Fever is a normal response to a variety of conditions, the most common of which is infection. Fever occurs when the body's temperature is elevated as a result of the body's thermostat being reset to a higher-than-usual temperature.

Nearly every child will develop a fever at some point. The challenge for parents is to know when to be concerned. This topic review will discuss the definition of a fever, how to accurately measure a child's temperature, how and when to treat fever, and signs and symptoms that require further evaluation.

FEVER DEFINITION — Because of the normal variation in body temperature, there is no single value that is defined as fever. However, the following are generally accepted values:

* Rectal temperature above 100.4ºF (38ºC)
* Oral temperature above 100ºF (37.8ºC)
* Axillary (armpit) temperature above 99ºF (37.2ºC)
* Ear (tympanic membrane) temperature above 100.4ºF (38ºC) in rectal mode or 99.5ºF (37.5ºC) in oral mode
* Forehead (temporal artery) temperature above 100.4ºF (38ºC)

Axillary, ear, and forehead temperature measurements are easier to obtain than rectal or oral temperatures, but they are less accurate and may need to be confirmed rectally or orally in certain children.

FEVER CAUSES — Infection is the most common cause of fever in children. Common viral and bacterial illnesses like colds, gastroenteritis, ear infections, croup, bronchiolitis, and urinary tract infections are the most likely illnesses to cause fever. (See "Patient information: The common cold in children (Beyond the Basics)" and "Patient information: Nausea and vomiting in infants and children (Beyond the Basics)" and "Patient information: Ear infections (otitis media) in children (Beyond the Basics)" and "Patient information: Croup in infants and children (Beyond the Basics)" and "Patient information: Bronchiolitis (and RSV) in infants and children (Beyond the Basics)" and "Patient information: Urinary tract infections in children (Beyond the Basics)".)

There is little or no scientific evidence to support the widespread belief that teething causes fever. Although it is difficult to disprove this notion completely, alternative causes of fever should always be sought and temperatures above 102°F (38.9°C) should never be attributed to teething.

Bundling a child who is less than three months old in too many clothes or blankets can increase the child's temperature slightly. However, a rectal temperature of 101ºF (38.5ºC) or greater is not likely to be related to bundling and should be evaluated. (See 'Evaluation recommended' below.)

Some childhood immunizations can cause fever. The timing of the fever varies, depending upon which vaccination was given. (See "Patient information: Vaccines for infants and children age 0 to 6 years (Beyond the Basics)".)

HOW DO I MEASURE MY CHILD'S TEMPERATURE? — The best way to measure a child's temperature depends upon several factors. In all children, a rectal temperature is the most accurate. However, it is possible to accurately measure the temperature in the mouth (for children older than four or five years) when the proper technique is used.

Temperatures measured in the armpit are less accurate but may be useful as a first test in an infant who is younger than three months or an older child who cannot hold the thermometer under his or her tongue. If the armpit temperature is over 99ºF (37.2ºC), the rectal temperature should be measured. Temperatures measured in the ear or on the forehead also are less accurate than temperatures measured rectally or orally and may need to be confirmed by one of these methods.

It is not accurate to measure a child's temperature by feeling the child's skin. This is called a tactile temperature, and it is highly dependent upon the temperature of the person who is feeling the child's skin.

Glass versus digital thermometers — Digital thermometers are inexpensive, widely available, and the most accurate way to measure temperature. A variety of styles are available.

Glass thermometers that contain mercury are not recommended due to the potential risks of exposure to mercury (which is toxic) if the thermometer is broken. If a digital thermometer is not available, be sure to carefully "shake down" the glass thermometer before use. Instructions for disposing of thermometers that contain mercury are available online ([www.epa.gov/mercury/spills/index.htm](http://www.epa.gov/mercury/spills/index.htm)).

Other types of thermometers are available, including plastic strip and pacifier thermometers. However, these are not as accurate as digital thermometers and are not recommended.

Rectal temperature

* The child or infant should lie down on his or her stomach across an adult's lap.
* Apply a small amount of petroleum jelly (eg, Vaseline) to the end of the thermometer.
* Gently insert the thermometer into the child's anus until the silver tip of the thermometer is not visible (1/4 to 1/2 inch inside the anus) (figure 1).
* Hold the thermometer in place. A glass thermometer requires two minutes, while most digital thermometers need less than one minute.

Oral temperature — Do not measure the temperature in a child's mouth if he or she has consumed a hot or cold food or drink in the last 30 minutes.

* Clean the thermometer with cool water and soap. Rinse with water.
* Place the tip of the thermometer under the child's tongue toward the back. Ask the child to hold the thermometer with his or her lips.
* Keep the lips sealed around the thermometer. A glass thermometer requires about three minutes, while most digital thermometers need less than one minute.

Armpit temperature

* Place the tip of the thermometer in the child's dry armpit.
* Hold the thermometer in place by holding the child's elbow against the chest for four to five minutes.

Ear temperature — Ear thermometers are not as accurate as rectal or oral thermometers. If the child has been outside on a cold day, wait 15 minutes before measuring the ear temperature. Ear tubes and ear infections do not affect the accuracy of an ear temperature.

* To measure temperature accurately in the ear, the parent must pull the child's outer ear backward before inserting the thermometer (figure 2).
* Hold the ear probe in the child's ear for about two seconds.

SHOULD I TREAT MY CHILD'S FEVER? — There are pros and cons of treating fever. Fever may play a role in fighting infection, but it can also make a child uncomfortable.

The height of a child's fever is not always the best indicator of whether the child needs to be treated and/or evaluated. Instead, it is important to note how a child behaves and appears. Fever is usually accompanied by other symptoms. Some of these symptoms require evaluation by a healthcare provider, even if there is no fever. The table provides a list of some of these symptoms (table 1).

In most cases, a child with a fever can be observed and/or treated at home. However, it is important for parents to know when a child with a fever needs to be evaluated by a healthcare provider, when fever should be treated, and when it is reasonable to observe the child without treating the fever.

The guidelines provided below are general guidelines that do not apply to every situation; parents who have questions or are concerned about their child should contact their child's healthcare provider for advice.

Evaluation recommended — A healthcare provider should be consulted in the following situations:

* Infants who are less than three months of age who have a rectal temperature of 100.4ºF (38ºC) or greater, regardless of how the infant appears (eg, even well-appearing young infants should be evaluated).
* Children who are three months to three years who have a rectal temperature of 100.4ºF (38ºC) or greater for more than three days or who appear ill (eg, fussy, clingy, refusing to drink fluids).
* Children who are 3 to 36 months who have a rectal temperature of 102ºF (38.9ºC) or greater.
* Children of any age whose oral, rectal, tympanic membrane, or forehead temperature is 104ºF (40ºC) or greater or whose axillary temperature is 103ºF (39.4ºC) or greater.
* Children of any age who have a febrile seizure. Febrile seizures are convulsions that occur when a child (between six months and six years of age) has a temperature greater than 100.4º F (38ºC). (See "Patient information: Febrile seizures (Beyond the Basics)".)
* Children of any age who have recurrent fevers for more than seven days, even if the fevers last only a few hours.
* Children of any age who have a fever and have a chronic medical problem such as heart disease, cancer, lupus, or sickle cell anemia.
* Children who have a fever as well as a new skin rash.

Treatment recommended — Treatment of fever is recommended if a child has an underlying medical problem, including diseases of the heart, lung, brain, or nervous system. In children who have had febrile seizures in the past, treatment of fever has not been shown to prevent seizures, but is still a reasonable precaution.

Treatment of fever may be helpful if the child is uncomfortable, although it is not necessary.

Treatment not required — In most cases, it is not necessary to treat a child's fever. A child older than three months who has a rectal temperature less than 102ºF (38.9ºC) and who is otherwise healthy and acting normally does not require treatment for fever.

Parents who are unsure if their child's fever needs treatment should contact the child's healthcare provider. (See 'Evaluation recommended' above.)

FEVER TREATMENT OPTIONS

Medications — The most effective way to treat fever is to use a medication such as acetaminophen (sample brand name: Tylenol) or ibuprofen (sample brand names: Advil, Motrin). These treatments can reduce the child's discomfort and lower the child's temperature by 2 to 3ºF (1 to 1.5ºC). Aspirin is not recommended for children under age 18 years due to concerns that it can cause a rare but serious illness known as Reye syndrome.

Acetaminophen may be given every four to six hours as needed, but should not be given more than five times in a 24-hour period. Acetaminophen should not be used in children younger than three months of age. The dose of acetaminophen should be calculated based upon the child's weight (not age).

Ibuprofen may be given every six hours. Ibuprofen should not be used in children younger than six months of age. The dose of ibuprofen should be calculated based upon the child's weight (not age).

Giving combinations of acetaminophen and ibuprofen or alternating acetaminophen and ibuprofen increases the chance of giving the wrong dose of one or the other of the medications.

Fever-reducing medications should only be given as needed, and discontinued once bothersome symptoms have resolved.

Increase fluids — Having fever can increase a child's risk of becoming dehydrated. To reduce this risk, parents should encourage their child to drink an adequate amount of fluids. Children with fever may not feel hungry, and it is not necessary to force them to eat. However, fluids such as milk (cow's or breast), formula, and water should be offered frequently. Older children may eat flavored gelatin, soup, or frozen popsicles. If the child is unwilling or unable to drink fluids for more than a few hours, the parent should consult the child's healthcare provider.

Rest — Having a fever causes most children to feel tired and achy. During this time, parents should encourage their child to rest as much as the child wants. It is not necessary to force the child to sleep or rest if he or she begins to feel better. Children may return to school or other activities when the temperature has been normal for 24 hours.

Sponging and baths — Sponging is not as effective as antifever medications and generally is not recommended. Alcohol should not be used for sponging because of the risk of toxicity if it is absorbed through the skin.

CROUP OVERVIEW — The term croup is used to describe a variety of respiratory illnesses in children. It mostly occurs in infants and young children between six months and three years of age, and is rarely seen in children older than six years. It is most commonly seen in the fall and early winter months. It is slightly more common in boys compared to girls.

CROUP CAUSES — The most common cause of croup is a viral infection (such as parainfluenza or influenza) that leads to swelling of the larynx (voice box) and trachea (windpipe). However, infection with these viruses is common and most children with these infections do not develop croup.

The viruses infect the nose and throat initially, and then spread along the upper respiratory tract (back of the throat) to the larynx and trachea (windpipe) (figure 1). As the infection progresses, the top part of the trachea becomes swollen, which narrows the space available for air to enter the lungs. This leads to the symptoms of croup. (See 'Croup symptoms' below.)

Bacterial infection of the same areas can occur during the viral infection, but this does not happen very often. Bacterial coinfection is usually more severe and requires a different treatment than a viral infection.

