Treatment of the Common Cold and Influenza in Children

By Lea S. Eiland, PharmD, BCPS

Upon completing this article, the pharmacist should be able to:
1. Differentiate symptoms of the common cold and influenza in a child.
2. Provide age-appropriate counseling tips for managing cold and influenza symptoms in children.
3. Select appropriate treatment for cough and cold symptoms based upon the age of a child.
4. Recognize symptoms of the novel H1N1 influenza virus.
5. Calculate appropriate doses for antiviral treatment for the child with influenza.

INTRODUCTION

Pharmacists are frequently asked advice for treatment recommendations regarding the common cold and influenza. These respiratory tract infections are commonly seen in the pediatric population. They usually cause mild to moderate symptoms for which patients and parents seek medication for self treatment. Additionally, the pediatric population has been at risk of attaining the novel H1N1 influenza virus, which emerged in April of 2009. The Centers for Disease Control and Prevention (CDC) continues to update treatment recommendations as this situation develops.

Numerous non prescription and prescription products are available for patients to treat the symptoms of these self limiting illnesses. A recent study evaluated the use of medications in 2,857 children 11 years and younger from 1998–2007 and determined a high use of cough and cold medication. In 478 children less than 24 months of age, 10.5 percent of parents reported use of cough and cold medication. There was a 5.9 percent use in children 2 to 5 years of age (n=1000) and 3.5 percent use in those 6 to 11 years old (n=1,379). The majority of medications were combination products. Specifically, pseudoephedrine was the second most commonly used active ingredient in children younger than 2, and fourth most common for those between 2 and 5 years of age and 6 and 11 years. Dextromethorphan was the fifth most commonly active ingredient in those younger than 2 years, and the 2 to 5 year group, and sixth in the 6 to 11 year old group.

Over the past few years, there has been great debate regarding the safe use of cough and cold medications in children. Since 1976, these medications were deemed ‘Generally Recognized as Safe and Effective,’ although pediatric data was lacking. From 2004 to 2005, approximately 1,519 children less than 2 years of age were treated in U.S. emergency rooms for adverse effects, including overdoses of cough and cold medication. Another report determined that approximately 7,091 children younger than 12 seek emergency department care for adverse effects from cough and cold medication annually.

In October of 2007, following case reports of adverse effects and deaths in children and a filed citizen petition, the FDA Pediatric Advisory Committee and Non Prescription Drug Advisory Committee began examining the use of nonprescription cough and cold medication in children. Evidence of greater risks than benefits associated with...
use of these medications resulted in an announcement by the Consumer Healthcare Products Association (CHPA) that manufacturers of cough and cold products for infants and children younger than 2 years of age would voluntarily withdraw these products from the market. In January of 2008, the FDA formally advocated avoidance of cough and cold products in children under 2. In October of 2008, CHPA recommended against the use of cough and cold products in children younger than 4. The FDA is still investigating the use of these products in children age 2 to 11 years. At this time, pharmacists should not recommend cough and cold products for children 4 years of age or younger. For children older, certain medication, such as topical decongestants could be recommended but clear explanations of risks and benefits are warranted.

Clinical differences between the adult and pediatric populations must be appreciated with medical management such as weight based dosing and potential for drug induced adverse effects. For pharmacists, awareness of current evidence and recommendations regarding cold and influenza medications is necessary to provide appropriate care for their pediatric patients. An overview of the common cold and influenza in children will be provided. Clinical efficacy and safety in children will be reviewed with recommendations provided for non prescription and prescription medications in these disease states.

THE COMMON COLD
The common cold is generally known as a viral upper respiratory illness. Children typically have eight to 10 cold infections during the first two years of life. Those attending daycare or have older siblings in school may have additional episodes. Boys tend to have more infections than girls in the first years of life. The common cold accounts for approximately 22 million school day absences per year. More than 200 viruses cause the common cold, with rhinovirus being the most common culprit. There have been more than 100 serotypes of the rhinovirus identified. In the United States, the common cold season increases in the fall, peaks in winter, and decreases in the spring.

Primary transmission of the common cold is via contact with contaminated hands and objects. Rhinovirus can survive on the hands for two hours and on fomites for several days. Self inoculation occurs when a person’s hand is contaminated with the virus and they touch their nose or conjunctival membranes. Viral concentrations are highest in the nasal secretions. Aerosol transmission can also occur but viral loads are not very high in saliva or coughs. Incubation of the virus can be from one to seven days. Viral shedding is occurring during this time and peaks around day two and three of the illness. Typically shedding will cease around day seven or 10, but may continue for three weeks. Children tend to have greater concentrations of the virus and shed for a longer period than adults.

Hallmark symptoms of a cold include sore throat, runny nose, sneezing, and cough. Rhinovirus tends to cause symptoms in that order. However, other symptoms are also associated with the common cold (Table 1). Compared with adults, fever is observed more in children with upper respiratory symptoms than adults, as well as, irritability and decreased appetite. Older children present with symptoms similar to adults. Many patients believe clear mucous is associated with a cold and yellowish/green mucous is diagnostic of a bacterial infection. However, this is not true. Mucous will change from clear to colored and thin to thicker over the duration of a common cold. It typically begins clear, but after two or three days will change to white/yellowish as the immune system is fighting the cold. As the normal bacteria found in the mucous membranes begin to recolonize, mucous tends to turn greenish in color. The common cold is a self limiting illness. Symptoms peak at day three or four and resolve at day seven or 10. However, some patients may experience symptoms up to 14 days. A small number of patients may also develop complications, such as sinusitis (0.5–2 percent) or acute otitis media (20 percent). In one adult study, rhinovirus was isolated and determined as the trigger for 60 percent of asthma exacerbations.

Diagnosis is generally based upon clinical symptoms. Although laboratory methods for identification exist, most are expensive and these diagnostic capabilities do not alter treatment plans. Viral culture is the gold standard of isolation, but a slow reporting of the results
limits its utility. Antigen detection kits may be used for isolating viruses such as respiratory syncytial virus or influenza, but none are able to identify rhinovirus due to the large number of isolates. PCR techniques are available but are very labor intensive for daily practice, and sensitivity issues limit its use.

**Prevention Tips for Parents**
The best way to treat a cold is to prevent catching a cold. Appropriate and frequent hand washing with appropriate technique is encouraged. Place soap dispensers at each sink in the home. Hand sanitizers may also be helpful if soap and water are not available. Sanitizing the home (doorknobs, bathroom handles, toys, objects that are shared) frequently when others are ill, especially children, can decrease viral contamination. Coughing or sneezing into the upper arm, sleeve or tissue is the best practice. Recommend patients to throw the tissue away in the trash after use. Washing hands prior to touching other people or objects after sneezing is important to reduce transmission. This will be challenging with children but teaching a child at a young age these techniques and advocating handwashing is helpful. Avoiding close contact with others who are ill is essential. If feasible, sick children should stay home from school or daycare to decrease the spread of the viral illness to others. Encourage general health practices, such as getting a good night sleep, staying hydrated, eating a well balanced diet, and reducing stress, of which social and academic stress can occur in teenagers.

