

Extensive coronavirus manual from Na Bulovce Hospital experts: What we know so far, why to stay at home and how to protect yourself

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A pair of leading experts on infections, professors of medicine at Prague's Na Bulovce Hospital, have drawn up a manual for the lay public on how to deal with the current coronavirus situation. "We would like to set the record straight on a few issues. The public should have at their disposal all information about the virus that plagues the world right now. I, along with my colleague Jiří Beneš, have created material that provides such information," Prof. Ladislav Machala told news server Lidovky.cz. He added that the manual is freely available to everyone and can be freely quoted and utilised.

Where we stand

As recently as in early March, it seemed possible to prevent the incursion of the coronavirus into the country, or, should rare cases of infection occur, prevent it from spreading throughout the population. At that time, northern Italy was already gripped by an epidemic while Germany and France were reporting initial dozens of cases. Under such circumstances, standard epidemiological measures were introduced, based on two fundamental pillars:

- 1) monitoring of key travel routes (primarily incoming flights from affected areas);
- 2) active searching for and isolating of persons with suspected infections, combined with searching for all persons with whom confirmed cases had come into contact.

These activities have been and continue to be performed by public health authorities with the maximum effort. Yet, despite these exertions the measures have proved insufficient, and for two reasons.

First and foremost, the disease caused by the coronavirus does not manifest itself through distinct clinical symptoms that would set it apart from common viral infections usually encountered at this time of the year. Official documents published by both European and global authorities (ECDC, WHO) reiterate that the disease manifests itself with a sudden onset of fever, a dry cough, feebleness and/or muscle pain. However, we on the healthcare frontline observe that most patients with a confirmed coronavirus infection show only a mildly raised temperature with some symptoms of nasopharyngeal inflammation, i.e. a runny nose and a mildly sore throat, with a cough sometimes being present as well. **We are therefore unable to identify suspect cases by symptoms alone and differentiate between people suffering a coronavirus infection and people suffering the common cold.**

The other factor that contributed to the failure of the initial measures was the skiing season, which generally peaks in February. Thousands of families from all over the Czech Republic went skiing in the Alps, including resorts in northern Italy. As most went on their own account, privately, there was no way of monitoring the situation by standard means. Initially, it seemed that this would not pose a problem as no cases had been reported from the mountain resorts. Some people, however, presented the symptoms of a cold and when they were subsequently tested for the coronavirus, their results came back positive. That situation in fact ruled out another premise of the initial plan for combatting the infection: the actual progress of the epidemic demonstrated the **inability to determine with any degree of reliability which geographical regions were or were not at risk.** The most that can be said is that some regions are more prone to the coronavirus infection than others, yet no region can be considered safe any longer.

Efforts to stop the propagation of the infection continue while individual cases, with no apparent epidemiological relationship, point to the conclusion that the infection is present throughout the population, even if it is not massively manifest.

We must now accept that any case of even a mild respiratory infection may possibly have been caused by the coronavirus. Under such circumstances, it is no longer reasonable to investigate epidemiological relationships between individual cases, trace previous contacts and isolate suspect individuals. What is required are blanket restrictions imposed by the national government with the objective of hindering as much as possible the transfer of the virus between individuals, while individuals should simultaneously use adequate means of personal protection. These efforts are directed at a different objective: **given that it is no longer possible to stop the epidemic, it is essential to slow its progress ensuring a gradual development instead of an explosive one.**

Why it is essential to prevent an explosive epidemic

The epidemic followed an explosive curve in the Chinese province of Wuhan and in northern Italy. In both regions, it resulted in a collapsing healthcare system and high numbers of fatalities caused by the coronavirus infection. On the other hand, countries such as Germany or South Korea report low numbers of fatalities despite their numbers of cases being in the thousands. *(An overview of regularly updated numbers of confirmed cases and fatalities can be found, for example, on the website of the Johns Hopkins University.)*

An explosive epidemic carries the following risks:

