextromethorphan	Cheraco® D, Diabetic Tussin® DM, Mucinex® DM, Robitussin® DM	Based upon formulation	Based upon formulation
Hydrocodone and chlorpheniramine	TussiCaps®, Tussinex®	10 mg/8 mg every 12 hours	5 mg/4 mg every 12 hours
Hydrocodone bitartrate and homatropine methylbromide	Hydromet®, Tussigon®	One tablet or 5 mL every four to six hours as needed (max six tablets or 30 mL per 24 hours)	Half a tablet or 2.5 mL every four to six hours as needed (max three tablets or 15 mL per 24 hours)

* Safety and efficacy as an anti-tussive in children not established.

Pregnant women should avoid using codeine, which carries a C pregnancy rating, unless the benefits outweigh the risk.¹⁷ AAP lists codeine as a medication compatible with breast-feeding although it is excreted in breast milk.¹⁸ They make no recommendations on dextromethorphan.

The elderly may be more likely to experience the sedating effects of dextromethorphan and diphenhydramine. Dosages should be started at the low end of the range, and patients should be monitored carefully.⁶

Exclusions for self-treatment

Patients should not self-treat, but rather seek medical treatment when the

following criteria are present:

- Presence of thick yellow sputum or green phlegm, indicating possible bacterial infection
- Fever > 101.5°F (38.6° C)
- Weight loss, unintended
- Drenching nighttime sweats
- History or symptoms of underlying chronic disease — e.g., asthma; COPD; or gastroesophageal reflux disease, or GERD
- Aspirating foreign object
- Drug-associated cough
- Coughing more than seven days
- Worsening cough when self-treating or developing new symptoms
- Infant or child who has a bark-like cough, stridor or hoarseness⁶

COLD

The common cold is an acute viral infection of the upper respiratory tract that is self-limiting. More than a billion cases of cold occur annually in the United States, making it the most common illness.² Colds are most common in children; it's estimated that they may have six to 10 colds per year, with the number rising if they are in day care or school where germs and viruses can spread between children.² Because children carry the rhinovirus during off-peak cold seasons, they are the major carriers of the common cold.¹⁹ The common cold is the second most common diagnosis by pediatricians, and the incidence is greatest among 3- to 5-year-olds in day care.²⁰ Colds are more common from August to April,

Children under 6 years	Common side effects	Drug interactions
<i>2 to 6 years:</i> 1 kg/mg/day in four doses	Nausea, vomiting, sedation, dizziness, constipation	Avoid alcohol and other CNS depressants
<i>Under 4 years:</i> not for OTC use <i>4 to 6 years:</i> 2.5 mg to 7.5 mg every four to eight hours	Drowsiness, nausea, vomiting, stomach discomfort, constipation	Avoid alcohol and other CNS depressants, antihistamines, psychotropics and MAO inhibitors
<i>2 to 6 years:</i> 6.25 mg every four to six hours (max 37.5 mg/day)	Drowsiness, disturbed coordination, respiratory depression, blurred vision, urinary retention, dry mouth and respiratory secretions. May cause excitability in children.	Potentiates effects of narcotics, non-narcotic analgesics, benzodiazepines, tranquilizers and alcohol. Increases effect of MAO inhibitors.
<i>6 months up to 2 years:</i> 25 mg to 50 mg every four hours (max 300 mg/day) <i>2 to 6 years:</i> 50 mg to 100 mg every four hours (max 600 mg/day)	Nausea, vomiting, dizziness, headache, rash, diarrhea, drowsiness, stomach pain	None reported
Based upon formulation	See individual agents	Avoid alcohol and other CNS depressants
Based upon formulation	See individual agents	Avoid combination with MAO inhibitors and sibutramine. Caution with CYP2D6 inhibitors
Contraindicated in children < 6 years	Chest tightness, anxiety, dizziness, drowsiness, sedation, rash, constipation, nausea, vomiting, respiratory depression, thickening of bronchial secretions	Avoid alcohol and other CNS depressants
Contraindicated in children < 6 years, safety not established	Chest tightness, anxiety, dizziness, drowsiness, sedation, rash, constipation, nausea, vomiting, respiratory depression	Avoid alcohol

although they may occur at any time.²

Symptomatology

Sore throat usually is the first symptom of a cold. Nasal congestion, sneezing, runny nose and cough also are symptoms. A low-grade fever (<101° F) also may occur. Cold symptoms usually last between one to two weeks. While not widespread, complications can result from colds and include sinusitis, ear infections, bronchitis and other respiratory infections.²¹ Other conditions may mimic

cold symptoms (Table 4). It is important for advanced practice clinicians to ask patients about their symptoms, length of time they have been present and other medical conditions in order to determine appropriate treatment recommendations.