**When to Refer**
Table 2 lists situations of when to refer infants and children to the physician. Print this list and keep it in your pharmacy. If you as the pharmacist feel uncomfortable with a presentation of an infant or child, it is appropriate to refer as well. When abnormal symptoms are present or last longer than usual, also recommend the patient to be seen by their physician. When an infant or child is not able to be seen by their pediatrician or primary care doctor, it is appropriate to refer them to the emergency room for evaluation.

**Medication Recommendations for the Common Cold**
Management of the common cold is primarily symptomatic. Many people take no medications for a cold but others seek treatment to alleviate symptoms. Hundreds of non prescription and prescription cough and cold preparations are marketed for children and adults. These products are typically combination products that contain an antipyretic, antihistamine, decongestant, antitussives, or expectorant. Clinical efficacy and safety of these agents have been scrutinized over the past few years, especially in the pediatric population. Medications that may be efficacious in adults with a cold may not be beneficial and could cause harm in children. Several trials have demonstrated lack of evidence of these products for use in the common cold, especially in younger children. In addition, a number of products do not have any trials evaluating their use in children. Medication recommendations for relief of cold symptoms in children should be based upon clinical data.

**Antipyretics/Analgesics (Fever, Aches, Pains)**
Fever, defined as a temperature of 100.4 degrees Fahrenheit or higher, is a common symptom in children with a viral infection. The temperature can range from 101–102 degrees F with a cold, and is the body’s natural defense against the infection. Some parents have “fever phobia” and want all temperatures treated
as they feel it is harmful to the child. Fever is the body’s natural adaptive response. Treating fever does not change the course of an infectious process in the body, but may minimize discomfort. In general fever can be thought of as a sign of an underlying cause, usually viral illnesses in children. Rarely do serious complications from fever occur. The American Academy of Pediatrics (AAP) also states that “the primary reason to treat fever is for patient comfort and that complete normalization of the temperature is not necessary and may not be possible.” Antipyretics, such as acetaminophen or ibuprofen, are appropriate treatment options for treating discomfort or symptomatic relief of a fever in a child. Some children with chronic underlying conditions may warrant treatment for the fever specifically.

A recent Cochrane review examined the use of non-steroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen, for the common cold. They determined NSAIDs were beneficial for reducing discomfort or pain associated with a viral illness but were not effective at decreasing the overall symptoms or length of illness. Aspirin products should be avoided in children with viral infections due to the risk of Reye’s syndrome.

Dosing of acetaminophen and ibuprofen in a child is provided in Table 3. Acetaminophen dosed at 15 mg/kg/dose and ibuprofen dosed at 10 mg/kg/dose have been shown equivalence. Some studies found ibuprofen to have a greater and longer clinical effect on reducing fever than acetaminophen. Parents should be instructed not to use more than five doses of acetaminophen or four doses of ibuprofen daily.

Alternating ibuprofen and acetaminophen generally should not recommended due to lack of large, well designed studies showing benefit and safety of this regimen. There is an increase risk of overdosing on one product, if mistakenly administered. In addition, the combination of the two medications can cause hepatotoxicity and renal failure, especially in the dehydrated patient. Many health care providers believe the AAP recommends alternating these products for fever reduction, but no statement exists. They recommend to “exercise discretion” if alternating products is considered. Lastly, recommending two drugs to reduce fever adds to the fever phobia concerns.

Antihistamines (Sneezing, Rhinorrhea)
Antihistamines are theorized to relieve the sneezing and rhinorrhea associated with a cold. Most patients will complain more of the rhinorrhea symptoms versus sneezing. Antihistamine’s anticholinergic effects are hypothesized to provide benefit for the common cold by drying the mucous membranes. Histamine is not an inflammatory marker in the common cold; thus the antihistamine effects are not beneficial. Several first and second generation antihistamines are available on the market today. First generation antihistamines, such as diphenhydramine, hydroxyzine, brompheniramine, chlorpheniramine, and clemastine, produce anticholinergic effects. They also tend to cause more central nervous system adverse effects because they cross the blood brain barrier. The second generation antihistamines, such as loratadine, cetirizine and fexofenadine, lack anticholinergic effects and thus, should not be efficacious for cold symptoms.

Although some adult data may show benefit of antihistamines for reducing rhinorrhea and sneezing associated with the common cold, conflicting reports exist. In general, the antihistamine drug class lacks clinical efficacy for the common cold in children. In 2003, a Cochrane review published results of 35 antihistamine

### Table 2. Guidelines for Referring Patients to Their Physician

<table>
<thead>
<tr>
<th>When to refer patient to their physician</th>
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<tbody>
<tr>
<td>Infant &lt;3 months of age with a rectal temp of &gt;100.4°F or &lt;97.5°F</td>
</tr>
<tr>
<td>Child with an oral temp &gt;102°F</td>
</tr>
<tr>
<td>Infant or child with a temperature more than 2 days</td>
</tr>
<tr>
<td>Infant or child cannot be comforted or is unusually quiet</td>
</tr>
<tr>
<td>Infant or child has had a cold or flu for more than 7 days</td>
</tr>
<tr>
<td>Infant is not feeding or had fewer wet diapers than normal</td>
</tr>
<tr>
<td>Infant or child has had vomiting for more than 12 hours</td>
</tr>
<tr>
<td>Infant or child has had diarrhea for more than 2 days</td>
</tr>
<tr>
<td>Child has severe abdominal pain or cramping</td>
</tr>
<tr>
<td>Infant or child is having rapid or difficulty breathing</td>
</tr>
<tr>
<td>Infant or child experienced a seizure or convulsion recently or upon presentation</td>
</tr>
<tr>
<td>Infant or child has constant ear pain or pulling/tugging at ears</td>
</tr>
<tr>
<td>Infant or child has a skin rash</td>
</tr>
<tr>
<td>Infant or child with a chronic cough</td>
</tr>
<tr>
<td>Infant or child with a ‘bark like’ cough, stridor, or hoarseness</td>
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</table>
randomized controlled trials for cold symptoms in adults and children. They determined antihistamines alone did not significantly alleviate nasal congestion, sneezing or rhinorrhea associated with the common cold in children or adults. Antihistamines also failed to provide a subjective improvement in symptoms in the meta analysis. When only evaluating the first generation antihistamines, some benefit was found reducing rhinorrhea in older children and adults. There was no clear evidence that antihistamines alone were beneficial in young children.

Many clinical studies evaluate antihistamines with decongestants. Trials in preschool and young children found no difference in clinical symptoms with antihistamine/decongestant combinations versus placebo. In older children and adults, antihistamine and decongestant combinations did show overall benefit in three clinical trials. However, the Cochrane authors caution interpretation as the trials were small and two also included an antitussives agent.

Not only do the antihistamines not provide clinical efficacy in children, safety concerns exist. The first generation antihistamines result in more sedation and side effects in patients. In children, antihistamines can commonly cause a paradoxical excitation instead of sedation. This adverse effect needs to be emphasized to parents. Children can experience other CNS excitatory effects also. Antihistamines should also not be recommended as a sleep aid for patients with cold symptoms. In addition, the pediatric death section below will detail further concerns of cough and cold products, specifically listing example with antihistamine products.

