Coughs and sneezes

Granny: I have been coughing all night and my throat is sore – will you make me a nice lemon and honey drink?

Photo by Andrea Piacquadio
https://www.pexels.com/photo/a-sick-girl-wiping-her-nose-with-tissue-3765115/

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Coughs and sneezes

1. What are they?

Coughs and sneezes are very common symptoms, and two of the most frequent reasons for consultation in the pediatric emergency department.

A cough is a sound and convulsive movement of the respiratory system of humans and animals. Is caused by the spasmodic contraction of the thoracic cavity creating the violent release of air from the lungs. A sneeze is a reflex action caused by an irritation in the mucosa of the nose and consists of expulsion air and saliva through the nose itself and, sometimes, the mouth. Typically, sneezing is caused by the appearance of dust or other foreign agents in the nasal area, but also by infections of the respiratory system.

Both actions remove particles (or microorganisms) from the pathway and protect the lower sectors of the lungs from different particles or germs that can cause us harm.

They are annoying, since sometimes they persist not only during the day but also at night, not allowing you to rest properly. And they generate great anxiety in parents who are afraid that they could be signals of an important illness such as pneumonia.

2. How will we be treated?

When coughs and sneezes are mild and occur in healthy children, caregivers take steps to ensure relief of discomfort. It is not uncommon to find a grandmother preparing a tea or soup that provides liquid to maintain hydration. She will probably buy a lot of tissues and suggest that the child stay in bed for a couple of days.

But when the symptoms are persistent and intense, or are accompanied by "red flags" such as shortness of breath, high fever, noises when breathing, among others, it becomes necessary to we obtain help from a physician.

3. The process of examination and diagnosis by the physician

Doctors analyze the duration and the intensity of the symptoms, Generally the fever is low and it lasts about two days. The characteristic of the coughs is very important to guide the physician to discover which microorganism he or she is dealing with. For example, a cough without breath in between, and that it makes you look like a tomato, could signal whooping cough caused by the bacterium *Bordetella pertussis*. Fortunately most of us were vaccinated against whooping cough and usually have only a mild cough.

Another relevant aspect of a cough is when it is loud or deep, or persistent, because it is possible that you have a complication. On the other hand, some viruses like influenza could explain the persistence of the fever. It is very important that the doctor listen to how we breathe with an instrument called a stethoscope. This allows the doctor to hear the noises that the air makes when entering the lungs, and if there is mucus or some narrowing that is evident.

Some symptoms such as shortness of breath, pain when breathing or in the chest, an inability to eat, among others, require that the doctor prescribe tests such as an X-ray. X-rays are photos in which the lungs, the heart and bones can be seen. This picture may for example reveal mucus in the air spaces which often suggests treatment with antibiotics.

4. Identification of the underlying cause

There are a lot of conditions that can trigger coughs and sneezes: allergies, irritants such as smoke and foreign objects in the airway (stuck peanuts for example), among others.

When it comes to infections, the most frequent cause of these symptoms is the common cold or the flu. There are many viruses like rhinovirus, coronavirus and others that can cause this illness (see table). Although they occur throughout the year, they predominate in the beginning of autumn and at the end of the spring.

Transmission of the viruses is usually by coughing and sneezing by a sick person (often another child), which creates in the air a cloud of droplets containing the virus, which we then breathe in and infect ourselves. The viruses infect the cells of our nasal passages, where they multiply. Here the temperature is a little lower than in the rest of the body (especially in winter), which favors some of these viruses.

When the virus multiplies, it activates the immune system, which is a sentinel of possible aggressors in the body, and whose job it is to detect that something is not right and to eliminate that threat (the virus) which causes damage.

Children are especially susceptible to such infections due to a lack of immunity against most of the causative viruses. Also, children haven't completely developed all practices of personal hygiene, such as hand washing, and this increases exposure.