Prevention

There is no known cure for the common cold. It may be caused by more than 200 viruses — the majority are rhinoviruses. It is transmitted most commonly by touching mucous membranes with hands that

have touched the virus on other humans or objects. Preventing the spread of the cold virus is the primary approach to treatment. There are a number of healthy habits and good hygiene practices that can help prevent the spread of colds. Advanced practice clinicians should educate patients about these strategies — refer to Table 2.

Much attention has been paid to products that claim to boost the immune system, and many products are marketed as immune boosters. Examples include high-dose vitamin C, echinacea and other botanicals, zinc

TABLE 4

Differential diagnosis of the common cold and other upper respiratory conditions^{7,10,21}

Symptom	Cold	Allergic rhinitis	Asthma	Bronchitis	Croup	Flu	Otitis media	Sinus infection	Streptococcal pharyngitis
Acute onset	+	-	+/-	+/-	+	+	+	+/-	+
Rhinorrhea/runny nose	+	+	+/-	+/-	NA	+	+/-	+	-
Discharge color	White	Clear	NA	NA	NA	NA	NA	Yellow/green	NA
Discharge consistency	Thin or thick	Thin, watery	NA	NA	NA	NA	NA	Thick	NA
Nasal congestion	+	+	NA	NA	+	+	NA	+	-
Sneezing	+	+	NA	NA	NA	-	NA	-	-
Itching of nose, eyes	Sometimes	+	NA	NA	NA	-	NA	-	-
Swollen glands	-	-	NA	NA	NA	-	NA	-	+
Fever	+ (low-grade)	-	NA	NA	+	+	NA	+	++
Sore throat	+	-	NA	NA	+	-	NA	-	+
Cough	+	-	+ (Nonproductive)	+ (Productive)	+ (Barking)	+ (Nonproductive)	NA	Sometimes	-
Ear pain, pressure	Sometimes	Sometimes	NA	NA	NA	NA	++	Sometimes	-
Facial pressure	Sometimes	-	NA	NA	NA	NA	+	+	-
Headache	+	Sometimes	NA	NA	NA	++	NA	Sometimes	Sometimes
Myalgia	Sometimes	-	NA	NA	NA	++	NA	-	+*
Fatigue	+	Sometimes	+	NA	NA	++	NA	Sometimes	Sometimes
Wheezing	NA	NA	+	NA	NA	NA	NA	-	-
Trouble breathing	NA	NA	+	NA	+	NA	NA	+/-	-

* Associated with fever

lozenges and combination products. A 2000 Cochrane Review analyzing 30 vitamin C trials found long-term daily supplementation does not appear to prevent colds. They found modest benefit in reducing duration of cold symptoms from ingestion of relatively high doses of vitamin C.²² However, a more recent trial found the vitamin C group had significantly fewer colds, fewer days “challenged virally” and a shorter duration of severe symptoms.²³ A 2006 meta-analysis involving echinacea looked at three studies that met the researchers’ inclusion criteria. They found the likelihood of experiencing a clinical cold was 55% higher with placebo versus echinacea in the studies ($p < 0.043$). Reviewers suggested standardized echinacea extracts were effective in the prevention of symptoms of the common cold after clinical inoculation, compared with placebo.²⁴ Because echinacea supplements are generally not standardized, each will have its own dosing regimen, and patients should be advised to read package directions carefully. Numerous studies have evaluated various zinc formulations and doses as a common cold treatment. Results have been conflicting. A recent meta-analysis of zinc lozenges found insufficient evidence exists for routine use of the products.²⁵ However, zinc lozenge makers routinely cite two double-blind, controlled clinical trials from 1992 and 1996 that showed effectiveness in reducing cold severity and duration.^{26,27} Zinc gluconate lozenges are recommended to be taken within 24 hours to 48 hours of the onset of cold symptoms, then every two hours to four hours thereafter not to exceed six per day.²¹

Nonpharmacologic treatment options

Nonpharmacologic treatment includes adequate rest and nutrition, hydration and humidification — refer to cough section for details. Additionally, saline drops and nasal sprays also can relieve congestion by loosening encrusted mucous and drawing fluid from the nasal passages, acting as decongestants. Because it has minimal side effects, saline can be used in children. They do not cause rebound congestion like decongestant nasal sprays.

The recommended dosage for saline drops is one to two drops into each nostril 15 minutes to 20 minutes before feeding and bedtime, with a repeated dose 10 minutes later. For sprays, it is two sprays in each nostril as needed.