Antihistamines in general should not be recommended for young children. Alone, an antihistamine has not been proven to have clinical improvement for cold symptoms in children or adults. In some older children and adults, a first generation antihistamine has shown mild improvement in rhinorrhea only. Antihistamines in combination with decongestants have also demonstrated some improvement in adolescents and adults, but not younger children.

Decongestants/Saline (Nasal Congestion/Rhinorrhea)
Decongestants are sympathomimetics that cause vasoconstriction, thus decreasing nasal congestion. Pseudoephedrine and phenylephrine are systemic decongestants available as non prescription products; however, due to the rise in illegal methamphetamine production, pseudoephedrine is regulated behind the pharmacy counter. Some states have moved pseudoephedrine to a prescription status only, and possible national legislation is under discussion at this time. This could leave phenylephrine as the only oral decongestant available over the counter, as phenylpropanolamine was removed from the market in 2000 due to an increased risk of stroke in women. No studies of oral decongestants for the common cold are available in children. However, hypertension in a 5 year old female due to oral phenylephrine has been documented in a case report.

Oxymetazoline, naphazoline, phenylephrine,

Table 3. Medication Dosing for the Common Cold in Children

<table>
<thead>
<tr>
<th>Medication</th>
<th>Indication</th>
<th>Age</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaminophen</td>
<td>Analgesic/Anti-pyretic</td>
<td>All ages</td>
<td>10–15mg/kg/dose every 4–6 hours, maximum of 5 doses daily</td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>Analgesic/Anti-pyretic/Anti-inflammatory</td>
<td>&gt;6 months of age</td>
<td>5–10mg/kg/dose every 6–8 hours, maximum of 4 doses daily</td>
</tr>
<tr>
<td>Saline Drops/Sprays</td>
<td>Congestion</td>
<td>All ages</td>
<td>Drops: 2–6 drops in each nostril 4–6 times daily; Sprays: 2 sprays in each nostril 4–6 times daily</td>
</tr>
<tr>
<td>Oxymetazoline 0.05%</td>
<td>Nasal decongestant</td>
<td>&gt;12 years of age</td>
<td>2–3 drops/sprays in each nostril every 12 hours</td>
</tr>
<tr>
<td>Naphazoline 0.05%</td>
<td>Nasal decongestant</td>
<td>&gt;12 years of age</td>
<td>1–2 drops/sprays in each nostril every 6 hours</td>
</tr>
<tr>
<td>Phenylephrine 0.25%–0.5%</td>
<td>Nasal decongestant</td>
<td>&gt;12 years of age</td>
<td>2–3 drops/sprays in each nostril every 4 hours</td>
</tr>
<tr>
<td>Tetrahydrozoline 0.1%</td>
<td>Nasal decongestant</td>
<td>&gt;12 years of age</td>
<td>2–4 drops/sprays in each nostril every 3–4 hours</td>
</tr>
<tr>
<td>Xylometazoline 0.1%</td>
<td>Nasal decongestant</td>
<td>&gt;12 years of age</td>
<td>2–3 drops/sprays in each nostril every 8–10 hours</td>
</tr>
</tbody>
</table>
tetrahydrozoline and xylometazoline are nasal (topical) formulations. Nasal decongestants have been utilized for the common cold, but efficacy varies according to age. A Cochrane review found that one dose of a nasal decongestant produced a “modest effect” for short term congestion in adults. Some patients who used it for three or four days also reported benefit. However, data for children 12 and younger was insufficient and thus, nasal decongestants were not recommended for this age group. Additionally, concerns for nasal rebound congestion is warranted in young children, as infants 6 months of age and younger rely on nasal passages for breathing. If nasal decongestants are utilized in older children or adults, treatment should only be for three to five days to prevent rebound congestion. Chronic use of topical decongestants can also cause a chronic rhinitis. Some children may have a difficult time with administering a nasal formulation, so this must be considered prior to recommending. Most infant formulations were removed from the market, but some are still available. However, data is lacking for using topical decongestants in children younger than 12 years.

Saline sprays or drops can be used as an alternative to decongestants. They are safe in all ages and can be used for longer periods of time. Studies comparing nasal decongestants and saline found no difference in clinical respiratory scores in children less than a year old. Many of the manufacturers of prior topical decongestant products removed from the market are now making saline drops or sprays with the same brand name. Drops can be used in infants and sprays are an easy dosage form for children to use. Nasal suctioning with bulbs is recommended to use in younger patients as they are not able to clear their nose on their own. Using saline prior to suctioning can relieve congestion temporarily in infants. Suctioning is recommended prior to each feeding and bedtime. Greater frequency and aggressive suctioning may cause irritation to the nasal membranes and result in nose bleeds. Placing petroleum jelly around the nostrils can protect the skin from irritation. Saline sprays or drops are a safe and appropriate recommendation for congestion relief in all children.

Antitussives (Cough)
A cough is a natural response of the body but can also be one of the most disturbing symptoms of a cold. It can decrease the sleep of patients and parents and lead to frustration. Coughing is the body’s way of expelling secretions to maintain airway patency. Two types of medication are available as antitussive agents: narcotics and non narcotics. Narcotic medications include codeine and hydrocodone and are only available by prescription. They act on the medullary cough center in the brainstem and have the potential to cause respiratory depression and other adverse effects. Dextromethorphan is the non narcotic available over the counter. It is a narcotic analog which can cause respiratory depression in overdose. Most antitussives are combined with other ingredients in cold medications; however, single agent products are available. In addition, many of these products are elixirs, which can contain up to 25 percent alcohol by volume. Elixirs should be avoided in children, if possible. Cough medicine should also be avoided in patients with asthma as it is more difficult to cough up mucous. It is important to remember that coughs associated with the common cold are typically short lived.

Clinical efficacy studies of narcotics and non narcotics have shown no benefit versus placebo in clinical trials in children. Deaths and respiratory depression warranting mechanical ventilation have been reported in children from codeine toxicity. Overdoses with dextrometho-

<table>
<thead>
<tr>
<th>Table 4. Pediatric Clinical Pearls for Common Cold</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Irritability and decreased appetite are more common symptoms in younger children.</td>
</tr>
<tr>
<td>• Acetaminophen or ibuprofen may be used for discomfort.</td>
</tr>
<tr>
<td>• Saline drops or sprays and nasal bulb suctioning can relieve congestion temporarily</td>
</tr>
<tr>
<td>• Cough and cold products should not be recommended for children 4 years of age or younger</td>
</tr>
<tr>
<td>• Nasal decongestants have conflicting evidence, but may be used for the common cold in children older than 12 years of age</td>
</tr>
<tr>
<td>• First generation antihistamines combined with a decongestant may have efficacy in adolescents</td>
</tr>
<tr>
<td>• Oral decongestants, antitussives, expectorants and antibiotics are not efficacious for the common cold or safe in the pediatric population and should not be recommended.</td>
</tr>
<tr>
<td>• Adequate fluid intake and cool mist humidifiers can assist with thinning secretion.</td>
</tr>
</tbody>
</table>
rphan have led to behavioral changes and respiratory depression in children as well. In 1997, the AAP stated that indication of the use of these agents in children was not established. Pediatric studies are lacking for antitussive agents and the adverse effect risk outweighs any benefit. The AAP recommends administering fluids and humidity for symptom relief of a cough. In addition, a Cochrane review found no evidence to support the use of nonprescription cough medicine in children. In 2006 the American College of Chest Physicians (ACCP) stated that no clinical evidence existed that supported the use of nonprescription antitussives or expectorants for cough relief. They recommended against the use of non prescription cough medication in children 14 and younger. In general, cough medications lack efficacy in children and have the potential of adverse effects. These agents should not be recommended in children.