- 1) When many people fall ill simultaneously, society comes to a halt with many services failing, including services on which many citizens are highly dependent.
- 2) Healthcare has a special place among these services. When a healthcare system is overloaded by increased numbers of COVID-19 patients, general healthcare may be rendered inaccessible even though an ongoing pandemic won't stop people from suffering other medical conditions of all types (injuries, sudden conditions requiring surgery, heart attacks, etc.).
- 3) Available experience with the coronavirus infection shows that the severity of the disease itself depends on the amount of virus particles initially entering the patient's organism. Under an explosive scenario, it can be assumed that the concentration of virus particles is quite high in places with a greater number of infected people present. As a result, healthy people entering such an environment would be exposed not only to a higher risk of contracting the infection but to a risk of a more severe disease.
- 4) If variants of the virus of varying degrees of pathogenicity emerge during an explosive epidemic, then the more aggressive variants would propagate more rapidly due to multiplying faster. Under such conditions, aggressive variants produce more progeny than variants behaving in a "standard" fashion. This is therefore another factor contributing to a greater severity of the disease.

What we know about the characteristics of the virus and progress of the disease

First of all, the coronavirus is a virus that is rather sensitive to external conditions. In specific terms, this means that it does not cope with solar radiation, freezing temperatures, excessive heat or drying out. The virus is capable of surviving in an outdoors environment for several dozen minutes only. However, in enclosed spaces, with constant temperature and humidity, the virus can survive on the surface of inert objects for several days.

Each instance of coronavirus has an outer envelope composed of lipid (fat) molecules. This envelope can be easily destroyed by alcohol-based solvents as well as by regular soap.

Compared to other viruses, the genetic information of coronaviruses is rather variable. This is one reason behind the extensive coronavirus epidemics of recent decades (SARS in 2002-2004, MERS in 2013-2015 and the current COVID-19 pandemic). It is also the cause of a range of variants of the same virus that differ from one another in their pathogenicity. Two variants have so far been described for the coronavirus causing COVID-19 (designated the L and S variants), but more can be expected.

The virus most often enters the human organism via the respiratory tract but it can also enter through mucous membranes of the eyes or other organs. The incubation period is usually five days, with possible spans of two to 14 days.

The infection itself usually progresses like any other common viral infection. Patients may suffer any of the following symptoms: a high temperature, a runny nose, a cough or a sore throat. Some patients report no symptoms at all. It is mostly children and young people in good health who report a mild progress of the disease, especially if the initial viral load was light. This clinical picture has been typically presented by individuals who contracted the virus during a skiing holiday. On the other hand, in old-aged persons and persons with pre-existing medical conditions, the virus may affect the lower respiratory tract and lungs. The main symptoms in these cases include a cough, a fever and an increasing shortness of breath. The risk of a severe progress increases with a high initial load, such as via the infection propagating in a retirement home with most residents falling ill simultaneously. Severe cases were also reported among Chinese medical professionals who, although free of pre-existing conditions, worked to exhaustion while being exposed to high doses of the virus.

A frequently asked question is whether the disease provides the patient with lasting immunity. So far it appears that it depends on the severity of the disease. A very light progress of the disease may not result in the development of specific antibodies, meaning that the person who recovers from a mild instance of the disease may remain susceptible to reinfection. On the contrary, an instance of the disease to a medium to high severity almost certainly results in the development of specific antibodies leading to lasting immunity.

Ways in which the infection propagates

An infected person most likely begins to shed virus particles a day before clinical symptoms (runny nose, cough, high temperature) develop and continues to do so for the duration of the disease plus a few days afterwards. The duration of shedding after the cessation of clinical symptoms depends, among other factors, on the condition of the infected person's immune system. People with compromised immune systems may continue to shed virus particles for more than a week after their body temperature has normalised. Generally speaking, it can probably be recommended that **people remain in self-isolation for an additional week after recovering from the disease.**

Most patients contract the disease in one of two ways. The first and most apparent is **contracting the infection via an airborne infectious aerosol.** Such infectious aerosols are mainly created by sneezing and coughing. Microscopic droplets containing large amounts of virus particles remain airborne for several minutes before settling on surrounding surfaces. If such droplets come into contact with mucous membranes of a previously healthy person, an infection can easily develop.