CROUP SYMPTOMS — The primary symptoms of croup are a “barking cough” and hoarseness. Croup is usually mild and lasts less than one week, although it is possible for symptoms to become severe and life threatening. Symptoms are usually worse at night. The more severe cases are due to difficulty breathing caused by swelling in the upper part of the windpipe. Symptoms usually start gradually, beginning with nasal irritation, congestion, and runny nose. Difficulty breathing can develop and become worse during the 12 to 48 hours after congestion and barking cough begin.

Most children develop a fever, which may range from mild (100.4ºF or 38ºC) to very high (104ºF or 40.5ºC). The fever itself does not cause them harm (see "Patient information: Fever in children (The Basics)"). The information in the Table describes how to take a child's temperature (table 1).

Other symptoms such as rash, eye redness (called conjunctivitis), and swollen lymph nodes may develop, depending upon the virus causing the illness. Dehydration can occur if the child is not able to drink enough fluids.

As the upper airway narrows, high-pitched, noisy breathing (called stridor) develops and the child may breathe faster; the child may become restless or anxious (agitated) as breathing becomes more difficult. Agitation can increase the narrowing, which leads to even more difficulty breathing and further agitation. The effort required to breathe faster and harder is tiring, and the child may become exhausted and unable to breathe on his or her own in severe cases.

Low oxygen levels (called hypoxia) and blue-tinged skin (called cyanosis) can develop as airflow to the lungs is restricted. Cyanosis may first be noticed in the fingers and toenails; ear lobes; tip of the nose, lips, tongue; and inside of the cheek.

Contagiousness — Croup is caused by viruses that can be spread easily through coughing, sneezing, and respiratory secretions (mucus and droplets from coughing or sneezing). Children with croup should be considered contagious for three days after the illness begins or until the fever is gone.

Severity of croup — Croup can be very mild or very severe, depending on how difficult it is for the infant or child to pull air into the lungs. The size (diameter) of the windpipe (which is normally smaller in infants) and degree of narrowing due to swelling are important determinants of severity. Croup may become more severe when a child becomes agitated or upset.

A child with moderate to severe croup may have to struggle to breathe in ways that can be frightening for both the child and parent (or other caregivers).

Mild croup — A child with mild croup generally is alert and without blue-tinged skin or retractions (sucking in of the skin around the ribs and the top of the sternum) (figure 2). There may be a barking cough. Stridor (high-pitched, noisy breathing) is not present at rest but may be present as the child coughs or cries. A child with mild croup can develop more severe symptoms intermittently throughout the course of the illness, especially during the evening hours.

Moderate croup — A child with moderate croup may have stridor (high-pitched, noisy breathing) and retractions (sucking in of the skin around the ribs and the top of the sternum) at rest, may be slightly disoriented or agitated, and may have moderate difficulty breathing.

Severe croup — A child with severe croup has stridor and retractions at rest. Retractions are a sign of severe croup. These include inward movement (sucking in) of the sternum (breast bone) or skin between the ribs as the child struggles to take a breath. The child may appear anxious, agitated, or fatigued. Cyanosis (blue-tinged skin) is common, initially only when the child is moving or crying, but progressively worsening so that it is present even when the child is resting.

CROUP DIAGNOSIS — Croup is usually diagnosed based upon the child's symptoms and signs, including a barking cough and stridor, especially if these findings occur during the fall and winter months. X-ray and laboratory testing are rarely needed.

The healthcare provider who examines your child must determine if your child is likely to worsen and require care in an emergent care setting.

CROUP TREATMENT — The treatment of croup depends upon the severity of symptoms and the risk of rapid worsening; children with mild symptoms who have no risk factors for severe croup generally are treated at home, while a child with moderate to severe symptoms or who is at risk for rapid worsening should be treated in an emergency department.

Mild croup — Most children with croup have mild symptoms and can be successfully treated at home. This includes using mist from a humidifier or sitting with the child in a bathroom (not in the shower) filled with steam generated by running hot water from the shower. A parent should stay with the child during mist treatment; a favorite book or lullaby may help to decrease the child's anxiety and prevent crying, which can worsen stridor.

Hot steam humidifiers should be avoided because of the risk of burns. If the child's stridor does not improve during the mist treatment, the parent should contact their child's healthcare provider.

Other suggestions for home treatment of mild croup include:

* Allow the child to breathe cool air during the night by opening a window or door.
* Fever can be treated with an over-the-counter medication such as acetaminophen or ibuprofen. (See "Patient information: Fever in children (Beyond the Basics)".)
* Coughing can be treated with warm, clear fluids to loosen mucus on the vocal chords. Warm water, apple juice, or lemonade is safe for children older than four months. Frozen juice popsicles also can be given.
* Smoking in the home should be avoided; smoke can worsen a child's cough.
* Keep the child's head elevated. An infant can be placed in a car seat. A child may be propped up in bed with an extra pillow. Pillows should not be used with infants younger than 12 months of age.
* Parents may sleep in the same room with their child during an episode of croup so that they will be immediately available if the child begins to have difficulty breathing.

Emergent care — Parents should seek immediate medical attention if, at any time, a child develops features of worsening or severe croup. (See 'When to seek help' below.)

Medications — A child with mild croup who is seen in a healthcare provider's office or the emergency department may be given mist treatment in addition to a single dose of a glucocorticoid medication. The most frequently used glucocorticoid is dexamethasone, which can be given as an oral syrup or as an intravenous (IV) or intramuscular (IM) injection (depending upon which treatment is easiest for the child).

Dexamethasone provides long-lasting and effective treatment for mild croup, as well as for moderate and severe croup. It works to decrease swelling of the larynx, usually within six hours of the first dose. For a child with mild croup, dexamethasone can reduce the need for a repeat visit to the emergency department or provider's office and can improve the child's ability to sleep (by easing the work of breathing).

Budesonide is another glucocorticoid medication that is sometimes used. It is administered by inhalation. Other oral glucocorticoids may be prescribed as well.

Moderate to severe croup — Moderate to severe croup should be evaluated in an emergency department or clinic capable of handling urgent respiratory illnesses. Severe croup is a life-threatening illness and treatment should not be delayed for any reason.

The treatment used depends upon the type and severity of signs and symptoms, but may include one or more of the following:

* Humidified air or oxygen (if oxygen is necessary).
* Intravenous fluids may be needed if the child is dehydrated as a result of fever or rapid breathing, both of which increase the body's loss of fluids. Difficulty breathing can discourage a child from drinking, which can increase the risk of dehydration.
* Monitoring of oxygen levels, breathing and heart rate, skin color (normal versus blue-tinged), and level of alertness are used to measure the child's status and response to treatment. A child who fails to improve or who improves slowly may need further treatment.
* Placement of a breathing tube in the throat is rarely needed for children with severe croup; less than 1 percent of children seen in the emergency room require intubation.

Dexamethasone — Dexamethasone is the most frequently used medication for the treatment of all types of croup; it is a glucocorticoid that provides long-lasting and effective treatment. It works by decreasing swelling of the larynx, usually within six hours of the first dose. It can reduce the need for a repeat visit to the emergency department or provider's office, decrease the time spent in the emergency department, and decrease the dose of other medications (eg, epinephrine).

It can be given as an oral syrup or as an intravenous (IV) or intramuscular (IM) injection (depending upon which treatment is easiest for the child). Most children only require one dose, and serious side effects are rare.

Epinephrine — Epinephrine, commonly referred to as "adrenaline", is given by nebulizer (an inhaled mist) to children with moderate to severe croup. It also reduces swelling in the airway and begins to work faster than dexamethasone. It works for a short time period (two hours or less), and may be given every 15 to 20 minutes for severe symptoms. Retreatment may be needed after two hours if symptoms return after an initial response. When such "rebound" symptoms occur, it is usually within two to four hours after the treatment.

Side effects of epinephrine include rapid heartbeat. Serious side effects are rare. Children who are given epinephrine must be monitored for three to four hours after the last dose to ensure that symptoms of airway blockage do not return.

Other therapies — Other therapies, such as antibiotics, cough medicines, decongestants, and sedatives, are not routinely recommended for children with croup. Antibiotics do not treat viruses, which cause most cases of croup. Cough medicines and decongestants have not been proven to be helpful, and sedatives can mask symptoms of low blood oxygen and difficulty breathing.

CROUP COMPLICATIONS — Complications of croup are uncommon. Symptoms of croup resolve in most children within two days, but can persist up to one week. Fewer than 5 percent of children with croup require hospitalization.

CROUP PREVENTION — Unfortunately, there is no way to prevent croup. There are no vaccines against most of the viruses that can cause croup.

Simple hygiene measures can help to prevent infection with the viruses that can lead to croup. These measures include:

* Frequent hand washing with soap and water. Hands should ideally be wet with water and plain or antimicrobial soap, and rubbed together for 15 to 30 seconds. Special attention should be paid to the fingernails, between the fingers, and the wrists. Hands should be rinsed thoroughly and dried with a single-use towel.
* Use of alcohol-based hand rubs. These are a good alternative for disinfecting hands if a sink is not available. Hand rubs should be spread over the entire surface of hands, fingers, and wrists until dry, and may be used several times. Hand rubs are available as a liquid or wipe in small, portable sizes that are easy to carry in a pocket or handbag. When a sink is available, visibly soiled hands should be washed with soap and water.
* Avoid close contact with other adults and children with upper respiratory infection when possible. This may be difficult, especially when in public, but parents can try to limit direct contact. In addition, infants or children who are sick should not be sent to day care or school as this can potentially cause others to become ill.
* Yearly vaccination for the influenza virus is recommended for individuals older than six months. Flu vaccines are usually given in the fall and winter months. (See "Patient information: Influenza prevention (Beyond the Basics)".)

WHEN TO SEEK HELP — If, at any time, a child develops features of worsening or severe croup, the parent should seek **immediate** medical attention. This includes:

* Difficulty breathing
* Pale or blue-tinged skin
* Severe coughing spells
* Drooling or difficulty swallowing
* Inability to speak or cry due to difficulty taking a breath
* A whistling sound with breathing, or noisy-high pitched breathing while sitting or resting
* Sucking in of the skin around the ribs and top of the sternum with breathing

Parents should not attempt to drive their child to the hospital if the child is severely agitated, has blue-tinged skin, is struggling to breathe, or is excessively drowsy (lethargic); emergency medical services should be called, available in most areas of the United States by dialing 911.

A parent should call their child's healthcare provider if:

* A fever (temperature higher than 100.4ºF or 38ºC) lasts more than three days.
* Symptoms of mild croup last longer than seven days.
* There are questions or concerns about the child's condition.