Flu virus is an important cause of respiratory disease. It has the particularity that it continuously changes by mutation a lot of the proteins of its envelope (as if it changed the clothes it is wearing). This means that the immune cells in charge of defending us do not recognize it easily. Its variability is due to various causes, one of which is that it has the possibility of infecting some animals (birds, pigs) as well as humans. It is also due to the genetic information found in several bits of DNA (segmented genome). This variability plays an important role in changing envelope characteristics from one winter to another, and the reason why every year we need to have a new vaccine to protect us that recognises the new viral surface

Of course, as everyone knows, in recent years we saw the spread of a pandemic virus called SARS-CoV-2. This virus is a variant of coronavirus, which causes many respiratory infections and causes some people (such as the elderly) to have a more significant illness. Luckily, since scientists have helped develop vaccines, the story has changed and fewer people are getting severely ill.

As you can see in the table, some bacteria also cause respiratory diseases. They can be in the upper part or lower respiratory system. When someone has a bacterial disease, the fever is very high and respiratory symptoms worsen over the days, adding difficulty to breathing, not eating and not drinking liquids, and having chest pain, among others.

Table: Some important causes of different respiratory tract infections

Common cold	Pharyngitis	Otitis	Lung infection
rhinovirus	all viruses that cause common cold	all viruses that cause common cold	*S. pneumoniae*
coronavirus			*H. influenzae*
respiratory syncytial virus	*S. pyogenes*	*S. pneumoniae*	
adenovirus		*H. influenzae*	

viruses in blue, bacteria in green

5. The treatments

The common cold is a very annoying disease, because of the itching in the nose, the amount of mucus we produce (to try to eliminate the viruses and dead cells resulting from the infection) and sometimes it also causes a little fever. Because of these symptoms, children can´t carry on with everyday activities: going to school, playing sports or playing with friends. Sometimes the body aches and children are a little more tired than usual and prefer to lie down.

No medicine can make the virus go away. For these reasons it is important on those days to pay attention to what the body needs and stay home quietly, sleep the hours you really need, drink plenty of liquids and eat healthily. All of these help our immune system.

The disease lasts between 3-7 days and generally does not cause major complications in healthy children. Babies, who have a small nose can have a hard time breathing.

Sometimes respiratory infections (in the throat, ears, and lungs) are caused by bacteria. Although these "bugs" are tiny just like viruses, they do have some biological differences. To fight bacteria, doctors use drugs called antibiotics.

However, it is really important not to use antibiotics unless indicated by a doctor, since some bacteria learn to strengthen themselves and become resistant to these drugs. Luckily, we still have a variety of antibiotics to choose from, but imagine a bacterium that is resistant to all antibiotics!! It would be a mess to combat such diseases. That is why this group of drugs should be saved for when they are really necessary.

6. How to reduce further transmission

Handwashing and staying away from other people during the illness is the best thing to do so that no one else gets a cold.

In the pandemic of SARS-CoV-2 we use a face mask. Nowadays this recommendation is not appropriate for healthy people and it is reserved for hospitals and children who are sick. Face-to-face interactions are very important in social life.

It is also important to keep rooms ventilated to dilute out and remove any virus that is expelled into the air of the room by an infected person. Of course it is difficult to do this during the winter in places where it is very cold. But it's better to wrap up warm and open the windows for a while and let the new air in.

Because of the risk of transmission, doctors indicate a few days of rest at home, not only to improve your rate of recovery but also avoid your infecting others.

7. Prevention (prophylaxis) options

Many countries have vaccines to prevent complications of the flu and some serious infections in the lungs caused by bacteria. Vaccines are administered with a needle and the prick may hurt just a little bit!! We hope oral vaccines are developed soon (drinkable in delicious syrups). But for now we have to endure the prick once a year if we want to avoid the complications of the flu.

Flu complications are not very frequent, but when they appear they force us to remain hospitalized and receive medication and oxygen. Even when the flu isn't serious, vaccination can reduce its symptoms, so that children can go back to school and to play sooner. The SARS-CoV-2 vaccines were very helpful in preventing complications in older people and those who had some other health problems. Luckily children were not the worst affected by the pandemic of this virus, but some doctors recommend in some situations that they also get vaccinated.

Vaccines for bacterial diseases that affect the respiratory system (such as those caused by pneumococcus or *Haemophilus*) are given to young children and are generally enough to protect them for a long time.