Use of saline nasal sprays or drops should be followed by aspiration with a nasal bulb syringe to clear the nasal passageways. The bulb should be squeezed while gently putting the tip into the nostril; then the pressure should be slowly released to draw out the fluid. The bulb should be disassembled and thoroughly cleaned with warm, soapy water after each use.²⁸

Nasal strips also can be used in adults and pediatric nasal strips in children ages 5 years and older. The strips consist of an adhesive-backed plastic band with a liner that is removed. The strip is centered between the bridge and the tip of the nose, just above the flare of each nostril. Placement is important for the FDA-approved device to work properly by exerting a gentle pressure on the nostril, opening it and providing relief of nasal congestion. Strips may be used up to 12 hours per day and are single-use. Patients allergic to latex should not use them.²⁸

Pharmacologic therapy

Pharmacologic options for self-treatment are limited and vary by age. They primarily deal with treating each symptom with single-entity products. While combination products are available, symptoms appear at different times and with different duration, so use of single-entity decongestants, antihistamines, cough suppressants, expectorants and pain relievers is recommended.²¹ Use of cough suppressants and expectorants was outlined earlier.

Decongestants and antihistamines

For nasal congestion or runny nose, use of topical or systemic decongestants and antihistamines may be considered. See Table 5 for dosage guidelines for decongestants and antihistamines. Decongestants can make hypertension, hyperthyroidism, diabetes, heart disease, glaucoma and prostatic hypertrophy worse. Advanced

practice clinicians should assess patients and make recommendations accordingly. Monotherapy with OTC antihistamines is not effective in decreasing runny nose and sneezing associated with colds. Combination therapy with first-generation agents with decongestants showed some benefit but with questionable significance.²⁹

Analgesics for pain and fever

Pain and fever associated with cold may be treated with analgesics. These include aspirin, acetaminophen, ibuprofen and naproxen. Advanced practice clinicians should advise patients to read the product label carefully and ask the patient if they are taking any other medications to ensure maximum dosages of pain relievers are not being exceeded due to combination or duplicate therapy. Acetaminophen and ibuprofen are the preferred analgesics for children. Acetaminophen use is restricted to children 12 weeks of age and older, unless infant is examined by a healthcare provider and directed otherwise. Ibuprofen is restricted to children 6 months and older. Aspirin should not be used in a child under age 18 with a fever, due to the risk of Reye’s syndrome.

Liver toxicity with acetaminophen may occur and is a serious, dose-dependent effect. The maximum recommended dosage is 75 mg/kg/day (adults not to exceed 4 g/day), and products carry warnings about exceeding this dose. Signs associated with acetaminophen toxicity can mimic the problems the drug itself treats and include nausea, vomiting, diarrhea and excessive sweating. This may lead parents and caregivers to administer more medication to the child. Care should be taken not to exceed this threshold by administering higher doses more frequently than recommended. Further, adult product formulations should be avoided in children.

Parents can give the child a sponge bath as a nondrug alternative to fever treatment. Lukewarm water should be used, not cold. The water’s evaporation will create a cooling sensation on the skin and draw the heat to the surface.¹¹

Retail Clinician CE Lesson

Local anesthetics for sore throat

In addition to earlier recommendations with treating throat irritation due to

cough, medicated lozenges may be used for sore throats due to colds. Post-nasal drip often is the cause of the sore throat,

and treating nasal congestion/runny nose may help reduce it. Medicated lozenges for sore throat contain anesthetics

TABLE 5

OTC decongestants and antihistamines^{17, 21}

	Adults/children > 12 years	Children 6 to 12 years	Children 2 to 6 years	Side effects	Drug interactions
Oral decongestants					
Pseudoephedrine (e.g., Sudafed®) Drops: 7.5 mg/0.8 mL Syrup: 15 mg/5 mL Chewables: 15 mg Tablets: 30 mg	60 mg every six hours (max: 240 mg/day)	30 mg every six hours (max: 120 mg/day)	15 mg every six hours (max: 60 mg/day)	Cardiovascular and central nervous system, or CNS, stimulation	MAO inhibitors, methyldopa, tricyclic anti- depressants, antacids
Phenylephrine Drops: 1.25 mg/0.8 mL Syrup: 2.5 mg/5 mL Strips: 2.5 mg Tabs: 10 mg	10 mg every four hours (max: 60 mg/day)	5 mg every four hours (max: 30 mg/day)	2.5 mg every four hours (max: 15 mg/day)	Cardiovascular and CNS stimulation	MAO inhibitors, methyldopa, tricyclic anti- depressants, antacids
Topical decongestants					
Ephedrine	0.05% solution; Two to three sprays not more than every four hours	0.05% solution; One to two sprays not more than every four hours	Avoid in this age group	CNS stimulation, rebound congestion with use more than three days	
Naphazoline	0.05% solu- tion; One to two sprays not more than every six hours	0.025% solution; One to two sprays not more than every six hours	Avoid in this age group	CNS stimulation, rebound congestion with use more than three days	
Oxymetazoline nasal spray/drops (e.g., Afrin®, Mucinex®)	0.05% solution; Two to three sprays twice daily	0.05% solution; Two to three sprays twice daily	Avoid in this age group	CNS stimulation, rebound congestion with use more than three days	
Phenylephrine nasal spray/drops (e.g., Little Noses®)	0.5% solution; Two to three sprays every four hours as needed	0.25% solution; Two to three sprays every four hours as needed	0.125% solution; Two to three sprays not more than every four hours	CNS stimulation, rebound congestion with use more than three days	
Xylometazoline	Two to three sprays no more than every eight to 10 hours	Avoid in this age group	Avoid in this age group	CNS stimulation, rebound congestion with use more than three days	
Saline nasal spray Sodium chloride 0.65% (e.g., Ocean® Premium Saline Nasal Spray, Ayr®)	Two sprays as needed	Two sprays as needed	Two sprays as needed		