Volatile oils, such as camphor, menthol or eucalyptus are topical or lozenge antitussives agents. Topical products, available in ointments or patches, are usually applied to the chest or throat area. Infant formulas are also marketed today with ingredients such as lavender, eucalyptus or rosemary. The oils are thought to provide inhaled vapors which stimulate sensory nerve ending in the nose and mucosa, which provide a local anesthetic and thus a feeling of improved airflow. Camphor and menthol ointment or solution products are toxic if ingested. Minor toxicity includes burning sensation in the mouth, nausea, vomiting, or headache. However, case reports of seizures and deaths have been seen in the pediatric population. Caution is also warranted with the patches as reports of children chewing on the product have lead to seizures as well. Several patch products have been removed from the market for this reason over the past few years. No clinical trials are available regarding use in children.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Age</th>
<th>Treatment Dose (5 Days)</th>
<th>Prophylaxis Dose (10 Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oseltamivir (Tamiflu)</td>
<td>&lt;3 months</td>
<td>12 mg BID</td>
<td>Not recommended</td>
</tr>
<tr>
<td></td>
<td>3–5 months</td>
<td>20 mg BID</td>
<td>20 mg Daily</td>
</tr>
<tr>
<td></td>
<td>6–11 months</td>
<td>25 mg BID</td>
<td>25 mg Daily</td>
</tr>
<tr>
<td>Children 1–12 yr:</td>
<td>≤15 kg</td>
<td>30 mg BID</td>
<td>30 mg Daily</td>
</tr>
<tr>
<td></td>
<td>&gt;15 to ≤23 kg</td>
<td>45 mg BID</td>
<td>45 mg Daily</td>
</tr>
<tr>
<td></td>
<td>&gt;23 to ≤40 kg</td>
<td>60 mg BID</td>
<td>60 mg Daily</td>
</tr>
<tr>
<td></td>
<td>&gt;40 kg</td>
<td>75 mg BID</td>
<td>75 mg Daily</td>
</tr>
<tr>
<td>Zanamivir (Relenza)</td>
<td>≥13 years</td>
<td>75 mg BID</td>
<td>75 mg Daily</td>
</tr>
<tr>
<td>Oseltamivir alternate dosing based upon weight: &lt;9 months: 3 mg/kg/dose twice daily &gt;9 months: 3.5 mg/kg/dose twice daily</td>
<td></td>
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<tr>
<td>Oseltamivir requires dose reduction when renal dysfunction is 10–30%</td>
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**Table 5. Dosing of Recommended Antiviral Agents for Influenza**

**Expectorants (Cough)**

Expectorants are meant to thin secretions, thus making secretions easier to expel. Guaiifenesin is the expectorant available over the counter. No controlled studies in children are available. Expectorants should not be recommended due to lack of evidence and the previous ACCP statement. Water is a natural expectorant. Staying adequately hydrated will assist with thinning secretions. Recommend that patients drink plenty of fluids when ill.

**Combination Products**

Antihistamines and decongestants are commonly marketed together, mostly for allergy symptoms, but many products are advertised to patients with the common cold. A Cochrane review also examined combinations of antihistamines and decongestants in adults and children with the common cold. Younger children had no benefit from these medications. Some older children and adults experienced beneficial results in overall improvement and nasal symptoms. However, a decongestant alone may
be able to provide the same relief without the potential adverse effects of an antihistamine.

Antitussives and expectorants may also be found marketed together. However, combinations of these two products may actually work against each other based upon mechanism. If expectorants are thinning the mucous so it can be expelled and antitussives are suppressing the cough, neither can optimally benefit the patient. Due to both products lacking evidence in children, they should not be recommended in combinations either.

Combination products may have two or more different medications in a single product. It is common to find a product with four different medications. Many of the non-prescription combination products have the same main ingredients so labels should always be doubled checked and not based upon the product name. Confusion can also exist between products due to names, labels and products. Combination products should not be advocated over single ingredient products. Combination products can cause more adverse effects and lead to unnecessary treatment with additional medications. In addition, the symptoms of a common cold tend to peak at different times during the illness. Single ingredient products allow the patient to maximize treatment of the specific symptom when needed.

**Antibiotics**

As the common cold is viral in nature, antibiotics are not warranted for routine treatment. Antibiotics are only effective against bacteria of which do not cause a cold. The use of antibiotics for viral illnesses only increases antibiotic resistance to bacterial pathogens. Thus, the antibiotic may not work when needed in a child. In addition, antibiotics can cause adverse effects such as diarrhea and an upset stomach which can make the child feel worse from a medication that is not indicated. Antibiotics may be utilized for specific treatment if a secondary bacterial infection develops and is diagnosed.

**Herbals**

Numerous herbal products have been evaluated for the common cold: vitamin C, echinacea, and zinc. However, scarce data exists in children. Several trials have evaluated vitamin C for prophylaxis of the common cold in children. A Cochrane review determined children who were administered vitamin C prophylactically had an overall 13.6 percent reduction in symptoms if they developed a cold. However, larger doses were required and diarrhea, nausea and vomiting are dose related adverse effects of vitamin C. No clinical trials have evaluated vitamin C for treatment of the common cold in the pediatric population.

Echinacea has also been evaluated for effectiveness in colds. One initial study in 401 children (2 to 11 year olds) determined that echinacea administered during the first upper respiratory infection decreased a subsequent upper respiratory infection by 28 percent \((p=0.01)\). However, a Cochrane review of adult and pediatric data found that no difference existed between echinacea and placebo in regards to prevention of a cold. The study also found conflicting data for treatment of symptoms. Nine of the studies showed benefit of echinacea over placebo, but six of the studies found no difference. A large pediatric trial \((n=407 \text{ children}, 707 \text{ infections})\) found no difference between echinacea and placebo in treating symptoms, but reported that 7.1 percent of patients in the echinacea group experienced rashes. No standard dose for children has been determined.