SUMMARY

* Croup is a respiratory illness usually caused by a virus. As the illness progresses, the trachea becomes swollen, which narrows the space available for air to enter the lungs.
* The viruses that cause croup can be spread easily through coughing, sneezing, and respiratory secretions (mucus, droplets from coughing or sneezing). Children with croup should be considered contagious for three days after the illness begins, or until the fever is gone.
* Croup is usually mild, although it is possible for symptoms to become severe and life-threatening. Symptoms usually start gradually, beginning with nasal irritation, congestion, and a runny nose, which may worsen after 12 to 48 hours to include difficulty breathing, a "barking cough", and hoarseness. Symptoms of croup usually resolve within two days, but can persist up to one week (with gradual improvement during this time).
* If, at any time, a child develops features of worsening or severe croup, the parent should seek immediate medical attention. Features of severe croup include:
* Difficulty breathing
* Pale or blue-tinged skin, especially in the lips, fingers, toes, or earlobes
* Severe coughing spells
* Drooling or difficulty swallowing
* Inability to speak or cry due to difficulty taking a breath
* A whistling sound with breathing or noisy-high pitched breathing while sitting or resting
* Sucking in of skin around the ribs with breathing

Parents should not attempt to drive their child to the hospital if the child is severely agitated, cyanotic, struggling to breathe, or excessively drowsy (lethargic); emergency medical services should be called, available in most areas of the United States by dialing 911.
* Mild croup can usually be treated at home. Home treatment includes using mist from a humidifier or by sitting with the child in a bathroom filled with steam generated by running hot water from the shower. Hot steam humidifiers should be avoided because of the risk of burns.
* Moderate to severe croup should be evaluated in an emergency department or clinic capable of handling urgent respiratory illnesses. Severe croup is a life-threatening illness and treatment should not be delayed for any reason.
* Other therapies, such as antibiotics, cough medicines, decongestants, and sedatives, are not recommended for children with croup. Antibiotics do not treat viruses, which cause most cases of croup.
* Smoking in the home should be avoided. Parents may sleep in the same room with their child during an episode of croup so that they will be immediately available if the child begins to have difficulty breathing.

INTRODUCTION — Influenza (commonly called the flu) is a highly contagious illness that can occur in children or adults of any age. It occurs more often in the winter months because people spend more time in close contact with one another. The flu is spread easily from person-to-person by coughing, sneezing, or touching surfaces.

Every year, complications of the flu require more than 200,000 people in the United States to be hospitalized. Serious illness is more likely in the very young, older adults, pregnant women, and people who have certain health problems such as asthma or other forms of lung disease.

There have been several widespread flu outbreaks (called pandemics), which led to the deaths of many people worldwide. These outbreaks occurred when new strains of influenza viruses formed (often from pigs or birds) and humans became infected because they had no immunity to these viruses.

This article discusses the symptoms and treatment of seasonal, swine H1N1, and avian flu. Treatments to prevent the flu, including the flu shot, are discussed separately. (See "Patient information: Influenza prevention (Beyond the Basics)".)

FLU SYMPTOMS — Symptoms of seasonal flu can vary from person to person, but usually include:

●Fever (temperature higher than 100ºF or 37.8ºC)

●Headache and muscle aches

●Fatigue

●Cough and sore throat may also be present

People with the flu usually have a fever for two to five days. This is different than fever caused by other upper respiratory viruses, which usually resolve after 24 to 48 hours.

Most people with the flu have fever and muscle aches, and some people also have cold-like symptoms (runny nose, sore throat). Flu symptoms usually improve over two to five days, although the illness may last for a week or more. Weakness and fatigue may persist for several weeks (table 1).

Flu complications — Complications of influenza occur in some people; pneumonia is the most common complication. Pneumonia is a serious infection of the lungs, and is more likely to occur in young children, people over the age of 65, people who live in long term care facilities (nursing homes), and those with other illnesses such as diabetes or conditions affecting the heart or lungs. Pneumonia is also more common in people with weakened immune systems, such as those who have had a transplant. (See "Patient information: Pneumonia in adults (Beyond the Basics)".)

FLU DIAGNOSIS — Influenza is usually diagnosed based on symptoms (fever, cough and muscle aches). Lab testing for influenza is performed in certain cases, such as during a new influenza outbreak in a community and in patients who are at increased risk for complications.

FLU TREATMENT

When to seek help — Most people with the flu recover within one to two weeks without treatment. However, serious complications of the flu can occur. Call your doctor or nurse immediately if:

●You feel short of breath or have trouble breathing

●You have pain or pressure in your chest or stomach

●You have signs of being dehydrated, such as dizziness when standing or not passing urine

●You feel confused

●You cannot stop vomiting or you cannot drink enough fluids

In children, you should seek help if the child has any of the above or if the child:

●Has blue or purplish skin color

●Is so irritable that he or she does not want to be held

●Does not have tears when crying (in infants)

●Has a fever with a rash

●Does not wake up easily

There are several groups of people who are at increased risk for flu complications. These include pregnant women, young children (<5 years of age, and especially <2 years of age), people ≥65 years of age, and people with certain diseases such as chronic lung disease (such as asthma), heart disease, diabetes, immunosuppressing conditions (such as HIV infection or transplantation), and some other diseases. If you or your child has flu symptoms and is at increased risk for flu complications, you should call your healthcare provider.

Treat symptoms — Treating the symptoms of influenza can help you to feel better, but will not make the flu go away faster.

●Rest until the flu is fully resolved, especially if the illness has been severe

●Fluids — Drink enough fluids so that you do not become dehydrated. One way to judge if you are drinking enough is to look at the color of your urine. Normally, urine should be light yellow to nearly colorless. If you are drinking enough, you should pass urine every three to five hours.

●Acetaminophen (such as Tylenol® and other brands) can relieve fever, headache, and muscle aches. Aspirin, and medicines that include aspirin (eg, bismuth subsalicylate; PeptoBismol), are not recommended for children under 18 because aspirin can lead to a serious disease called Reye syndrome.

●Cough medicines are not usually helpful; cough usually resolves without treatment. We do not recommend cough or cold medicine for children under age six years. (See "Patient information: The common cold in children (Beyond the Basics)".)

Antiviral treatment — Antiviral medicines can be used to treat or prevent influenza. When used as a treatment, the medicine does not eliminate flu symptoms, although it can reduce the severity and duration of symptoms by about one day. Not every person with influenza needs an antiviral medicine, but some people do; the decision is based upon several factors. If you are severely ill and/or have risk factors for developing complications of influenza, you will need an antiviral agent. People who are only mildly ill and have no risk factors for complications are usually treated with an antiviral medicine if they have had symptoms for 48 hours or less, but they are not treated if they have had symptoms for more than 48 hours.

Antiviral medicines that are used to treat or prevent the flu include oseltamivir (Tamiflu®) and zanamivir (Relenza®). Two other antiviral medicines, rimantadine (Flumadine®) and amantadine (Symmetrel®), were used in the past but are generally no longer effective because most flu viruses are now resistant to them. Antiviral treatment is most effective for seasonal influenza when it is taken within the first 48 hours of flu symptoms.

The best antiviral medicine depends upon the type of influenza virus, if the virus could be resistant, and some individual factors. A doctor or nurse should make this decision. (See "Prevention of seasonal influenza with antiviral drugs in adults" and "Treatment of seasonal influenza in adults" and "Seasonal influenza in children: Prevention and treatment with antiviral drugs" and "Treatment and prevention of pandemic H1N1 influenza ('swine influenza')".)

Side effects — Zanamivir and oseltamivir can cause mild side effects, including nausea and vomiting; zanamivir, which is inhaled, can cause difficulty breathing in some cases. Most people are able to continue the medicine despite the side effects.

Antibiotics — Antibiotics are **NOT** useful for treating viral illnesses such as influenza. Antibiotics should only used if there is a bacterial complication of the flu such as bacterial pneumonia, ear infection, or sinusitis. Antibiotics can cause side effects and lead to development of antibiotic resistance.

Complementary and alternative treatments — There are a wide variety of herbal, homeopathic, and other complementary and alternative treatments that are marketed for influenza. Unfortunately, there have been few well designed studies to evaluate their efficacy and safety.

PREVENTING FLU — Treatments to prevent influenza are discussed separately. (See "Patient information: Influenza prevention (Beyond the Basics)".)

SWINE H1N1 FLU — A new strain of H1N1 influenza, which contains parts of swine, avian, and human influenza viruses, was first seen in humans in March 2009 in Mexico. Human infections subsequently occurred around the world and caused a pandemic that continued until August 2010. (See "Epidemiology of pandemic H1N1 influenza ('swine influenza')".)

Symptoms of infection with the swine H1N1 flu virus and treatment for it were generally similar to those of seasonal flu.

AVIAN FLU — Avian influenza (bird flu) is caused by a strain of influenza virus that originally infected birds. Infected birds include chickens, ducks, and geese, among others.

There are several strains of avian flu; the H5N1 avian flu virus is the cause of concern since it has led to several deaths, mostly in Asia. To date, avian flu has primarily spread from bird-to-bird, and much less commonly from bird-to-human; human-to-human transmission has occurred rarely. Most humans who became infected with avian flu had direct contact with sick or dead poultry or wild birds, or had very recently visited a live poultry market. No human cases of avian influenza have been described in the United States or elsewhere in North America.

Avian flu is frequently severe, and there is little natural immunity in the human population. At least one antiviral medicine (oseltamivir) might improve the chance of surviving the infection. (See 'Antiviral treatment' above.)

There is a vaccine to prevent avian flu. The vaccine is not commercially available, but has been stockpiled by the United States government in case it is needed in the future.

Updated information about avian influenza is available from the United States Centers for Disease Control and Prevention ([www.cdc.gov/flu/avian/](http://www.cdc.gov/flu/avian/)).

COMMON COLD OVERVIEW — The common cold is the most common illness in the United States. Infants and children are affected more often and experience more prolonged symptoms than adults. The common cold accounts for approximately 22 million missed days of school and 20 million absences from work, including time away from work caring for ill children.

This topic review discusses the causes, symptoms, and treatment of the common cold in children. The common cold in adults is discussed separately. (See "Patient information: The common cold in adults (Beyond the Basics)".)

COMMON COLD CAUSES — The common cold is a group of symptoms caused by a number of different viruses. There are more than 100 different varieties of rhinovirus, the type of virus responsible for the greatest number of colds. Other viruses that cause colds include enteroviruses (echovirus and coxsackieviruses) and coronavirus. Because there are so many viruses that cause the symptoms of the common cold, people may have multiple colds each year and dozens over a lifetime.

Children under six years average six to eight colds per year (up to one per month, September through April), with symptoms lasting an average of 14 days. This means that a child could be ill with intermittent cold symptoms for nearly half of the days in this time period, without cause for concern. Young children in daycare appear to suffer from more colds than children cared for at home. However, when day-care children enter primary school, they catch fewer colds, presumably because they are already immune to a larger number.

Seasonal patterns — The common cold may occur at any time of year, although most colds occur during the fall and winter months, regardless of the geographic location. Colds are not caused by cold climates or being exposed to cold air.

Transmission — Colds are transmitted from person-to-person, either by direct contact or by contact with the virus in the environment. Colds are most contagious during the first two to four days.

Direct contact — People with colds typically carry the cold virus on their hands, where it is capable of infecting another person for at least two hours. If a child with a cold touches another child or adult, who then touches their eye, nose, or mouth, the virus can later infect that person.