and local antiseptics, such as benzocaine, phenol and menthol. The usual dosage regimen calls for their use every two

hours to four hours. Commonly known brand names include Cepacol[®], Chloraseptic[®], Halls[®] and Sucrets[®].

Special considerations for children, pregnant women and elderly

Concerns about the use of cough-and-

TABLE 5 (continued)

OTC decongestants and antihistamines^{17, 21}

	Adults/children > 12 years	Children 6 to 12 years	Children 2 to 6 years	Side effects	Drug interactions
Oral antihistamines					
<i>First generation</i>					
Brompheniramine	4 mg every four to six hours	2 mg every four to six hours	Avoid in this age group	Drowsiness, dry mouth, nervousness and dizziness	CNS depressants (alcohol, sedatives), MAO inhibitors, phenytoin, ketoconazole, erythromycin, cimetidine, theophylline (>400 mg)
Chlorpheniramine	4 mg every four to six hours (max: 24 mg/day)	2 mg every four to six hours (max: 12 mg/day)	Avoid in this age group	Drowsiness, dry mouth, nervousness and dizziness	CNS depressants (alcohol, sedatives), MAO inhibitors, phenytoin, ketoconazole, erythromycin, cimetidine, theophylline (>400 mg)
Dexbrompheniramine	2 mg every four to six hours	1 mg every four to six hours	Avoid in this age group	Drowsiness, dry mouth, nervousness and dizziness	CNS depressants (alcohol, sedatives), MAO inhibitors, phenytoin, ketoconazole, erythromycin, cimetidine, theophylline (>400 mg)
Diphenhydramine HCl	25 mg to 50 mg every six to eight hours (max: 300 mg/day)	12.5 mg to 25 mg every four to six hours (max: 150 mg/day)	Avoid in this age group	Drowsiness, dry mouth, nervousness and dizziness	CNS depressants (alcohol, sedatives), MAO inhibitors, phenytoin, ketoconazole, erythromycin, cimetidine, theophylline (>400 mg)
Pyrilamine maleate	25 mg to 50 mg every six to eight hours	12.5 mg to 25 mg every six to eight hours	Avoid in this age group	Drowsiness, dry mouth, nervousness and dizziness	CNS depressants (alcohol, sedatives), MAO inhibitors, phenytoin, ketoconazole, erythromycin, cimetidine, theophylline (>400 mg)
Tripolidine HCl	2.5 mg every four to six hours	1.25 mg every four to six hours	Avoid in this age group	Drowsiness, dry mouth, nervousness and dizziness	CNS depressants (alcohol, sedatives), MAO inhibitors, phenytoin, ketoconazole, erythromycin, cimetidine, theophylline (>400 mg)
<i>Second generation</i>					
Cetirizine (Zyrtec [®])	10 mg every 24 hours	10 mg every 24 hours	2.5 mg to 5 mg every 24 hours		
Fexofenadine (Allegra [®] Allergy)	24 hour: 180 mg once a day Adults 65 years and older: Ask a doctor	Children's: 1 tsp (5 mL) every 12 hours (no more than 10 mL in 24 hours)	Children's: 1 tsp (5 mL) every 12 hours (no more than 10 mL in 24 hours)		Do not take at the same time as aluminum or magnesium antacids
Loratadine (Claritin [®])	10 mg every 24 hours	10 mg every 24 hours	5 mg every 24 hours		

* Extended-release formulations are available, and care should be taken to read the label carefully and follow directions, especially to swallow whole.

cold products in children were addressed earlier in this monograph. With colds, however, analgesia for pain and fever creates an additional caution for children and adults with regard to acetaminophen toxicity, and care needs to be taken to avoid concomitant use of combination products with single-ingredient acetaminophen products. Additionally, sedating antihistamines can produce excitation in children and should be avoided.

For pregnant women, all FDA-approved cold medications carry a pregnancy category B or C rating, meaning their use may be considered if the benefits outweigh the risk. Decongestants might decrease fetal blood flow, and some may be linked to abdominal wall defects — e.g., pseudoephedrine.²¹ Breast-feeding mothers may use the drug according to AAP. Decongestants can reduce milk production, however, and naphazoline and xylometazoline should be avoided. For analgesia, acetaminophen is the preferred choice in both pregnant and breast-feeding patients. For runny nose, chlorpheniramine is the preferred choice due to its long safety profile with loratidine and cetirizine alternates. Antihistamines can pass into breast milk and are contraindicated during breast-feeding. In addition, mucolytics should be used with caution in women who are or could become pregnant because of their potential to loosen the mucous plug.