Zinc is available in various products and dosage forms. Zinc sulfate is an oral formulation and zinc gluconate glycine is a lozenge. Two oral zinc sulfate studies have varying outcomes for its use in colds. Both trials found a reduction of severity of symptoms with zinc use during an infection. However, the duration of symptoms was reduced in one study but not in the other. The study which found positive results for both outcomes had patients take zinc prophylaxis for up to seven months and then doubled the dose to 30 mg during an acute viral infection. The efficacy of zinc lozenges has conflicting results, but most studies show a 1–2 day reduction in the duration of symptoms when used in adolescents. Prophylactic administration also demonstrated a decrease in viral infections. Zinc must be administered multiple times daily and adverse effects such as bad taste, mouth irritation, diarrhea, and nausea may limit its use.
Humidifiers
Humidifiers can add moisture to the room and thus thin secretions and relieve irritated nasal passages. No clinical studies of the use of steam or cool air for nasal congestion have been completed in children. Heat or steam humidifiers can cause burns if a child overturns the device, so caution is warranted. Cool mist humidifiers are available today and do not have this concern. However, cool mist humidifiers can breed bacteria so proper routine cleaning is essential. They can also spread minerals from the water into the air so distilled water could also be utilized to decrease this effect. There are several types of cool mist humidifiers. Humidifiers can be used in child’s room, close to the sleeping area. More benefit from humidifiers may be seen in drier climates.

Pediatric Deaths Related to Cough and Cold Medication
Several reports have documented death in pediatric patients related to cough and cold medication use. The Morbidity and Mortality Weekly Report of the Centers for Disease Control and Prevention reported that in 2005, three infant deaths (6 months and younger) were due to ingestion of cough and cold products. Specifically, toxic levels of pseudoephedrine were found in all three infants. Dextromethorphan was found in two of the infants’ blood; one infant also had blood levels containing doxylamine. One infant had been administered prescription and nonprescription pseudoephedrine products concomitantly. An Arizona study examined unexpected deaths in infants during 2006. They found 10 deaths were associated with cough and cold products. The patients were 17 days to 10 months of age and autopsies determined “recent administration” of pseudoephedrine, antihistamines, dextromethorphan, and/or other cough and cold combination products. Only one patient had been prescribed the medication by a physician, and only four patients had received medical care for symptoms. Interestingly, two patients had been administered ambroxol, a mucolytic not available in the United States. A case series of 15 infant deaths (age 16 months and younger) was detailed by the Philadelphia medical examiner’s office. They found pseudoephedrine as the sole drug in three patients. However, it was present in all cases. Other cases also had dextromethorphan (n=5), carbinoxamine (n=4), chlorpheniramine (n=2), brompheniramine (n=1), and doxylamine (n=1). Most of the case evaluations determined toxicity as the direct cause of death or contributing factor. Another evaluation of 10 infant deaths (12 months of age and younger) that occurred in Ohio during an eight month time frame determined that cough and cold medications (single ingredient or combination) were the cause of death or contributed to the cause of death in six patients.

More recently, a Denver Poison and Drug Center reported 118 deaths in children younger than 12 that were “definitely, likely or possibly” associated with cough and cold ingredients. One hundred and three of the cases implicated non prescription products, of which 21 cases involved non-prescription and prescription medications. Eighty-eight percent of the cases involved an overdose of medication. Only 15 cases involved a sole prescription medication. Of note, 75 percent of cases were in children younger than 2. Pseudoephedrine, diphenhydramine, and dextromethorphan were the three most common ingredients found in the cases. Another case series reported death in a 9-month old child due to toxic ingestion of multiple nonprescription cough and cold ingredients. They also reported adverse effects such as persistent tachycardia and altered mental status in two children (age 3 years and 35 months) due to administration of cough and cold products. Both children’s symptoms resolved in time. An additional case report provided information regarding the death of a 1 year old that was chronically administered brompheniramine and phenylpropanolamine for sedation. An evaluation of the National Association of Medical Examiners’ Pediatric Toxicity Registry from 1985 to 1993 found 18 cases of death in children between the ages of 6 weeks to 12 months. Two cases were due to drug overdose, one with brompheniramine, and one with brompheniramine and pheniramine. Two were suspicious of death due to brompheniramine. In 15 other cases, sudden infant death syndrome was determined the cause of death, but pheniramine was found in 14 of the cases. Brompheniramine plus pheniramine was found in the other case. One patient died due to Reye’s syndrome, but pheniramine...
was also found in the patient’s system. These reports detail multiple deaths in children due to cough and cold medication use. The poison control center (800–222–1222) can be of service if a parent inquires about intentional or unintentional ingestions. Referring a patient to the emergency room is also warranted for any type of overdose situation.

**Pediatric Consideration in Medication Administration**

Appropriate administration of medications is essential in pediatric patients. Proper dosing devices should be utilized based upon the age of the patient. The household teaspoon or tablespoons should never be utilized as amounts vary per spoon. Infants should be provided medication by an oral syringe. Children may use a dosing spoon or graduate to a dosing cup once able to appropriately drink from a cup. The oral syringe, dosing spoon and cup all provide markings for dosing, either in milliliters or teaspoon markings. Many devices have both measurement markings. Pharmacists should provide these devices to the parent and counsel them on appropriate use. The products are also available for purchase at most pharmacies if not distributed with the prescription. The pharmacist can also mark the syringe or dosing spoon at the appropriate dose line for the individual medication. It is wise to discard the oral syringes after course completion of the medication as washing the device can destroy the rubber tip and impact dosing. Many nonprescription liquids come with their own cup or built-in dropper. It is important to emphasize that the device for that product should only be used with that product. Appropriate use of an oral administration device is imperative for accurate dosing of medication in children. Emphasize to the parent not to use household teaspoon or tablespoons for administration.

**Summary**

In general, the common cold is a self-limiting illness that is optimally managed with supportive care such as rest and adequate fluid intake. Saline drops or sprays provide temporary relief of congestion in infants and children. Deaths and adverse effects have occurred in infants and young children due to the administration of cough and cold medications. All cough and cold preparations should be avoided in children younger than 4. Nasal decongestants may be considered in children older than 12, but efficacy is conflicting. Antihistamines and cough medications (antitussives and expectorants) should be avoided in young children due to adverse effects and lack of efficacy. Antihistamine and decongestant products may show some benefit in adolescents. Overall, the lack of efficacy data in the pediatric population limits recommending these products for management of the common cold. Caution should be used if administered to those older than 4 years of age. Recommending acetaminophen or ibuprofen for discomfort and saline drops or sprays for congestion is a safe and efficacious option. Pharmacists need to educate parents and patients on the risk and lack of benefit of nonprescription medications for treatment of the common cold.

**INFLUENZA**

Annually, 5 percent to 20 percent of the total U.S. population becomes ill with the flu. This respiratory illness is caused by the influenza virus, which has numerous strains. Usually, the flu causes mild to moderate symptoms, but sometimes severe symptoms occur. More than 200,000 people are hospitalized each year due to complications from the viral infection. Unfortunately, approximately 36,000 people die each year from the flu. Younger children, the elderly, and individuals with certain chronic health issues are at a higher risk for complications. The optimal way to prevent getting the flu is to get vaccinated with the influenza vaccine annually. Each year the vaccine is altered to cover the most likely strains that will cause disease in the United States. In 2009, a new strain emerged, the novel H1N1 virus, or “swine flu” as originally called. This virus has affected people worldwide, generating a pandemic and causing more illness than the usual seasonal influenza.