The other and similarly frequent manner of propagation is via **touching contaminated surfaces.** In this case the vector of infection stems from the fluids of an infected person, such as from the nose or mouth, the respiratory tract and even tears containing virus particles. Depending on surrounding conditions, the virus can survive for varying amounts of time in the dried up residues of such fluids. The virus can survive for several dozen minutes on the skin of the hands, while on the surfaces of handkerchiefs, hand-grips in public transport vehicles, banknotes, keys and keyboards, and other frequently touched surfaces, it can last for several days. In these cases, people become infected by first contaminating a hand by touching a surface bearing the virus and then touching their nose, mouth or eyes.

Use of face masks and respirators

Simple face masks made from paper or textile provide partial protection for dozens of minutes, or more specifically until they become moist from the user's breath. Textile masks can be used repeatedly provided they are washed at temperatures above 60 °C and possibly ironed before reuse. Paper masks are single-use only. Respirators provide a greater degree of protection. They are better sealed on the face and provide

protection for longer. They are generally used by medical professional exposed to an increased risk of contracting the infection for extended periods during their working hours.

Some respirators are fitted with a valve. It is necessary to check what type of valve is used prior to the use of a respirator. An expiratory valve facilitates easy breathing out as the exhaled air passes through the valve and is not filtered. Respirators with this type of valve are designed to protect healthy people in risky environments. There are also respirators with an aspiration valve that makes breathing in easier. They filter the exhaled air. These respirators should be used by sick people in order to prevent the propagation of the infection.

It is also advisable to distinguish between situations that require the use of facial masks and situations that don't.

When in an outdoors environment (on a walk, doing sports, walking the dog) and avoiding contact with other people (keeping a safe distance, not stopping to chat), the risk of a transfer of the virus remains minimal and a face mask is not necessary. Propagation of the virus becomes a risk in the case of an increased concentration of people in an outdoors environment. This is typical for cities in Asia where it has become customary to wear face masks when amid the public. In the Czech Republic, this type of situation might occur, for example, when standing in a queue.

An ill person with a confirmed coronavirus infection or anyone showing symptoms of any respiratory infection should use a face mask. The mask then serves two purposes: it reduces the chances of the virus being shed into the environment and acts as a visual signal for others to keep a good distance from such a person.

When indoors, the need to use a face mask should be assessed case by case based on four factors: the concentration of people present; the level of risk that any one of those present is infected; the presence of senior citizens and/or people with pre-existing conditions; and the presence of effective ventilation. A face mask should be worn by anyone showing symptoms of a respiratory infection but it can also be worn by anyone who needs protection.

How healthy people can be protected during the epidemic

1) People should keep a good distance from anyone showing symptoms of a respiratory tract infection, especially in situations in which infection-containing aerosols are generated. The risk of contracting the infection increases in line with the lengthening duration of contact with an infected person and in cases of exposure that occur in enclosed spaces. In this respect, travelling by metro carries a greater risk than travelling by bus or tram, for instance.

2) The level of personal protection can be increased with the use of a face mask. It is also advisable to combine face masks with glasses to protect the eyes. The more tightly a mask sits on the face, the better the protection it provides.

3) To protect against contracting the infection by touch, it is necessary to maintain the highest possible hands hygiene. It is recommended that the hands are washed thoroughly using soap each time upon a return home. It is also necessary to avoid as much as possible touching surfaces that may have recently been touched by many other people, such as handles or keyboard keys. If prolonged or more frequent stays outdoors are required, it is recommended that a spray-on disinfectant or gloves are used. In this respect, special attention should be paid to small children. They should be wearing gloves or mittens when in a public transport vehicle. When shopping, openly stored food that is consumed without further processing (bread rolls and buns) carries an extra risk. It is better to pay with the use of a payment card, not forgetting hand hygiene after typing in the PIN code.