The elderly should also avoid use of sedating antihistamines as their effects may be potentiated. Side effects include confusion, excitation and hypotension, all of which may increase a person's risk for falls. Loratidine is the antihistamine of choice for the elderly.²¹

Exclusions for self-treatment

Patients should not self-treat, but rather seek medical treatment when the following criteria are present:

- Fever > 101.5°F (38.6° C)
- History or symptoms of underlying chronic disease — e.g. asthma, COPD, GERD
- AIDS or chronic immunosuppres-

sant therapy

- Chest pain or shortness of breath
- Unusual fatigue/weakness
- Earache or tugging on the ears
- Swollen glands in the neck or severely painful sore throat
- Worsening cough when self-treating or developing new symptoms
- Frail, elderly patients
- Infants < 9 months
- Infants or children with cold lasting longer than seven days

FLU

Flu is caused by the influenza virus, which was first isolated in the 1930s with subsequent vaccines developed a decade later. Influenza viruses are classified as type A, B or C. Type A and B affect humans, with type A having the most severe impact. Influenza type A is subtyped, based upon two surface protein antigens: hemagglutinin, or HA, and neuraminidase, or NA. HA allows the virus into the cell, while NA helps with cell-to-cell transmission of the virus.³⁰ Humans create antibodies to these antigens when infected, producing an immune response.³¹ H1N1 and H3N2 are the two types of influenza A viruses circulating in humans, with the latter being more serious. Influenza is named according to the type, the location of initial isolation, the strain designation and the year of isolation. For example, A/Brisbane/59/2007, or H1N1, is influenza type A with origin in Brisbane, Australia, with strain number 59, isolated in 2007 and of the H1N1 subtype.³²

Influenza viruses continually change in response to human antibody production through antigenic drift and antigenic shift. Antigenic drift is an ongoing process in influenza A and B viruses when mutations occur within HA or NA genes and is what causes yearly flu epidemics. This is why seasonal influenza vaccines have to be changed annually. Antigenic shift occurs in influenza A; it is uncommon and unpredictable, and is responsible for new virulent virus strains associated with worldwide pandemics.³³ The 2009–2010 flu season is an example

of how unpredictable flu can be when the 2009 H1N1 virus caused a lot of illness that was more serious for younger people than seasonal flu usually is.

Influenza is a serious disease that can lead to hospitalization and sometimes even death. Influenza affects 5% to 20% of Americans each year.³⁴ More than 200,000 people are hospitalized from flu complications, and about 41,400 people die, based on annualized statistics for 1979–2001.^{35,36} Anyone can get sick from the flu, but a number of populations are at greater risk for serious complications from the flu, including children, the elderly, pregnant women and people with chronic lung diseases, such as asthma and COPD; diabetes; heart disease; neurologic conditions; and certain other long-term health conditions.

Symptomatology

Fever, muscle weakness, body aches and fatigue are common symptoms associated with the flu. Respiratory symptoms include nasal congestion, rhinitis, sore throat and nonproductive cough. Nausea and vomiting may occur, usually more often in children. Onset is rapid, and the flu virus can spread before symptoms occur. It is important to be able to distinguish the symptoms of flu from cold or other respiratory conditions — refer to Table 4. Fever, headache and chills from the flu are more common than in colds; cough is nonproductive if present. Fatigue and body aches are moderate to severe, and sore throats occur less often.

Prevention

Influenza vaccination is the most important method for preventing flu and its complications. Vaccination prevents illness in up to 70% to 90% of healthy adults under the age of 65 years when there is a good match between the circulating flu virus and the vaccine.³⁷ In 2010, the Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices, or ACIP, first recommended annual influenza vaccination for all persons ages 6 months and older. Influenza vaccination of all per-

sons ages 6 months and older continues to be recommended.³⁸

Advanced practice clinicians who are knowledgeable about vaccine design, production and distribution can play an important role in dispelling common misunderstandings. These include the myth that the flu vaccine causes influ-

enza and respiratory infection. There also is concern about health effects of thimerosal, a TIV vaccine preservative used in multidose vials. The ACIP recommendations state no scientific evidence indicates that thimerosal is a cause of adverse events other than occasional local hypersensitivity reactions in

vaccine recipients.³⁹ Thimerosal also can be avoided by providing single-dose flu shots, rather than using multidose vials.