Infection from particles on surfaces — Some cold viruses can live on surfaces (such as countertops, door handles, or toys) for up to one day.

Inhaling viral particles — Droplets containing viral particles can be exhaled into the air by breathing or coughing. Rhinoviruses are not usually transmitted as a result of contact with infected droplets, although influenza virus and coronavirus can be transmitted via small droplets. Cold viruses are not usually spread through saliva.

COMMON COLD SYMPTOMS — The signs and symptoms of a cold usually begin one to two days after exposure. In children, nasal congestion is the most prominent symptom. Children can also have clear, yellow, or green-colored nasal discharge; fever (temperature higher than 100.4ºF or 38ºC) is common during the first three days of the illness. The table describes how to take a child's temperature (table 1). (See "Patient information: Fever in children (Beyond the Basics)".)

Other symptoms may include sore throat, cough, irritability, difficulty sleeping, and decreased appetite. The lining of the nose may become red and swollen, and the lymph nodes (glands) in the neck may become slightly enlarged.

The symptoms of a cold are usually worst during the first 10 days. However, some children continue to have a runny nose, congestion, and a cough beyond 10 days. In addition, it is not unusual for a child to develop a second cold as the symptoms of the first cold are resolving; this can make it seem as if the child has a single cold that lasts for weeks or even months, especially during the fall and winter. This is not a cause for concern, unless the child has any of the more serious symptoms, discussed below. (See 'When to seek help' below.)

Symptoms of allergies (allergic rhinitis) are slightly different than those of a cold, and may include bothersome itching of the nose and eyes.

COMMON COLD COMPLICATIONS — Most children who have colds do not develop complications. However, parents should be aware of the signs and symptoms of potential complications.

Ear infection — Between 5 and 19 percent of children with a cold develop a bacterial or viral ear infection. If a child develops a fever (temperature higher than 100.4ºF or 38ºC) after the first three days of cold symptoms, an ear infection may be to blame. (See "Patient information: Ear infections (otitis media) in children (Beyond the Basics)".)

Asthma — Colds can cause wheezing in children who have not wheezed before, or worsening of asthma in children who have a history of this condition.

Sinusitis — Children who have nasal congestion that does not improve over the course of 10 days may have a bacterial sinus infection.

Pneumonia — Children who develop a fever after the first three days of cold symptoms may have bacterial pneumonia, especially if the child also has a cough and is breathing rapidly.

COMMON COLD TREATMENT

Symptomatic treatment — The treatment of an infant or child with a cold is different than treatment recommended for adults. Antihistamines, decongestants, cough medicines, and expectorants, alone and in combinations, are all marketed for the symptoms of a cold. However, there have been few clinical trials of these products in infants and children, and there are no studies that demonstrate any benefit in infants or children.

The United States Food and Drug Administration (FDA) advisory panel has recommended against the use of these medications in children younger than six [[1](http://www.uptodate.com/contents/the-common-cold-in-children-beyond-the-basics/abstract/1)]. We agree with this recommendation because these medications are not proven to be effective and have the potential to cause dangerous side effects. For children older than 6 years, cold medications may have fewer risks; however, there is still no proven benefit.

Parents may give acetaminophen (sample brand name: Tylenol) to treat a child (older than three months) who is uncomfortable because of fever during the first few days of a cold. Ibuprofen (sample brand names: Advil, Motrin) can be given to children older than six months. Aspirin should not be given to any child under age 18 years. There is no benefit of these medications if the child is comfortable. Parents should speak with their child's healthcare provider about when and how to treat fever. (See "Patient information: Fever in children (Beyond the Basics)".)

Humidified air may improve symptoms of nasal congestion and runny nose. For infants, parents can try saline nose drops to thin the mucus, followed by bulb suction to temporarily remove nasal secretions (table 2). An older child may try using a saline nose spray.

Honey may be helpful for nighttime cough in children older than 12 months.

Parents should encourage their child to drink an adequate amount of fluids; it is not necessary to drink extra fluids. Children often have a reduced appetite during a cold, and may eat less than usual. If an infant or child completely refuses to eat or drink for a prolonged period, the parent should contact their child's healthcare provider.

Antibiotics — Antibiotics are not effective in treating colds. They may be necessary if the cold is complicated by a bacterial infection, like an ear infection, pneumonia, or sinusitis. Parents who think their child has developed one of these infections should contact their child's healthcare provider.

Inappropriate use of antibiotics can lead to the development of antibiotic resistance, and can possibly lead to side effects, such as an allergic reaction.

Herbal and alternative treatments — A number of alternative products, including zinc, and herbal products such as echinacea, are advertised to treat or prevent the common cold. There is some evidence that prophylactic use of vitamin C may decrease the duration of the common cold in children and adults. With the exception of vitamin C, none of these treatments have been proven to be effective in clinical trials; their use is not recommended.

COMMON COLD PREVENTION — Simple hygiene measures can help to prevent infection with the viruses that cause colds. These measures include:

* Hand washing is an essential and highly effective way to prevent the spread of infection. Hands should be wet with water and plain soap, and rubbed together for 15 to 30 seconds. It is not necessary to use antibacterial hand soap. Teach children to wash their hands before and after eating and after coughing or sneezing.
* Alcohol-based hand rubs are a good alternative for disinfecting hands if a sink is not available. Hand rubs should be spread over the entire surface of hands, fingers, and wrists until dry, and may be used several times. These rubs can be used repeatedly without skin irritation or loss of effectiveness.
* It may be difficult or impossible to completely avoid people who are ill, although parents should try to limit direct contact.
* Most children with colds need not be excluded from day care or school. It is likely that they spread the virus before they developed cold symptoms.
* Using a household cleaner that kills viruses, such as phenol/alcohol(sample brand name: Lysol), may help to reduce viral transmission.

WHEN TO SEEK HELP — If a child develops any of the following features, the parent should call their healthcare provider, regardless of the time of day or night.

* Refusing to drink anything for a prolonged period
* Behavior changes, including irritability or lethargy (decreased responsiveness); this usually requires immediate medical attention
* Difficulty breathing, working hard to breathe, or breathing rapidly; this usually requires immediate medical attention

Parents should call the healthcare provider if the following symptoms develop, or if there are general concerns about the child:

* Fever greater than 101ºF (38.4ºC) lasts more than three days. The table describes how to take a child's temperature (table 1).
* Nasal congestion does not improve or worsens over the course of 14 days.
* The eyes become red or develop yellow discharge.
* There are signs or symptoms of an ear infection (pain, ear pulling, fussiness).

SUMMARY

* The common cold is a group of symptoms caused by a number of different viruses. Children under six years average six to eight colds per year (up to one per month, September through April), with symptoms lasting an average of 14 days. This means that a child could be ill with intermittent cold symptoms for nearly half of the days in this time period, without cause for concern.
* Colds are most contagious during the first two to four days. People with colds typically carry the cold virus on their hands, where it is capable of infecting another person for at least two hours. Some cold viruses can live on surfaces (such as countertops, door handles, or toys) for as long as one day. Droplets containing viral particles can be exhaled into the air by breathing, coughing, or sneezing.
* The signs and symptoms of a cold usually begin one to two days after exposure. In children, nasal congestion is the most prominent symptom. Children can also have clear, yellow, or green-colored nasal discharge. Fever (temperature higher than 100.4ºF or 38ºC) is common during the first three days of the illness. Other symptoms may include sore throat, cough, irritability, difficulty sleeping, and decreased appetite.
* Most children who have colds do not develop complications. However, parents should be aware of the signs and symptoms of potential complications, including ear infections, asthma, sinusitis, and pneumonia.
* There have been few clinical trials of cold medications (antihistamines, decongestants, cough medicines, and expectorants) in infants and children, and there are no studies that demonstrate any benefit in infants or children. We do **not**recommend their use in infants and children because of the lack of proven efficacy and the potential risk of dangerous side effects.
* Parents may give acetaminophen (sample brand name: Tylenol) to children older than three months or ibuprofen (sample brand names: Advil, Motrin) to children older than six months to treat discomfort associated with fever. Humidified air can improve symptoms of nasal congestion and runny nose. Honey may be helpful for nighttime cough in children older than 12 months.
* Parents should encourage their child to drink an adequate amount of fluids; it is not necessary to drink extra fluids.
* Antibiotics are not effective in treating colds. They may be necessary if the cold is complicated by a bacterial infection, like an ear infection, pneumonia, or sinusitis. Parents who think their child has developed one of these infections should contact their child's healthcare provider. Inappropriate use of antibiotics can lead to the development of antibiotic resistance, and can possibly lead to side effects, such as an allergic reaction.
* A number of alternative products, including zinc, vitamin C, and herbal products such as echinacea, are advertised to treat or prevent the common cold. None of these treatments has been proven to be effective in clinical trials; their use is not recommended.
* Simple hygiene measures can help to prevent infection with the viruses that cause colds, including hand washing or use of an alcohol-based hand rub and limiting contact with others who a

INTRODUCTION — In the United States, routine vaccines are recommended in children between ages 0 and 6 years to prevent a number of serious or even deadly diseases. The recommended schedule is available through the [Centers for Disease Control and Prevention](http://www.cdc.gov/vaccines/parents/downloads/parent-ver-sch-0-6yrs.pdf).

This article will review the recommended timing and dose of these vaccines, possible side effects, and vaccine effectiveness in children between ages 0 and 6 years.

How vaccines work, the risks and benefits of vaccines, common concerns regarding vaccine safety, vaccines recommended for children 7 to 18 years, vaccines for adults, and vaccines for travel are presented separately. (See "Patient information: Why does my child need vaccines? (Beyond the Basics)" and "Patient information: Vaccines for children age 7 to 18 years (Beyond the Basics)" and "Patient information: Adult vaccines (Beyond the Basics)" and "Patient information: Vaccines for travel (The Basics)".)

HEPATITIS B — Inflammation of the liver (hepatitis) can be caused by toxic drugs, chemical agents, and certain viral infections, including hepatitis B virus (HBV). Although the hepatitis B virus infection often resolves or causes no symptoms, HBV can cause chronic liver disease that leads to progressive liver scarring (cirrhosis) or liver cancer. HBV is transmitted by contact with an infected individual's body fluids, such as during unprotected sexual intercourse, by sharing contaminated needles, or from contact with contaminated blood or blood products. In addition, HBV can be transmitted from an infected pregnant woman to her baby. (See "Patient information: Hepatitis B (Beyond the Basics)".)

Although most infants are not at high risk for becoming infected with HBV, immunizing during infancy is the most effective way to ensure lifetime protection.

Timing and dose — HBV vaccination is recommended for all children beginning at birth. The series also can be started at a later time. The vaccine requires three doses, with the first usually given a day or two after birth. The second and third doses are given one to two months later and then at 6 to 18 months of age.