**Seasonal Influenza**

Influenza viruses are typed as A, B or C. Only the A and B strains cause disease in humans. Typically the A strains are responsible for the regular, seasonal activity, and B strains tend to cause random outbreaks. The A viruses are classified as subtypes based upon the hemagglutinin and neuraminidase surface antigens.
The B viruses are not categorized. Understanding the classifications of influenza viruses and antigen assists with understanding the vaccine. The hemagglutinin allows the virus to enter the host cell. Antibodies then form against this major antigen upon exposure. The neuraminidase allows the host cell to release new viral particles. When a point mutation occurs in the hemagglutinin and/or neuraminidase, it is called an antigenic drift. As a result, the seasonal influenza vaccine changes annually. The CDC predicts which virus will impact the United States and the vaccine is developed to protect against those strains. This is also the reason there is susceptibility each year to the new strains of influenza. Immunity to all subtypes does not occur in humans after one illness. Antigenic shift, by comparison, occurs when the virus acquires a new hemagglutinin and/or neuraminidase through genetic reassembly. The Spanish Flu of 1918, Asian Flu of 1957, and Hong Kong Flu of 1968 are some examples of antigenic shifts.

Influenza is spread to others by respiratory secretions or droplets, usually person to person exposure through coughing and sneezing. Transmission can also occur by contact with contaminated objects and then touching the mouth or eyes. Young children are naturally touching their faces, other objects and people and thus, spreading viruses easily. The incubation period is one to four days. Viral shedding can begin one day prior to the signs of symptoms and last for five to seven days. Children can shed the virus for longer than 10 days. Symptoms should resolve in three to seven days, but malaise and coughing may linger for two weeks. Influenza can occur at any time during the year, but the highest rates are typically during the winter season in the Northern hemisphere. The majority of influenza peaks have occurred after January in the United States. The CDC monitors influenza activity year round and produces weekly reports from October to May.

Symptoms of the flu include a high fever (100–104 degrees F), headache, muscle aches, malaise, dry cough, sore throat and runny nose. Table 1 compares the difference of symptoms between the flu and a cold. Children are more likely to experience nausea, vomiting, and diarrhea with the illness. Young children, pregnant women, patients with chronic medical conditions, and patients older than 65, are more likely to have complications from the flu. Complications of the seasonal flu can include bacterial pneumonia, otitis media or sinusitis. Deaths from influenza usually are due to a secondary pneumonia or exacerbation of underlying diseases, such as asthma, diabetes, or heart failure.

Influenza is easily diagnosed with rapid antigen and point of care testing. These less expensive methods provide quick results, usually within one hour. They are obtained by nasal swabs. Most tests identify influenza A or B as positive or negative. Exact strains are not determined. Viral culture is the gold standard diagnostic test which will identify subtype and strain. However, cultures can take up to a week for results, which limits its utility. The majority of the time, diagnosis is based on clinical symptoms. Testing may be completed but will not always change the treatment plan.

H1N1 Strain
A novel H1N1 strain was first detected in April of 2009 with 248 pediatric deaths attributed to it through early January 2010. This new strain resulted in persistent cases of infection through the summer and early fall months with 47 states experiencing widespread activity at the end of October 2009. As of early 2010, frequency of cases has subsided, but the virus continues to be a public health concern. Originally called the “swine flu” due to genetic similarity to pigs, further studies have determined the H1N1 strain actually has porcine, avian, and human gene components. Thus, the strain is now simply called the “novel H1N1” or just “H1N1” strain. While the H1N1 strain is contagious to humans and has caused hospitalization and death in patients, most people have had a mild illness and have not required medical care or antiviral agents. Children younger than 5 years of age are more likely to develop complications of the flu. Symptoms are similar to those of the seasonal flu; however, reports of respiratory symptoms without fever have occurred. Also, the H1N1 strain has been associated with more vomiting and diarrhea compared with the seasonal flu.

Ten percent to 70 percent of rapid acting tests may be able to determine the H1N1 virus. Most may only be able
to detect an “A” subtype; further lab testing can determine the specific strain. When the virus was originally detected, many state labs would examine the A positive subtypes for the H1N1 virus. Once the viral infection was widespread, many state labs ceased this activity and only examined samples from hospitalized patients or those who died.

Recent reports state that children younger than 5 and children with neurological and neuromuscular dysfunction are at a higher risk of complications from the H1N1 flu. Severe complications are the highest in children younger than 2. Although risk factors are important, 40 percent of children who have been hospitalized with H1N1 have no risk factors. Thus far, the highest hospitalization rates have been for newborn children and those up to age 4. In general, children have been hospitalized more than adults. From April to early December, there were 224 pediatric deaths due to a laboratory confirmed H1N1 infection. There have also been 41 other deaths related to influenza in children, but the viral subtype was not determined. Two deaths have occurred from the seasonal flu.

**Infection Control**

Preventing the spread of influenza is important for decreasing transmission to others. All of the methods described in the common cold section for infection control are also applicable for the influenza. The best way to prevent catching the flu is to vaccinate against the flu yearly. High risk groups should especially be encouraged to receive the vaccine.

**Treatment**

Most people who become ill with influenza will recover without treatment. Symptomatic care, such as acetaminophen or ibuprofen for aches, discomfort and fever, can be recommended. Appropriate hydration and sleep is important. Antibiotics are not warranted as influenza is a viral illness. Antiviral agents may be utilized if initiation is within 48 hours of symptoms appearing, but are only effective at decreasing symptoms by one day. Ideal initiation is within 12 hours of symptoms. However, if a patient is hospitalized, some data demonstrates a decrease in mortality and hospitalization if antiviral therapy is started after 48 hours. Treatment may begin empirically after symptom recognition. Laboratory confirmation is not required for initiation of medications. The AAP recommends treatment in children who are at a high risk for influenza complications and in those who have moderate to severe disease. Most clinical studies of the antiviral agents have been conducted in generally healthy children. However, this should not limit use in patients with underlying diseases, as they may be at a higher rate for potential complications.

**Antivirals**

There are two classes of antiviral agents that are used for influenza: adamantanes and neuraminidase inhibitors. The adamantane class includes amantadine (Symmetrel) and rimantadine (Flumadine). Amantadine and rimantadine are oral agents only active against influenza subtypes A. Both are approved in children age 1 year and older. However, during the 2005–2006 influenza season, the majority of the influenza A strains became resistant to the adamantane class. Thus, the CDC recommended against the use of these agents for influenza A infections. The 2009 novel H1N1 strain has also tested resistant to amantadine and rimantadine. The lack of efficacy against influenza has limited the use of the adamantane class today.