4) After touching surfaces that may have been contaminated, people should avoid touching their faces, especially near the eyes, nose and mouth before they have thoroughly washed their hands.

5) Rooms where people gather and stay for any period of time should be ventilated often.

A taxi ride can serve as a real-life example: a considerate driver airs the vehicle each time a passenger has left the car. The driver uses a face mask, not knowing who will hail them. Each passenger wears a face mask, not knowing who has recently travelled in the taxi. After leaving the taxi, passengers wash their hands at their earliest opportunity as they will have touched the seat, handles or other surfaces inside the vehicle.

What to do when self-isolating following exposure while subjectively experiencing no symptoms

1) People in self-isolation should avoid contact with other people, especially those at an increased risk of a more severe progress of the disease should they contract it (older people, people with impaired immune systems). If a self-isolating person needs to leave their home, they should wear a face mask (it should be added that using a face mask is important mainly as an optical signal for others – as long as a person remains free of the infection and no virus particles propagate from the respiratory tract, the risk of an airborne infection remains minimal). People in self-isolation are allowed to go outdoors, walk their dog, etc., on their own, unless prevented from doing so by special regulations or limitations.

2) At this self-isolation stage, there is no benefit in being tested for the coronavirus. A positive test result would confirm the presence of the infection; however, as long as the person felt well, their self-isolation regime would remain unchanged. A negative test result would only confirm that the tested person was not releasing virus particles as of the moment. However, the incubation period following their exposure would continue with the disease possibly flaring up the next day. A negative test result cannot be considered as proof of being free of infection as the result's validity does not extend beyond 24 hours.

What to do in the presence of any respiratory infection symptoms

1) At a time of an ongoing epidemic, any person with such symptoms should act as if they have already been confirmed as suffering a coronavirus infection. In practical terms, it means staying at home in self-isolation to avoid spreading the infection.

2) In line with regulations currently in place, a person observing in themselves symptoms of a lower respiratory tract infection (fever, cough, shortness of breath) should report their condition by phone to their relevant public health authority. The authority will then make a decision as to whether the person should be tested for the coronavirus.

3) The basic hygiene rules that help prevent the propagation of the infection are already well known:

- Cough and sneeze into a disposable handkerchief or into the crook of your elbow, not your hands.
- Blow your nose into a disposable handkerchief and throw it away immediately after use into a bin or a plastic bag in the absence of a bin; do not place a used handkerchief in your pocket or bag.
- Wash or disinfect your hands after blowing your nose or when there has been any other contact between your hands and any respiratory tract secretions.

4) If it becomes necessary for any reason to leave home to go to a place where other people are present, always wear a face mask. It is especially important to prevent direct or indirect contact with older people and/or people with pre-existing conditions.

5) As there is no specific effective medication to combat the coronavirus available to date, it is recommended that you at least support your immune system by getting enough sleep, eating a healthy and balanced diet, consuming extra vitamin C, etc. Intensive research is ongoing to develop possible cures. In all likelihood, preparations will become available within months to treat severe coronavirus infection cases. It should be noted that antiviral medications used to treat influenza (oseltamivir, Tamiflu) are completely ineffective against the coronavirus.

6) Contact emergency medical services in the case of suspected complications associated with a coronavirus infection, especially if the patient suffers from a worsening shortness of breath. Such cases usually require admission to a hospital.

By way of conclusion

The most important thing is to keep a cool head and avoid panicking. Our current knowledge of the progress of the epidemic suggests that when managed properly it is largely comparable to influenza. And yes, it is apparent that a major part of our country's population will contract the infection but an overwhelming majority of patients will recover quickly with no ill effects.

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