Hepatitis B vaccine precautions — HBV vaccination is not recommended for people with a severe allergy to baker's yeast. The vaccine can be given to people with a history of multiple sclerosis, Guillain-Barré syndrome, autoimmune disease, or other chronic disorders, as well as to pregnant women.

HepB vaccine effectiveness — When given according to the recommended schedule, the HepB vaccine protects 98 to 100 percent of individuals from developing chronic hepatitis B infection.

DIPHTHERIA, TETANUS, PERTUSSIS — Diphtheria is a highly contagious disease. It is usually transmitted via droplet particles that are coughed or sneezed into the air. It can cause a thick covering in the back of the throat that can lead to breathing problems or heart failure.

Tetanus is another very serious infection that is caused by a bacterial toxin. The bacteria reside in soil and the intestinal tracts of certain mammals. It enters the body through an open wound, multiplies, and produces a toxin that can affect nerves controlling muscle activity. A common symptom of tetanus infection is stiffness of the jaw muscles ("lockjaw").

Pertussis, or whooping cough, is an upper respiratory illness caused by a bacterium. The organism is highly contagious, spreads easily and can cause serious illness, especially in infants.

Tetanus and diphtheria disease are rare in the United States because of the high numbers of people who have been immunized. However, the number of infants in the United States who are affected by pertussis is rising despite widespread vaccination. The good news is that infants who are immunized against pertussis disease are typically less ill than those who are not immunized.

Timing and dose — Combined diphtheria, tetanus, and acellular pertussis (DTaP) vaccine is recommended for all children in the United States. The acellular form of pertussis vaccine (DTaP) has replaced the older form of pertussis vaccine (DTP), known as the whole cell vaccine. A total of five separate doses are recommended, at 2, 4, and 6 months of age, with the fourth dose given at 15 to 18 months and the fifth at 4 to 6 years of age. The recommended schedule is available through the [Centers for Disease Control and Prevention](http://www.cdc.gov/vaccines/parents/downloads/parent-ver-sch-0-6yrs.pdf).

Adolescents should receive a booster dose of tetanus diphtheria pertussis vaccine at 11 to 12 years of age (called Tdap). Subsequent doses of diphtheria and tetanus vaccine (called Td) are recommended at 10-year intervals throughout life.

DTaP and DTP vaccine precautions — Common side effects include injection site pain, redness, and swelling; fever; drowsiness; and loss of appetite. These reactions are more common after the fourth and fifth doses.

Children who have a severe allergic reaction (anaphylaxis) or brain swelling within seven days of receiving the DTaP or DTP vaccine should not receive future doses of this vaccine.

If a child develops one of the following problems within 48 hours of receiving the diphtheria-tetanus-pertussis vaccine, the next vaccine should be given with caution.

●Temperature ≥104.8ºF, not related to a known cause

●Collapse or shock-like state

●Persistent, inconsolable crying lasting three hours or longer

●Seizure or convulsions within three days after the vaccine

In the event that one or more of these reactions occurs in an infant or young child, some experts recommend giving only the combination diphtheria-tetanus (DT) vaccine.

Parents should call their child's healthcare provider (for high fever or excessive crying) or emergency medical services (for collapse or seizures) if one or more of these reactions develop.

Children who develop other symptoms after receiving the vaccine, such as low-grade fever or irritability, should receive any subsequent dose(s) of the vaccine at the next recommended interval(s).

DTaP effectiveness — DTaP is a very effective vaccine that protects 80 to 85 percent from pertussis, 95 percent from diphtheria, and nearly 100 percent from tetanus. Because protection can fade over time, booster vaccines are needed at least every 10 years. (See 'Timing and dose' above.)

POLIOMYELITIS — During the first half of the 20th century, poliomyelitis was a major cause of serious illness and death throughout the world. It is still a significant health problem in some developing countries. Before a vaccine was available, more than 20,000 cases of polio were reported in the United States per year. The primary signs of polio include muscle weakness, pain, and fatigue; ultimately, the illness can lead to paralysis and even death.

All children should be vaccinated against polio to avoid new outbreaks. In the United States, the polio vaccine is made from a killed virus and is injected (called IPV). In other countries, where polio disease is still a major problem, oral polio vaccine (OPV) is given.

Timing and dose — The injected polio vaccine series in the United States includes four doses; the first and second doses are given at 2 and 4 months of age. The third dose is usually given at 6 to 18 months of age, and a fourth dose is routinely given at 4 to 6 years, before school entry. Children who miss a dose should be given the remaining doses.

Polio vaccine precautions — The injected polio vaccine should not be given to children who have a severe allergy to antibiotics contained in the vaccine, including neomycin, streptomycin, or polymyxin B. There is little to no risk of side effects (eg, swelling at injection site). There is no risk of developing poliomyelitis with the IPV vaccine currently used in the United States.

Polio vaccine effectiveness — When three doses of the polio vaccine are given, 99 percent of children develop immunity. Fortunately, even the one percent of children in the United States who do not develop immunity after being vaccinated are unlikely to develop polio. This is because of "herd immunity", meaning that most people who have been vaccinated against polio are immune, which protects even those who are not immune.

ROTAVIRUS — Rotavirus is the single most important cause of severe diarrhea and dehydration in infants and young children. A rotavirus vaccine is recommended for all infants in the United States. Two vaccines are available: RotaTeq (RV5) and Rotarix (RV1).

Timing and dose — The vaccine is in a liquid form and is given by mouth (not as a shot). The first dose of the vaccine should be given between 6 and 15 weeks of age, but not after 15 weeks. The number of doses (two or three) depends upon which vaccine is given:

●RotaTeq (RV5) – Three doses of RV5 are recommended, given at 2, 4, and 6 months of age. The third dose of the vaccine should be given by 8 months of age.

●Rotarix (RV1) – Two doses of RV1 are recommended, given at 2 and 4 months of age. The second dose should be given by 8 months of age.

Rotavirus vaccine precautions — Rotavirus vaccine should not be given to infants with a **known immunodeficiency**or history of intussusception. RV1 should not be given to infants with a history of latex allergy. In all infants, there is a small risk of diarrhea and vomiting in the week after the vaccine is given. Healthy infants with normal immunity can be given the rotavirus vaccine even if there is a sibling or other family member who does not have normal immunity, as long as the family practices good hand washing and proper hygiene, especially after changing the infant’s diapers. If an infant develops abdominal pain, vomiting, diarrhea, blood in the stool, or has a change in bowel movements after receiving the rotavirus vaccine, the parents should contact their child's healthcare provider immediately.

Rotavirus vaccine effectiveness — Rotavirus vaccine does not prevent diarrhea or vomiting caused by other bacteria or viruses, but it is very effective in preventing diarrhea caused by rotavirus.

HAEMOPHILUS INFLUENZAE B (HiB) — Until the mid-1990s, *Haemophilus influenzae* serotype b (Hib) was the most common cause of bacterial meningitis (inflammation of the covering of the brain) in children. It was also responsible for other serious bacterial infections, including skin, throat, and joint infections. The widespread use of Hib vaccines in infancy has led to a dramatic decline in the incidence of invasive Hib disease in children. However, the disease remains common in countries that do not use the vaccine. Despite its name, Hib is not related to the influenza virus.

Timing and dose — There are several types of Hib vaccines available in the United States; one is given in three doses at 2, 4, and 6 months of age and as a booster dose at 12 to 15 months. The second type is given in two doses, at 2 and 4 months, and as a booster dose at 12 to 15 months of age. There are vaccines that combine the Hib vaccine with another vaccine or vaccines, including Hib/hepatitis B vaccine, Hib/DTaP vaccine, and Hib/DTaP/inactivatedpoliovirus vaccine.

Hib vaccine precautions — There are no medical conditions that require a child to avoid receiving Hib vaccine, other than a severe allergic reaction to one of the vaccine components. Reactions (eg, fever, irritability) are uncommon after Hib vaccine. Local reactions, consisting of pain, redness, and/or swelling at the injection site occur in approximately 25 percent of children. Such local reactions usually are mild and resolve within 24 hours.

Hib vaccine effectiveness — Hib vaccines protect 95 to 100 percent of children from developing a serious infection caused by Hib.

PNEUMOCOCCAL — *Streptococcus pneumoniae* (pneumococcus) can cause serious infections, including meningitis and pneumonia, which can be fatal in young children. This also is true in older children with a chronic medical condition or a weakened immune system.

Before infants were routinely immunized against pneumococcus in the United States, there were approximately 17,000 cases of invasive disease each year among children younger than 5 years of age, including 700 cases of meningitis and 200 deaths.

Timing and dose — Children should receive a total of four doses of pneumococcal vaccine. Doses should be given at 2, 4, and 6 and 12 to 15 months of age. The first dose can be given as early as 6 weeks of age.

Pneumococcal vaccine precautions — The most common side effect of the vaccine is an injection site reaction (redness, pain) and fever. (See "Patient information: Fever in children (Beyond the Basics)".)

Pneumococcal vaccine effectiveness — Pneumococcal vaccine is more than 90 percent effective in preventing invasive illness.

INFLUENZA — Commonly known as flu, influenza is a highly contagious viral infection that occurs in outbreaks worldwide, usually during the winter months in the United States. Young children and those with certain underlying medical conditions are at increased risk for severe or complicated influenza infection. Immunizing all children (and adults) can help decrease this risk. (See "Patient information: Influenza prevention (Beyond the Basics)".)

Immunization against influenza is recommended for all persons older than 6 months.

Timing and dose — There are two types of influenza vaccine; one is an injection (shot), while the other is administered as a nasal spray. The shot is approved for adults and children six months of age and older, while the nasal spray is approved only for those between 24 months of age and 49 years of age.

People who have a weakened immune system or who have chronic heart, lung, kidney, or metabolic disease should not use the nasal spray since it contains a weakened form of the live virus. Household contacts of those who have severely weakened immune systems also should not receive the nasal spray.

The influenza viruses change every year, which means that a new vaccine must be given every year (in the fall). In the first year that a child (younger than 9 years old) gets the vaccine, two doses are recommended; the second dose is given at least one month after the first. In subsequent years, only one dose is needed. The influenza vaccine does not prevent illnesses such as the common cold or strep throat.

Influenza vaccine precautions — Both forms of the influenza vaccine are prepared using chicken eggs. Thus, children who have had a severe allergic reaction to chicken or egg proteins should not get the vaccine. Talk to your child's doctor or nurse if you have a question about allergies and vaccines. (See "Allergic reactions to vaccines".)

Injectable influenza vaccine precautions — Children who have a fever (higher than 100.4ºF/38ºC) should wait to get the vaccine until the fever resolves. However, children with mild illnesses that do not cause a fever can get the vaccine. The most common side effect of the shot is redness and soreness at the injection site. Some children develop a low-grade fever or a runny or congested nose after vaccination, particularly in children younger than 2 years. (See "Patient information: Fever in children (Beyond the Basics)".)