Flu vaccines may be of two types: trivalent inactivated vaccine, or TIV, which is given with a needle either intramuscularly or intradermally, and live attenuated influenza vaccine, also known as LAIV,

TABLE 6

ACIP recommended influenza vaccines for different age groups — United States, 2010-2011 season³⁸

Vaccine	Trade name	Manufacturer	Presentation	Mercury content*	Age group	No. of doses	Route
TIV	Fluzone®	Sanofi Pasteur	0.25-mL prefilled syringe	0	6 to 35 months	1 or 2†	Intramuscular§
			0.5-mL prefilled syringe	0	36 months and older	1 or 2†	Intramuscular§
			0.5-mL vial	0	36 months and older	1 or 2†	Intramuscular§
			5.0-mL multidose vial	25	6 months and older	1 or 2†	Intramuscular§
TIV	Fluvirin®	Novartis Vaccines	5.0-mL multidose vial	25	4 years and older	1 or 2†	Intramuscular§
			0.5-mL prefilled syringe	Less than 1.0			
TIV	Fluarix®	GlaxoSmithKline	0.5-mL prefilled syringe	0	3 years and older	1 or 2†	Intramuscular§
TIV	FluLaval®	ID Biomedical of Quebec (distributed by GlaxoSmithKline)	5.0-mL multidose vial	25	18 years and older	1	Intramuscular§
TIV	Afluria®**	CSL Biotherapies (distributed by Merck)	5.0-mL multidose vial	24.5	9 years and older	1	Intramuscular§
			0.5-mL prefilled syringe	0			
TIV High Dose**	Fluzone® High-Dose	Sanofi Pasteur	0.5-mL prefilled syringe	0	65 years and older	1	Intramuscular§
TIV intra-dermal	Fluzone® Intradermal	Sanofi Pasteur	0.1-mL prefilled micro-injection system	0	18 to 64 years	1	Intradermal
LAIV	FluMist®***	MedImmune	0.2-mL sprayer, divided dose	0	2 years to 49 years	1 or 2†	Intranasal

* Mercury content is measured by mcg Hg/0.5-mL dose.

† Children ages 6 months through 8 years who did not receive seasonal influenza vaccine during the 2010-2011 influenza season should receive two doses at least four weeks apart for the 2011-2012 season. Those children ages 6 months through 8 years who received 1 or more doses of the 2010-2011 seasonal vaccine require one dose for the 2011-2012 season.

§ For adults and older children, the recommended site of vaccination is the deltoid muscle. The preferred site for infants and young children is the anterolateral aspect of the thigh.

** Age indication per package insert is 5 years and older; however, ACIP recommends Afluria not be used in children ages 6 months through 8 years because of increased reports of febrile reactions in this age group. If no other age-appropriate, licensed, inactivated seasonal influenza vaccine is available for a child ages 5 to 8 years who has a medical condition that increases the child's risk for influenza complications, Afluria can be used; however, providers should discuss with the parents or caregivers the benefits and risks of influenza vaccination with Afluria before administering this vaccine. Afluria may be used in persons ages 9 years and older.

*** FluMist is indicated for healthy, nonpregnant persons ages 2 to 49 years.

which is given intranasally. Fluzone® High-Dose is available as an alternative TIV for persons ages 65 years and older; no preference is indicated for this TIV versus other TIV preparations. In May 2011, a new intradermally administered TIV preparation was licensed. TIV intra-

dermal is indicated for persons ages 18 through 64 years and contains less antigen than intramuscular TIV preparations (9 µg rather than 15 µg of each strain per dose) in a smaller volume (0.1 mL rather than 0.5 mL). The vaccine is administered intradermally over the deltoid muscle via a single-

dose, prefilled microinjection syringe. The most common adverse reactions for intradermal TIV included injection-site erythema, induration, swelling, pain and pruritus. With the exception of pain, these reactions occurred more frequently than with intramuscular vaccine, but generally

TABLE 7

Dosing guidelines and side effects of neuraminidase inhibitor antivirals¹⁷

	Dosage form	Dosage guidelines		Common side effects	Drug interactions/cautions
Oseltamivir (Tamiflu®)	Oral capsules: 30 mg, 45 mg, 75 mg Oral suspension: 12 mg/mL	Prevention	Treatment	Nausea, vomiting, diarrhea, delirium	Do not administer with LAIV influenza vaccine. Reduce dose in patients with renal impairment to once a day.
1 to 12 years	Dosage based upon weight	10 days of treatment is recommended in households while up to six weeks is recommended for community outbreaks	Dose based on weight, twice a day for five days		
< 15 kg		30 mg every day	30 mg twice a day for five days		
16 kg to 23 kg		45 mg every day	45 mg twice a day for five days		
24 kg to 40 kg		60 mg every day	60 mg every day for five days		
> 40 kg		75 mg every day	75 mg every day for five days		
13 to 64 years		75 mg every day	75 mg twice a day for five days		
Over 65 years		75 mg every day	75 mg twice a day for five days		
Zanamivir (Relenza®)	Oral inhalation: Rotadisk. Blister pack of No. 4 with 5-mg drug in each blister. Uses disk-inhaler device.	10 days of treatment is recommended in households, while 28 days is recommended for community outbreaks		Nausea, diarrhea, headache, cough, sinusitis, dizziness, fever, chills, arthralgia	Do not administer with LAIV influenza vaccine. Not recommended for people with pulmonary disease.
1 to 6 years		NA	NA		
7 to 9 years		5 to 9 years: 10 mg every day	10 mg twice a day for five days		
10 to 12 years		10 mg every day	10 mg twice a day for five days		
13 to 64 years		10 mg every day	10 mg twice a day for five days		
Over 65 years		10 mg every day	10 mg twice a day for five days		