The two neuraminidase inhibitors are oseltamivir (Tamiflu) and zanamivir (Relenza). They are currently used for treatment and prevention of influenza A and B infections, as well as the H1N1 virus. As of October 2009, 99 percent of the H1N1 strains were sensitive to both neuraminidase inhibitors. Dosing is available in Table 5. Oseltamivir is an oral, systemic antiviral agent approved for use in children 1 year and older. It is not indicated in children under 1 due to concerns of central nervous system adverse effects in rats. However, due to the influenza pandemic, the CDC issued an emergency use authorization of oseltamivir which provided dosing regimens for infants younger than 1. Common adverse effects of oseltamivir include vomiting, nausea and abdominal pain. Of note, oseltamivir has a precaution of neuropsychiatric events such as delirium, hallucinations, and self injury in the pediatric population. The
The majority of reports were in Japan where the drug is used more frequently. Oseltamivir has demonstrated a reduction in clinical illness, viral shedding, fever and incidence of otitis media in children between the ages of 1 and 12 with influenza. Zanamivir is an inhaled agent which works locally in the lungs and is indicated for children older than 7. It also has been shown to decrease the duration of influenza symptoms in children. The inhaled dosage form of zanamivir limits its use in young children. Additionally, patients with bronchospasms should avoid this agent due to changes in lung function when used. Adverse effects of zanamivir include headache, throat pain, and nasal symptoms. Increased risk of seizures, abnormal behavior and confusion has also been seen when used in the pediatric population. Although zanamivir is a powder for inhalation, it should not be nebulized or reconstituted in a liquid formulation. No generic formulations are available for either anti-viral agent. Both drugs have also been proven to prevent symptomatic influenza in children when exposed to a known case.

As stated earlier, most people with the flu will not require medication treatment. Due to the epidemic of the H1N1 virus, the CDC has revised prophylaxis and treatment recommendations. In general, high risk patients are prioritized for treatment. This includes patients with severe symptoms, hospitalized patients, those at high risk (younger than 2, older than 65, pregnant, immunosuppressive disorders, and chronic medical conditions) and children who are receiving long term aspirin therapy. However, a physician can treat anyone based upon clinical judgment. The recommended duration for treatment is five days. Prophylaxis is only recommended by the CDC for limited groups in certain situations. They are health care personnel, public health workers, and first responders who have known unprotected exposure to a person with the virus. Children do not fall into any of the prophylaxis categories per the CDC. Prophylaxis is also not recommended for healthy children and adults who have general exposure. The AAP recommends only considering prophylaxis in the following groups: high risk children who have not been immunized or have been immunized fewer than two weeks, non-immunized health care providers and family members who are taking care of children less than 6 months of age, or non-immunized children, and non-immunized children and staff in an outbreak. The recommended duration of prophylaxis is 10 days. Treatment and prophylaxis guidelines may change again once the seasonal flu has emerged for this year. Current recommendations can always be found on the CDC Web site.

Capsules and a suspension are available dosing forms for oseltamivir. However, due to the H1N1 pandemic, the commercially available suspension was placed on backorder in September 2009. The CDC’s Strategic National Stockpile had oseltamivir for the purpose of a national flu outbreak. Expired lots of the solution in the stockpile passed efficacy testing and were released by the FDA to assist with the nationwide shortage. The manufacturer of oseltamivir announced that in December 2009, appropriate amounts of the commercially available solution and small capsule doses should be available to meet the prescribing demand. However, opening the capsule and mixing with sweetening liquids, such as chocolate syrup, is acceptable for administration. Additionally, an oral suspension can be compounded (15 mg/mL) using the capsules, but it is a different concentration than the commercially available suspension (12 mg/mL). Compounding instructions can be found in the dosing and administration section in the oseltamivir package insert. Additional confusion has occurred as the commercially available suspension comes with its own dosing syringe that is labeled in milligrams. Oral syringes that should be provided from the pharmacy for patient use are calibrated by volume. Dosing errors have occurred due to the differences in concentration and confusion in milligram and milliliter dosing. Pharmacists should verify the correct dose and explain the device when dispensing the suspensions.

Vaccines
Seasonal and H1N1 influenza vaccines are available. Both live attenuated and inactivated versions are manufactured for use in children and adults. Concerns regarding the H1N1 new vaccination have spread quickly through the public. However the CDC is trying to educate the public regarding the vaccine development process to
minimize concerns. First, the H1N1 vaccination is being made by the same manufacturers, in the same locations, and on the same timeline as the seasonal flu vaccine. Second the H1N1 is not a completely new vaccine. Its base is the same seasonal influenza base with a different strain and it is produced the same way as the seasonal influenza vaccine. Patients who have an egg allergy should not be administered any influenza vaccine as the inactivated and live vaccines are made from chicken embryos. Patients with past complications of Guillain Barre syndrome from the vaccination or other severe reactions to the vaccine should not be immunized. Patients who received the 1976 swine influenza vaccination should still be administered the 2009 H1N1 vaccine as full immunity from the prior vaccine is unlikely.

The seasonal influenza vaccination should be administered to the following groups: children age 6 months to 19 years, adults older than 50, pregnant women, patients with chronic illnesses, patients who live in nursing homes or long term care facilities, health care workers and household contacts who care for those at high risk of the flu or are less than 5 years old (emphasizing those caring for infants less than 6 months of age). Any other patients who request the vaccination and do not have contraindications should be provided the immunization if supplies are available. The availability of the seasonal influenza vaccine depends on your area. Patients 9 or younger who have never received the influenza vaccination before should be administered a second dose (same amount) one month after the first dose. All other patients receive one dose annually.

The H1N1 vaccination should be targeted to the following groups: children 6 to 24 months of age, people who live with or care for children less than 6 months old, pregnant women, health care and emergency care providers and adults between the ages of 25 and 64 with chronic illnesses or compromised immune systems. Because of the concerns with the pediatric population, children younger than 5 with chronic conditions, and those 2 to 4 years old should also receive the vaccine when in short supply. The H1N1 vaccine is being distributed by CDC. Most states developed a plan on dispersing the vaccine through providers to patients in the state. Vaccines are being shipped as they become available. Supply information can be found at the CDC’s Web site. Children 10 and older will only require one vaccination with the H1N1 vaccine. Younger children will require two vaccinations, ideally one month apart. However, an interval of 21 days is sufficient. The CDC states that if a patient had laboratory confirmed H1N1 by “RT PCR” (real time reverse transcriptase polymerase), then the patient may choose not to receive the H1N1 vaccine. However, most patients who have been ill with flu like symptoms will not know if they specifically had the H1N1 strain. They probably know they were flu A positive with assumed H1N1. The CDC recommends that patients who were ill but did not have H1N1 specifically diagnosed should still receive the H1N1 vaccine.

The inactivated vaccines (seasonal and H1N1) are intramuscular injections approved for use in infants 6 months of age and older. Patients who are 6 months to 35 months should receive 0.25 mL of the vaccination. Those 3 and older should receive 0.5 mL. Adverse effects primarily include local reactions such as tenderness and redness at the injection site. It takes two weeks for antibodies to develop in the system after the inactivated vaccination. Many people claim “the flu shot gave me the flu,” but if a patient develops it within two weeks of administration, they were more likely exposed to the virus prior to vaccination and antibody development. Viral infections cannot be acquired from an inactivated vaccine.