Nasal spray influenza vaccine precautions — The nasal spray form of influenza vaccine is not recommended for children who take aspirin daily and those with a weakened immune system, Guillain-Barré syndrome, asthma, and other conditions (eg, chronic lung or heart problems, pregnancy, chronic metabolic disease, kidney dysfunction, and blood disorders). The nasal spray vaccine is not recommended for children younger than 24 months.

Influenza vaccine effectiveness — The injectable influenza vaccine protects between 70 and 90 percent of healthy children from developing laboratory-confirmed influenza infection. The nasal spray vaccine protects about 87 percent of children between ages 5 and 7 years.

MEASLES-MUMPS-RUBELLA (MMR) — Measles, mumps, and rubella are illnesses that may be transmitted by airborne droplets released during coughing or sneezing.

●Measles (also known as rubeola) is a highly contagious viral illness of the respiratory tract that primarily affects children; it causes a distinctive rash, fever, and cough, and may result in complications, including infection of the middle ear, lungs, and brain.

●Mumps is an acute, usually mild viral infection of childhood that causes painful swelling of the salivary glands. Mumps complications can develop, including inflammation of the brain (encephalitis), the protective membranes of the brain (meningitis) and, in males after puberty, swelling and tenderness of one or both testes (orchitis).

●Rubella, also known as German measles, is a mild viral infection that causes fever, swelling of the lymph nodes in the neck, and a distinctive rash; however, it can cause severe birth defects (congenital rubella syndrome) if a woman becomes infected during early pregnancy.

The number of people affected by these diseases has fallen dramatically in the United States since vaccines were developed. Despite the rarity of these diseases in the United States, vaccination is still recommended for a number of reasons:

●Individuals who visit or emigrate from countries that do not vaccinate against measles can spread the virus to those who are not immune.

●Measles that develops during pregnancy can cause early labor and miscarriage.

●The most serious complications of mumps occur more frequently in adults than children, including orchitis (leading to sterility in men), neurologic complications, and a risk of fetal death if the infection is acquired in early pregnancy.

●Well-vaccinated groups of children help to protect almost everyone, including adults as well as other children.

Timing and dose — The first dose of MMR is administered at 12 to 15 months of age. A second dose is recommended routinely before school entry (between 4 and 6 years of age). The recommended schedule is available through the [Centers for Disease Control and Prevention](http://www.cdc.gov/vaccines/parents/downloads/parent-ver-sch-0-6yrs.pdf).

MMR vaccine precautions — Common side effects of the MMR vaccine include a mild rash or fever; these may be seen one to two weeks after the vaccine is given, and usually lasts one to three days. (See "Patient information: Fever in children (Beyond the Basics)".)

Reasons to avoid the MMR vaccine include pregnancy, some immune system conditions, use of medications that weaken the immune system, cancer, or a severe allergy to gelatin or the antibiotic neomycin. The vaccine should be given later if a child has a serious illness or if the child has recently received a blood transfusion or other blood product (eg, serum immune globulin).

Concern has been raised about a possible link between the MMR vaccine, autism, autism spectrum disorder, and type 1 diabetes. To date, no scientific study published in the peer-reviewed literature has provided any evidence that such a link exists. (See "Patient information: Why does my child need vaccines? (Beyond the Basics)".)

For the **first dose**, the risk of febrile seizures is twice as high in children 12 to 23 months of age who receive MMR vaccine combined with varicella vaccine as in children who receive MMR vaccine and varicella vaccine separately. For this reason, separate MMR and varicella vaccines are generally preferred for the first dose if the child is younger than 48 months. The risk of febrile seizures decreases as children get older, so the combination MMR-varicella vaccine can be used for the second dose.

MMR vaccine effectiveness — When given on time, the MMR vaccine protects more than 99 percent of children from developing measles and 95 percent of children from developing mumps and rubella.

VARICELLA (CHICKENPOX) — Varicella is a highly contagious viral illness caused by infection with the varicella zoster virus (VZV). The disease causes fever, sore throat, and a distinctive, itchy rash with fluid-filled blisters that later forms scabs. The virus is transmitted by the spread of airborne droplets or direct contact with skin lesions. Complications of chickenpox may include bacterial infections of the skin, pneumonia, or, less commonly, inflammation of the brain. (See "Patient information: Chickenpox prevention and treatment (Beyond the Basics)".)

Before the vaccine was available, an estimated 3.7 million cases of chickenpox occurred in the United States every year, resulting in nearly 9000 hospitalizations and approximately 100 deaths.

Timing and dose — In the United States, VZV vaccine is recommended for all children at 12 to 18 months of age. The recommended schedule is available through the [Centers for Disease Control and Prevention](http://www.cdc.gov/vaccines/parents/downloads/parent-ver-sch-0-6yrs.pdf). A second dose is recommended at 4 to 6 years of age. A combination measles, mumps, rubella, and varicella vaccine (MMRV, ProQuad) may be used in children between 12 months and 12 years. The VZV vaccine is not needed if a child develops typical chickenpox disease before the vaccine is given.

Chickenpox vaccine precautions — The varicella vaccine contains a live weakened form of VZV, thus it is not recommended for children with a weakened immune system or in someone experiencing moderate to severe illness. The vaccine should be delayed in a child who has recently received an injection of immunoglobulin, a blood transfusion, or other blood product. The vaccine is not recommended for children who have a severe allergy to neomycin or gelatin. The most common side effects of the VZV vaccine are redness or soreness at the injection site and a mild rash (about five spots).

For the **first dose** risk of febrile seizures is twice as high in children 12 to 23 months of age who receive VZV vaccine combined with measles-mumps-rubella (MMR) vaccine as in children who receive VZV vaccine and MMR vaccine separately. For this reason, separate VZV and MMR vaccines are generally preferred for the first dose if the child is younger than 48 months. The risk of febrile seizures decreases as children get older, so the combination MMR-VZV vaccine can be used for the second dose.

Chickenpox vaccine effectiveness — The chickenpox vaccine protects 70 to 90 percent of people who receive it. However, about 1 percent of people who are given the vaccine develop chickenpox; in these people, the infection is usually mild, fever does not usually occur, and skin blisters do not develop.

HEPATITIS A VACCINE — Hepatitis due to infection with the hepatitis A virus (HAV) is one of the most common viral infections in children and adolescents in the United States. HAV infection often causes few or no symptoms in younger children. By contrast, infection in adults can vary in severity from a mild flu-like illness to rapidly progressive, severe liver disease. Vaccinating children can help to protect adult caregivers from a potentially serious illness. (See "Patient information: Hepatitis A (Beyond the Basics)".)

HAV is found in the stool of infected individuals. A person can become infected with HAV by consuming contaminated food or water or by touching the mouth, nose, or eyes after touching a contaminated surface (eg, in the bathroom or during a diaper change). Washing the hands can help to prevent infection.

Timing and dose — Hepatitis A vaccine is recommended for all children between 12 and 23 months of age. Older children and adults also should consider being immunized. In all age groups, two doses are required, given at least six months apart

The vaccine also is recommended for certain high-risk adults, such as food handlers, international travelers, people with blood clotting disorders or chronic liver disease and those who live in communities with a high hepatitis A infection rate.

Hepatitis A vaccine precautions — The HepA vaccine should not be given if the child had a severe reaction to the vaccine after the first dose. The vaccine contains alum and phenoxyethanol, and should not be given to children with a known sensitivity to these additives. The most common side effect of the HepA vaccine is brief redness or discomfort at the injection site.

Hepatitis A vaccine effectiveness — The HepA vaccine protects nearly 100 percent of children who receive the recommended two doses.

INTRODUCTION — Ear infections, also called otitis media, are a common problem in children. About 50 percent of infants have at least one ear infection by their first birthday. Ear infections can cause pain in the ear, fever, and temporary hearing loss and general signs such as loss of appetite and irritability. Some children get better without specific antibiotic treatment but most young infants benefit from use of an antimicrobial agent.

This topic will review the definition, causes, symptoms, diagnosis, treatment, and potential complications of ear infections in infants and children.

More detailed information about ear infections is available by subscription. (See "Acute otitis media in children: Treatment".)

WHAT IS AN EAR INFECTION? — Ear infection is also known as acute otitis media (otitis = ear, media = middle). Otitis media is an infection of the middle section of the ear.

Ear infections most often develop after a viral respiratory tract infection, such as a cold or the flu. These infections can cause swelling of the mucous membranes of the nose and throat, and diminish normal host defenses such as clearance of bacteria from the nose, increasing the amount of bacteria in the nose. Viral respiratory tract infections also can impair Eustachian tube function. Normal Eustachian tube function is important for maintaining normal pressure in the ear. Impaired Eustachian tube function changes the pressure in the middle ear (like when you are flying in an airplane). Fluid (called an effusion) may form in the middle ear and bacteria and viruses follow, resulting in inflammation in the middle ear (figure 1). The increased pressure causes the eardrum to bulge, leading to the typical symptoms of fever, pain, and fussiness in young children. (See 'Ear infection symptoms' below.)

EAR INFECTION SYMPTOMS — Symptoms of an ear infection in adolescents and older children may include ear aching or pain and temporary hearing loss. These symptoms usually come on suddenly.

In infants and young children, symptoms of an ear infection can include:

* Fever (temperature higher than 100.4ºF or 38ºC, see the Table for how to measure a child's temperature) (table 1)
* Pulling on the ear
* Fussiness or irritability
* Decreased activity
* Lack of appetite or difficulty eating
* Vomiting or diarrhea

EAR INFECTION DIAGNOSIS — If you suspect that your child has an ear infection, call your doctor or nurse to see if and when the child should be examined.

Although the exam is not painful, most infants and children do not like having their ears examined. To make the process easier, hold your child in your lap and hug your child's arms and body while the doctor or nurse uses an instrument (otoscope) to look inside the child's ear. Often cerumen (ear wax) will need to be removed so your doctor or nurse can get a good view of the ear drum.

The doctor or nurse can tell if your child has an ear infection by looking at the ear drum (tympanic membrane) for the typical features of an ear infection.

EAR INFECTION TREATMENT — Treatment of an ear infection may include:

* Antibiotics
* Medicines to treat pain and fever
* Observation
* A combination of the above

The "best" treatment depends on the child's age, history of previous infections, degree of illness, and any underlying medical problems.

Antibiotics — Antibiotics are usually given to infants who are younger than 24 months or who have high fever or infection in both ears. Children who are older than 24 months and have mild symptoms may be treated with an antibiotic or observed to see if they improve without antibiotics. (See 'Observation' below.)

Antibiotics can have side effects such as diarrhea and rash, and overusing antibiotics can lead to more difficult to treat (resistant) bacteria. Resistance means that a particular antibiotic no longer works or that higher doses are needed next time.

Observation — In some cases, your child's doctor or nurse will recommend that you watch your child at home before starting antibiotics; this is called observation. Observation can help to determine whether antibiotics are needed.