were resolved within three to seven days. TIV intradermal is an alternative to other TIV preparations for those in the indicated age range, with no preferential recommendation. LAIV is indicated for healthy nonpregnant persons ages 2 through 49 years. It should be avoided in adults and children who may have asthma.³⁸

The FDA-approved 2011-2012 flu vaccines include the following three viruses: an A/California/7/2009 H1N1-like virus, an A/Perth/16/2009 H3N2-like virus and a B/Brisbane/60/2008-like virus.⁴⁰ Even though influenza vaccine strains are unchanged from those of 2010-2011 season, annual vaccination is recommended even for those who received the vaccine for the previous season.⁴⁰ Children ages 6 months through 8 years may need two vaccine doses, depending on prior influenza vaccination history.³⁸ See Table 6 for detailed ACIP dosage and age recommendations. Both vaccines are contraindicated in individuals who have anaphylactic reaction to eggs or other components of the influenza vaccine. Precaution should be taken in people who experienced Guillain-Barré syndrome, or GBS, within 6 weeks after a previous flu shot.³⁹

In addition to flu vaccination, advanced practice clinicians should stress other prevention strategies, including healthy habits and hygiene practices found in Table 2. Avoiding contact with people who already have the flu is recommended since the virus can spread through direct exposure from droplets expelled by infected persons. Persons with the flu should be advised to stay home.

Humidification also is an important strategy to prevent flu. A recent analysis based on modeling and review of earlier studies suggests that maintaining an indoor humidity level between 40% to 60% can reduce the survival of flu viruses on surfaces and in the air.⁴¹ This is because the influenza virus survives best at humidity levels below 40%.

Treatment approaches

Nonpharmacological treatment of flu involves bed rest, proper nutrition and

hydration. Flu symptoms may be addressed with a variety of over-the-counter medications — see cold section.

Prescription antiviral medications with influenza virus activity may be useful adjuncts in influenza prevention and are effective when used early in the course of illness for treatment. They are considered a second line of defense after vaccination.⁴² There are four FDA-approved antiviral medications: amantadine, rimantadine, oseltamivir (Tamiflu®) and zanamivir (Relenza®). The first two are amantadanes, while the second two are neuraminidase inhibitors. Inhibiting neuraminidase reduces the release of virus from infected cells, viral aggregation and spreading within the respiratory tract.⁴³

Resistance is a cause for concern. As of June 2010, approximately 99% of seasonal influenza A (H1N1) viruses tested resistant to oseltamivir in the United States. Resistance to the amantadane antivirals also is widespread, so they are not routinely recommended for treatment or for prophylaxis against influenza. Advanced practice clinicians should stay abreast of seasonal flu strains, flu recommendations and resistance. The flu area of the CDC website is an excellent resource: CDC.gov/flu/professionals. Another helpful resource is the Immunization Action Coalition's website: Immunize.org.

The CDC recommends use of either oseltamivir or zanamivir for the 2010-2011 flu season in people at high risk for developing complications, including:

- People with severe illness who have been hospitalized
- People younger than 19 years of age who are receiving long-term aspirin therapy
- People with suspected or confirmed influenza who are at higher risk for complications, such as:
 - Children younger than 2 years of age
 - Adults 65 years and older
 - Pregnant women
 - People with certain chronic medical and immunosuppressive conditions

Antiviral medication can shorten the duration of flu by one to two days. Dosage and side-effect information of the neuraminidase inhibitor antiviral medications are in Table 7. Antiviral agents carry a C pregnancy rating, and there is limited data on their safe use in pregnancy. For elderly patients, oseltamivir dosage should be adjusted based on renal function. Zanamivir may be used as prophylaxis in children 5 years and older and for treatment in ages 7 years and older. Oseltamivir is indicated for children ages 1 year and older.

Exclusions for self-treatment

Patients and children should consult a healthcare provider if they develop symptoms associated with severe illness from the flu. The CDC describes emergency warning signs as:

- Difficulty breathing or shortness of breath
- Pain or pressure in the chest or abdomen
- Sudden dizziness
- Confusion
- Severe or persistent vomiting
- Flu-like symptoms that improve but then return with fever and worse cough

Additional signs in children include fast breathing or trouble breathing, bluish skin color, not drinking enough fluids or infants with fewer wet diapers than normal, not waking up or not interacting, being so irritable that the child does not want to be held, diarrhea lasting longer than two days, severe abdominal cramping, seizure and fever with a rash.⁴⁴

CONCLUSION

As cough, cold and flu season begins, advanced practice clinicians can provide education, assessment and recommendations for patients and caregivers regarding prevention and treatment. There are many healthy habits and preventive strategies that can help prevent the spread of cold and flu viruses. Assessing a patient's symptoms and providing appropriate treatment recommendations is an important service advanced practice clinicians provide.