The live attenuated vaccines (seasonal and H1N1) are intranasal inhalations approved for use in patients between 2 and 49 years old. Pregnant women, patients with asthma, bronchospasms, or wheezing, and patients in close contact with immunocompromised patients should not receive the live vaccination. The dose for all patients is one spray (0.1 mL) in each nostril. The dosage form comes prepared where one syringe provides the dose for both nostrils. Common adverse effects are runny nose and nasal congestion. Many people state they feel the liquid running down the back of their throat after administration.

Patients can receive both inactivated seasonal and H1N1 vaccinations at the same time. A live
and inactivated vaccine can also be administered at the same time. However, both live H1N1 and seasonal vaccinations cannot be administered at the same visit. Antiviral medications should not be administered less than 48 hours prior to administration, or two weeks after administration of the live vaccination. Antivirals can be administered at the same time of the inactivated vaccination. It is important to emphasize that both vaccines should be given to patients as one infection does not confer immunity to the other virus. The CDC is monitoring this data as it becomes available.

SUMMARY
Influenza is a common respiratory infection typically acquired during the winter months. A novel influenza strain has emerged this year causing a pandemic. Influenza vaccinations are available for both the seasonal and H1N1 influenza this year and are recommended for all children without contraindications to the vaccine. Priority groups exist for allocation during a shortage of vaccinations. Treatment is warranted in high risk patients with oseltamivir or zanamivir.

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CONTINUING EDUCATION QUIZ
Select the correct answer.

1. According to the Consumer Healthcare Products Association, non-prescription cough and cold medications are not recommended in what age group?
   a. Under 2 years of age
   b. Under 4 years of age
   c. Under 8 years of age
   d. Under 12 years of age

2. Which of the following is/are symptom(s) of the common cold?
   a. Cough
   b. Sneezing
   c. Sore throat
   d. All of the above

3. JD is an 8-year-old child diagnosed with the common cold. He has had asthma for five years and is a very active child. His mother comes to the pharmacy and asks about medication to help his congestion. Which of the following do you recommend for JD?
   a. nasal phenylephrine
   b. oral pseudoephedrine
   c. nasal saline spray
   d. no recommendations

4. LC is 5 years old and has experienced four days of symptoms (cough, sneezing, and congestion) of the common cold. Which of the following can you recommend for symptom management?
   a. Diphenhydramine
   b. Pseudoephedrine
   c. Amoxicillin
   d. None of the above

Questions 5–6 are the same patient case:

5. CY is a 9-month-old female infant who is diagnosed with the common cold. Which of the following cold symptoms are more likely to be seen in an infant like CY versus an adult with a cold?
   a. Irritability
   b. Cough
   c. Sneezing
   d. All of the above are correct

Editor’s Note: To obtain the complete list of references used in the article, contact Chris Linville at NCPhA (703-838-2680) or at chris.linville@ncpanet.org.
6. CY is experiencing symptoms of fever, congestion and sneezing. Her mother asks for a recommended acetaminophen dose for CY. CY weighs 18 pounds. Which of the following is correct?
   a. 80 mg/0.8 ml, 0.6 ml (60 mg)
   b. 80 mg/0.8 ml, 0.4 ml (40 mg)
   c. 160 mg/tsp, ¾ teaspoonful (120 mg)
   d. 160 mg/tsp, 1 teaspoonful (160 mg)

7. Which of the following medications have been implicated with deaths in the pediatric population regarding cough and cold products?
   a. Pseudoephedrine
   b. Dextromethorphan
   c. Brompheniramine
   d. All of the above

8. KW is 7 years old and has the common cold. She has a disturbing cough which is interfering with her sleep at night. Which of the following medications should be recommended to KW for her cough?
   a. Dextromethorphan
   b. Guaifenesin
   c. Codeine
   d. None of the above

Questions 9–11 are the same patient case:

9. NR is 14 years old and has severe congestion, a sore throat and an annoying cough from the common cold. Which of the following could you recommend for NR?
   a. Nasal phenylephrine
   b. Oral brompheniramine
   c. Oral cetirizine
   d. Aspirin

10. NR states that her fever causes her to feel horrible and she does not want to get out of bed. She weighs 100 lbs and prefers to take an ibuprofen product. What dose of ibuprofen would you recommend for her fever?
    a. 200 mg every eight hours
    b. 400 mg every eight hours
    c. 200 mg every four hours
    d. 400 mg every four hours

11. NR states that her cough is annoying her and her family. She is having trouble sleeping as it wakes her up. What do you recommend for her cough?
    a. Guaifenesin
    b. Hydrocodone
    c. Dextromethorphan
    d. No medication is recommended.

12. True or false: Multiple ingredient cough and cold preparations are more efficacious and safer than single ingredient products.
    a. True
    b. False

13. WT is 2 years old with a one day history of cold symptoms: runny nose, coughing, fever, and sore throat. He is not sleeping at night and keeping his parents awake. The mother inquires about using diphenhydramine to get WT to sleep at night. Which of the following is true?
    a. Diphenhydramine is appropriate as a sleep aid. His dose would be 6.25 mg.
    b. Diphenhydramine is appropriate for his cold symptoms but not as a sleep aid.
    c. Diphenhydramine is not appropriate as a sleep aid in children with a cold.
    d. Diphenhydramine is not appropriate as a sleep aid in children but brompheniramine could be beneficial.

14. Which of the following is/are symptom(s) of influenza?
    a. High fever
    b. Dry cough
    c. Muscle aches
    d. All of the above

15. Which of the following symptom(s) is/are seen more with the H1N1 virus versus the seasonal virus?
    a. Higher fever
    b. Diarrhea
    c. Muscle aches
    d. Headache
16. TM is a 5-month-old male diagnosed with influenza A at the local emergency room today. She is eating, drinking and breathing well so the physician discharges her home with an oseltamivir prescription. Which of the following is an appropriate dose of oseltamivir for TM? He is 15.5 lbs.
   a. 12 mg BID
   b. 15 mg BID
   c. 20 mg BID
   d. 25 mg BID

17. SP is 4 years old with a fever, aches, runny nose and sore throat for one day. She has a history of asthma and lives with mom, dad and a 2-year-old brother. She is diagnosed with presumed H1N1 influenza, as she is influenza A ‘positive’ on rapid testing. Which of the following is appropriate treatment?
   a. Oseletamivir
   b. Zanamivir
   c. Amantadine
   d. Rimantadine

Questions 18–20 are the same patient case:

18. DY is a 15-year-old male diagnosed with influenza A “positive,” presumed H1N1. His symptoms started one day ago and he requests treatment. He is having severe congestion and aches. The physician decides to treat DY. Which of the following is appropriate treatment?
   a. Oseletamivir
   b. Zanamivir
   c. Amantadine
   d. A or B

19. What would be an appropriate dose of oseltamivir for DY?
   a. 30 mg BID
   b. 45 mg BID
   c. 60 mg BID
   d. 75 mg BID

20. How long would you treat DY with oseltamivir?
   a. Three days
   b. Five days
   c. Seven days
   d. 10 days

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