Observation may be recommended in these situations:

* If the child is older than 24 months
* If ear pain and fever are not severe
* If the child is otherwise healthy

You can give pain-relieving medicines during observation to ease pain. (See 'Pain management' below.)

If your child is being observed rather than treated with antibiotics, you will need to call or go back to the doctor or nurse's office after 24 hours for follow-up. If your child's pain or fever continues or worsens, antibiotics are usually recommended; observation may continue if the child is improving.

Pain management — Pain-relieving medicines, including ibuprofen (sample brand name: Motrin), acetaminophen (sample brand name: Tylenol), or ear drops (sample brand name: Auralgan) that contain a numbing medicine, may be used to reduce discomfort.

Complementary and alternative medical treatments — There are a wide variety of complementary and alternative medical (CAM) treatments advertised to treat ear infections. These may include homeopathic, naturopathic, chiropractic, and acupuncture treatments.

There are few scientific studies of CAM treatments for ear infection, and even fewer studies that show CAM treatments to be effective. As a result, these treatments are not recommended for ear infections in children.

Decongestants and antihistamines — Cough and cold medicines (which usually include a decongestant or antihistamine) have not been proven to speed healing or reduce complications of ear infections in children. In addition, these treatments have side effects that can be dangerous. Neither decongestants nor antihistamines are recommended for children with ear infections.

Follow-up — Your child's symptoms should improve within 24 to 48 hours whether or not antibiotics were prescribed. If your child does not improve after 48 hours or gets worse, call your doctor or nurse for advice. Although fever and discomfort may continue even after starting antibiotics, the child should get a little better every day. If your child appears more ill than when seen by his or her health care provider, contact the provider as soon as possible.

Children who are younger than two years and those who have language or learning problems should have a follow-up ear exam two to three months after being treated for an ear infection. These children are at risk for delays in learning to speak. This follow-up helps to ensure that the fluid collection (which can affect hearing) has resolved. (See 'Ear infection complications' below.)

EAR INFECTION COMPLICATIONS

Tympanic membrane rupture — One of the common complications of an ear infection is rupture of the ear drum, also known as the tympanic membrane. The tympanic membrane can rupture when fluid presses on the membrane, reducing blood flow and causing the tissue to weaken. It does not hurt when the membrane ruptures, and many children actually feel better because pressure is released. Fortunately, the tympanic membrane usually heals quickly after rupturing, within hours to days. Rupture of the ear drum is an indication for antibiotic treatment of an ear infection.

Hearing loss — The fluid that collects behind the eardrum (called an effusion) can persist for weeks to months after the pain of an ear infection resolves. An effusion causes trouble hearing, which is usually temporary. If the fluid persists, however, it can interfere with the process of learning to speak. (See "Otitis media with effusion (serous otitis media) in children: Clinical features and diagnosis" and "Otitis media with effusion (serous otitis media) in children: Management".)

Effusions usually resolve without any treatment. However, if the effusion persists for more than three months, the child may need treatment with a surgical procedure. The decision to treat is based upon how much the effusion affects the child's hearing and the child's risk of speech problems.

Children who are not treated for an effusion should be monitored over time. This includes an ear exam and hearing testing every three to six months until the effusion goes away.

EAR INFECTION PREVENTION — Some children develop ear infections frequently. Recurrent ear infections are defined as three or more infections in six months, or four or more infections within 12 months. In addition to receiving the pneumococcal and influenza vaccines, as recommended for all children, several interventions can help reduce the risk of recurrent infections. These include avoidance of tobacco smoke, breastfeeding, continuous low dose antibiotics, and/or surgical placement of tubes in the ears. (See "Acute otitis media in children: Prevention of recurrence" and "Patient information: Vaccines for infants and children age 0 to 6 years (Beyond the Basics)".)

Preventive antibiotics — Children who have recurrent ear infections are sometimes treated with a preventive regimen of a daily antibiotic during the fall, winter, and early spring months. Although preventive antibiotics might help reduce the number of ear infections, it is still possible for the child to get an infection. There is also a risk that taking antibiotics for a long period of time can lead to bacteria that are resistant to standard antibiotics. Talk to your child's doctor or nurse about the potential benefits and risks of this approach.

Surgery — Some studies show that having surgery to place tympanostomy tubes in the ears helps to prevent recurrent ear infections. Other studies show no benefit of tympanostomy tubes for prevention of recurrences (figure 2). Talk to your child's doctor about the risks and benefits of surgery.

INTRODUCTION — Bronchiolitis is a lower respiratory tract infection that occurs in children younger than two years old. It is usually caused by a virus. The virus causes inflammation of the small airways (bronchioles) (figure 1). The inflammation partially or completely blocks the airways, which causes wheezing (a whistling sound heard as the child breathes out). This means that less oxygen enters the lungs, potentially causing a decrease in the blood level of oxygen.

Bronchiolitis is a common cause of illness and is the leading cause of hospitalization in infants and young children. Treatment includes measures to ensure that the child consumes adequate fluids and is able to breathe without significant difficulty. Most children begin to improve two to five days after first developing breathing difficulties, but wheezing can last for a week or longer. Bronchiolitis can cause serious illness in some children. Infants who are very young, born early, have lung or heart disease, or have difficulty fighting infections or handling oral secretions are more likely to have severe disease with bronchiolitis. It is important to be aware of the signs and symptoms that require evaluation and treatment.

This topic review discusses the causes, signs and symptoms, and usual treatment of bronchiolitis in infants and children. More detailed information about bronchiolitis is available by subscription. (See "Bronchiolitis in infants and children: Clinical features and diagnosis" and "Bronchiolitis in infants and children: Treatment; outcome; and prevention".)

BRONCHIOLITIS CAUSE — Bronchiolitis is typically caused by a virus. Respiratory syncytial virus (RSV) is the most common cause. In the northern hemisphere, RSV outbreaks usually occur from November to April with a peak in January or February. In the southern hemisphere, wintertime epidemics occur from May to September, with a peak in May, June, or July. In tropical and semitropical climates, the seasonal outbreaks usually are associated with the rainy season.

Virtually everyone will have been infected with RSV by the age of three years. It is common to be infected more than once, even in the same RSV season; however, subsequent infections are usually milder. (See "Respiratory syncytial virus infection: Clinical features and diagnosis".)

Children who are older than two years typically do not develop bronchiolitis, but can be infected with RSV. RSV infection is common in children older than two years. It usually causes symptoms similar to those of the common cold or mild wheezing and at times the illness is significant enough to require evaluation by a health care provider. (See "Patient information: The common cold in children (Beyond the Basics)".)

BRONCHIOLITIS SYMPTOMS — Bronchiolitis usually develops following one to three days of common cold symptoms, including the following:

* Nasal congestion and discharge.
* A mild cough.
* Fever (temperature higher than 100.4ºF or 38ºC). The table describes how to take a child's temperature (table 1). (See "Patient information: Fever in children (Beyond the Basics)".).
* Decreased appetite.

As the infection progresses and the lower airways are affected, other symptoms may develop, including the following:

* Breathing rapidly (60 to 80 times per minute) or with mild to severe difficulty
* Wheezing, which usually lasts about seven days
* Persistent coughing, which may last for 14 or more days (persistent cough also may be caused by other serious illnesses that require medical attention)
* Difficulty feeding related to nasal congestion and rapid breathing, which can result in dehydration

Apnea (a pause in breathing for more than 15 or 20 seconds) can be the first sign of bronchiolitis in an infant. This occurs more commonly in infants born prematurely and infants who are younger than 2 months.

Signs of severe bronchiolitis include retractions (sucking in of the skin around the ribs and the base of the throat) (figure 2), nasal flaring (when the nostrils enlarge during breathing), and grunting. The effort required to breathe faster and harder is tiring. In severe cases, a child may not be able to continue to breathe on his or her own.

Low oxygen levels (called hypoxia) and blue-tinged skin (called cyanosis) can develop as the illness progresses. Cyanosis may first be noticed in the finger and toenails; ear lobes; tip of the nose, lips, or tongue; and inside of the cheek. Any of these signs or symptoms requires immediate medical evaluation.

A child who is grunting, appears to be tiring, stops breathing, or has cyanosis needs urgent medical attention. (See 'Emergent care' below.)

Contagiousness — The most common cause of bronchiolitis, respiratory syncytial virus (RSV), is transmitted through droplets that contain viral particles; these are exhaled into the air by breathing, coughing, or sneezing. These droplets can be carried on the hands, where they survive and can spread infection for several hours. If someone with RSV on his or her hands touches a child's eye, nose, or mouth, the virus can infect the child. Adults infected with RSV can easily transmit the virus to the child or other adults.

A child with bronchiolitis should be kept away from other infants and individuals susceptible to severe respiratory infection (eg, those with chronic heart or lung diseases, those with a weakened immune system) until the wheezing and fever are gone.

BRONCHIOLITIS DIAGNOSIS — The diagnosis of bronchiolitis is based upon a history and physical examination. Blood tests and x-rays are not usually necessary.

Determining severity — The healthcare provider must determine if the child's illness is severe or if there is a risk of complications. In these cases, hospitalization is generally recommended to closely monitor the child and provide intravenous fluids or supplemental oxygen. (See 'Hospital care' below.)

BRONCHIOLITIS TREATMENT

Emergent care — Parents should seek medical attention if the child seems to be worsening. A child who is grunting, appears to be tiring, stops breathing, or has blue-colored skin (cyanosis) needs urgent medical attention. Emergency medical services should be called, available in most areas of the United States by dialing 911. (See 'When to seek help' below.)

Severe bronchiolitis should be evaluated in an emergency department or clinic capable of handling urgent respiratory illnesses. This is a life-threatening illness and treatment should not be delayed for any reason.

Symptomatic care — There is no cure for bronchiolitis, so treatment is aimed at the symptoms (eg, difficulty breathing, fever). Treatment at home usually includes making sure the child drinks enough and saline nose drops (with bulb suctioning for infants).

Monitoring — Monitoring at home involves observing the child periodically for signs or symptoms of worsening. Specifically, this includes monitoring for an increased rate of breathing, worsening chest retractions, nasal flaring, cyanosis, a decreased ability to feed or decreased urine output. Parents should contact their child's healthcare provider to determine if and when an office visit is needed, or if there are any other questions or concerns. (See 'When to seek help' below.)

Fever control — Parents may give acetaminophen (sample brand names: Tempra, Tylenol) to treat fever if the child is uncomfortable. Ibuprofen (sample brand names: Advil, Motrin) can be given to children greater than six months of age. Aspirin should not be given to any child under age 18 years. Parents should speak with their child's healthcare provider about when and how to treat fever.

Nose drops or spray — Saline nose drops or spray might help with congestion and runny nose. For infants, parents can try saline nose drops to thin the mucus, followed by bulb suction to temporarily remove nasal secretions (table 2). An older child may try using a saline nose spray before blowing the nose.