PRACTICE POINTS

- Advanced practice clinicians should provide counseling on strategies to prevent the spread of infection.
 - Practicing healthy habits and good hygiene can reduce the transmission of cold and flu viruses.
 - Maintaining home humidity between 40% and 60% also can prevent the spread of the flu virus in the air and on surfaces.
 - Everyone over 6 months of age should be vaccinated against flu.
- Advanced practice clinicians should assess cough, cold and flu symptoms and their duration in patients to determine the appropriate treatment approach, including referral for further medical treatment.
- Advanced practice clinicians should educate patients and caregivers that all current treatments are aimed at easing symptoms, with the exception of antivirals for flu, and that many nonpharmacological approaches exist. Adequate rest, nutrition and hydration are important elements in treating cold and flu that should be emphasized.
- If cough-and-cold medications are appropriate, advanced practice clinicians should encourage patients and caregivers to review the ingredients carefully and avoid use of adult formulations in children.
- Counsel patients on the emergency warning signs of flu-related severe illness that may require further medical care.

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Helping patients manage cough, cold and flu

Learning Assessment

Successful completion of "Helping patients manage cough, cold and flu" is accredited for 1.25 (one and one-quarter) hours of continuing education credit, of which 0.75 (three-quarters) hour is considered pharmacology credit. To obtain credit, answer the following questions and complete the evaluation online at RetailClinician.com.

1. **When assessing cough in patients, the advanced practice clinician should ask:**
 - a. If the cough is productive or nonproductive
 - b. If the patient has asthma or any other chronic condition
 - c. How long the patient has had the cough
 - d. All the above
2. **Coughs are:**
 - a. Rarely associated with angiotensin-converting enzyme inhibitors
 - b. Classified as acute, subacute and chronic
 - c. Rarely associated with underlying chronic conditions
 - d. Treated with antibiotics
3. **Which statement is true regarding cough treatment?**
 - a. Dextromethorphan has been classified as a prescription product by the Food and Drug Administration.
 - b. The American Academy of Pediatrics recommends codeine and dextromethorphan as the primary means to treat cough in children.
 - c. Hydration and humidification are nonpharmacologic approaches to treating cough.
 - d. Adults should be treated with prescription hydrocodone before trying any self-treatment.
4. **Which nonpharmacologic strategies can be recommended by the advanced practice clinician to help prevent the spread of cough, cold and flu?**
 - a. Practicing healthy habits, including plenty of rest and good nutrition
 - b. Using good hygiene practices to prevent viruses from spreading
 - c. Maintaining household humidity at levels that inhibit viral spread
 - d. All of the above
5. **Regarding preventative strategies for avoiding cold and flu:**
 - a. Some hand-sanitizer ingredients have proven effective in antiviral activity.
 - b. Humidity levels should be kept below 40% to avoid viral spread.
 - c. Hand washing has not proven effective in preventing viral spread.
 - d. Vaporizers are better than humidifiers at maintaining humidity.
6. **Which statement is true regarding cough, cold and flu?**
 - a. Colds and flu both have acute onset.
 - b. Flu usually lasts longer than cold.
 - c. Antivirals should be used to prevent the spread of colds.
 - d. Swollen glands are generally not associated with cough, cold and flu but may indicate strep throat.
7. **Which statement about cold is false?**
 - a. Preventive strategies can stop colds from spreading.
 - b. There is no known cure for the common cold.
 - c. Humidification does not help with cold.
 - d. Aspirin may be used in children to help with aches.
8. **The Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices recommends the following people be vaccinated for flu in the 2011-2012 flu season:**
 - a. Children and adults ages 6 months and older
 - b. High-risk individuals only
 - c. Children and adults ages 8 and older
 - d. Healthcare workers and the elderly only
9. **Which of the following statements is true:**
 - a. Flu viruses live best in relative humidity of 40% to 60%.
 - b. Keeping relative humidity at 40% to 60% has been shown to reduce the survival of flu viruses on surfaces and in the air.
 - c. Flu viruses only spread through direct contact with infected individuals.
 - d. Only cool-mist humidifiers are effective in retarding transmission of the flu virus.
10. **Antiviral medications for flu:**
 - a. Are used only for treatment to shorten symptoms
 - b. Are all active against influenza A, B and C
 - c. When used for treatment, shorten symptoms by one to two days
 - d. Are used for the same time regardless of whether for treating or preventing flu