Encourage fluids — Parents should encourage their child to drink an adequate amount of fluids; it is not necessary to drink extra fluids. Children often have a reduced appetite, and may eat less than usual. If an infant or child completely refuses to eat or drink for a prolonged period, urinates less often, or has vomiting episodes with cough, the parent should contact their child's healthcare provider.

Other therapies — Other therapies, such as antibiotics, cough medicines, decongestants, and sedatives, are not recommended. Cough medicines and decongestants have not been proven to be helpful, and sedatives can mask symptoms of low blood oxygen and difficulty breathing.

Coughing is one way for the body to clear the lungs, and normally does not need to be treated. As the lungs heal, the coughing caused by the virus resolves. Smoking in the home or around the child should be avoided because it can worsen a child's cough.

Antibiotics are not effective in treating bronchiolitis because it is usually caused by a virus. However, antibiotics may be necessary if the bronchiolitis is complicated by a bacterial infection, like an ear infection or bacterial pneumonia (very uncommon).

Sometimes, keeping the child's head elevated can reduce the work of breathing. A child may be propped up in bed with an extra pillow. Pillows should not be used with infants younger than 12 months of age.

Hospital care — Approximately 3 percent of children with bronchiolitis will require monitoring and treatment in a hospital. Most children receive monitoring of vital signs and supportive care, including supplemental oxygen and intravenous fluids, if necessary. Other treatments are individualized, based upon the child's needs and response to therapy.

Isolation precautions — Because the viruses that cause bronchiolitis are contagious, precautions must be taken to prevent spreading the virus to other patients and/or children. Parents may visit (and stay with the child) but siblings and friends should not. Toys, books, games, and other activities can be brought to the child's room. All visitors (nurses, doctors, parents) must wash their hands before and after leaving the room.

Feeding — Most infants and children can continue to eat, breastfeed, or drink normally while in the hospital. If the child is unable or unwilling to eat or drink adequately, the respiratory rate is too fast, or the child is having significant difficulty breathing or stops breathing, fluids and nutrition should be given into a vein (intravenously).

Treatments — In some cases, an inhaled medication is given to open the child's airways (a bronchodilator). If the medication is helpful, it may be given every four to six hours as needed to ease breathing.

Supplemental oxygen may be needed for children who are unable to get enough oxygen from room air; this is usually given by placing a tube (called a nasal cannula) under a child's nose or by placing a face mask over the nose and mouth. For infants, an oxygen head box (a clear plastic box) may be used. The child is tested periodically to determine the blood oxygen level when oxygen is turned off. The goal is to slowly reduce and then discontinue supplemental oxygen when the child is ready.

If a child is severely ill and unable to breathe adequately on his or her own, or if the child stops breathing, a breathing tube (endotracheal tube) may be inserted into the mouth and throat. This is connected to a machine (called a ventilator) that breathes for the child at a regular rate. The use of an endotracheal tube and ventilator is a temporary measure that is discontinued when the child improves.

Discharge to home — Most children who require hospitalization are well enough to return home within three to four days. Children who require a machine to help them breathe usually need to stay in the hospital for four to eight days or longer before they are ready to go home.

Recovery — Most children with bronchiolitis who are otherwise healthy begin to improve within two to five days. However, wheezing persists in some infants for a week or longer, and it may take as long as four weeks for the child to return to his or her "normal" self. Recovery may take longer in younger infants and those with underlying medical problems (eg, prematurity, other lung diseases). The child should be kept out of daycare and/or school until the fever and runny nose have resolved (ie, the time during which they are most contagious).

BRONCHIOLITIS PREVENTION — There are several ways to prevent severe bronchiolitis:

* Avoid smoking in the child's home because this increases the risk of respiratory illness.
* Wash hands frequently with soap and water, especially before touching an infant. Hands should ideally be wet with water and plain or antimicrobial soap, and rubbed together for 15 to 30 seconds. Hands should be rinsed thoroughly and dried with a single-use towel.
* Use alcohol-based hand rubs. These are a good alternative for disinfecting hands if a sink is not available. Hand rubs should be spread over the entire surface of hands, fingers, and wrists until dry. Hand rubs are available as a liquid or wipe in small, portable sizes that are easy to carry in a pocket or handbag. When a sink is available, visibly soiled hands should be washed with soap and water.
* Avoid other adults and children with upper respiratory infection. It may be difficult or impossible to completely avoid persons who are ill, although parents can try to limit direct contact. In addition, infants or children who are sick should not be sent to day care or school because this can potentially cause others to become ill.
* A yearly vaccination for influenza virus is recommended for everyone older than 6 months, especially for household contacts of children younger than five years, and out of home caregivers of children younger than five years. (See "Patient information: Influenza symptoms and treatment (Beyond the Basics)".)
* Infants who are younger than 24 months with specific types of chronic lung disease or heart disease, as well as infants who are born preterm (before 32 weeks) may be given a special medication (palivizumab) to prevent severe respiratory syncytial virus (RSV) infection requiring hospitalization. Palivizumab (brand name: Synagis) is a monoclonal antibody that protects the lungs from severe infection from RSV. It is given as an injection into the muscle once per month for five months starting before RSV season. There is a low risk of serious side effects with palivizumab. More detailed information about this is available separately. (See "Respiratory syncytial virus infection: Prevention".)

BRONCHIOLITIS AND ASTHMA — There is interest in the relationship between bronchiolitis in early childhood and later development of asthma. Some studies have noted an increased risk of asthma following an episode of bronchiolitis, although it is unclear if the risk of asthma is increased due to bronchiolitis or other risk factors (eg, genetic predisposition to asthma, environmental irritants such as cigarette smoke).

The first time a child develops wheezing, it can be difficult to know if it is caused by bronchiolitis or asthma. Most cases of first time wheezing are caused by a virus. A history of recurrent wheezing episodes and a family or personal history of asthma, nasal allergies, or eczema help to support a diagnosis of asthma. Viruses frequently trigger asthma attacks in children with asthma.

After developing bronchiolitis, some infants will have recurrent episodes of wheezing during childhood. These wheezing episodes are triggered by viruses and may respond to the same treatments used in children with asthma.

WHEN TO SEEK HELP — If, at any time, a child develops features of worsening or severe bronchiolitis, the parent should seek **immediate** medical attention. This includes:

* Difficulty breathing or appearing overwhelmed by the work of breathing
* Pale or blue-tinged (cyanotic) skin
* Severe coughing spells
* Severe sucking in of the skin around the ribs and base of the throat (retractions) with breathing (figure 2)
* If the child stops breathing

Parents should not attempt to drive their child to the hospital if the child is severely agitated, cyanotic, struggling to breathe, stops breathing, or is excessively drowsy (lethargic); emergency medical services should be called, available in most areas of the United States by dialing 911.

A parent should call the child's doctor or nurse if:

* The child has a fever (temperature higher than 100.4ºF or 38ºC), particularly for infants who are younger than 90 days (table 1)
* The child has signs or symptoms of bronchiolitis
* The child has difficulty feeding or has fewer wet diapers than usual
* There are questions or concerns about the child's condition

What are advance directives? — Advance directives are legal documents that allow you to spell out ahead of time what types medical care you would want if you ever became unable to speak for yourself. These documents can help ensure that you get the care you want even if you have an unexpected serious illness or accident. The documents can also make things easier for the people who will need to make decisions for you if you ever become unable to make them for yourself.

Are there different kinds of advance directives? — Yes. The most useful kinds of advance directives are:

●**Healthcare proxy (also called the durable power of attorney for healthcare)** – The healthcare proxy document allows you to choose someone to make medical decisions for you if you become unable to speak for yourself. The benefit of having this document is that it makes your choice of a decision-maker clear to your doctors and family members. When you choose a healthcare proxy, it is important to talk to the person you choose about the things that you do or don’t want. That way your decision-maker knows what to do later on if he or she ever has to speak for you.

●**Living will** – A living will is the document that tells healthcare providers what type of care you want if you become unable to speak for yourself. For instance, a living will allows you to record in writing whether you would want a feeding tube put in if you had a serious illness or accident.

●**Do not resuscitate/do not intubate order** (also called a DNR/DNI) – If you decide you do not want your heart restarted if it stops and you do not want a breathing tube put in if you stop breathing, you can ask for a DNR/DNI. This is a form that must be signed by a doctor. It tells all your healthcare providers that you have decided you do not want these treatments.

How do I choose a healthcare proxy? — Choose someone who:

●You know and trust

●Can separate his or her own wishes from your own

●You know would carry out your wishes if that became necessary

●Could be easily reached if he or she was needed

●Could handle it if other family members or loved ones wanted you to get treated differently than you would want

Some people choose a second person as an alternate proxy, in case their first choice cannot be reached at the time decisions need to be made.

Who should have an advance directive? — Advance directives are a good idea for anyone, but they are especially important if:

●You are older than 65.

●You have a serious life-threatening illness, such as advanced cancer, or end-stage heart or liver failure.

●The person whom you would like as your healthcare proxy (decision-maker) is not a family member or legally married to you. If that is the case the person you would choose might not be allowed to make decisions for you. Unless there is a healthcare proxy, the law usually states that a person’s closest family member has the right to make decisions for him or her.

What kinds of decisions will I need to make? — Your advance directives can have as much or as little detail as you want. But many people who have advance directives record their wishes about the following treatments:

●**Breathing tubes** – If you stop breathing or are having a very hard time breathing, you can get attached to a machine that will help you breathe. For that to happen, you will have to be “intubated.” That means that a tube will be put down your throat and into your lungs. Then the tube will be connected to a breathing machine. When the tube is in place, you will not be able to talk, at least at first. Plus, you will probably be sedated, meaning that you are on medicines that make you sleep.

Sometimes a breathing machine is needed only for a short time. For instance, some people need the breathing machine just while they recover from a lung infection. When deciding about a breathing tube, consider whether you would want it at all, want it only for a short time, or want it no matter what. Also, keep in mind that any time a breathing machine is used, it is hard to know for sure if and when it will be able to be disconnected.

●**Cardiopulmonary resuscitation (CPR)** – If your heart stops beating suddenly, doctors might be able to restart it by pumping on your chest, putting in a breathing tube and pushing air into your lungs, giving you an electric shock (called “defibrillation”), and/or giving you special medicines. Some people recover completely after having their heart restarted. Others have permanent brain damage from a lack of blood flow to the brain; this is most likely in people who have an advanced, serious illness.

●**Feeding tubes** – If you become unable to eat, you can have a tube put into your stomach or intestines that can deliver nutrients. A feeding tube can keep a person’s body going while he or she heals and gets strong. But it can also keep a person alive for a long time even if there is no chance the person will recover.

Can I change my mind? — Yes. You can change your mind at any time. If you sign an advance directive and you decide you want a different kind of treatment or you no longer want the healthcare proxy you chose, all you have to do is tell your doctor or nurse about your new decision. If you want to name a new healthcare proxy or want to record new wishes, you can draw up new documents.