COVID-19 Outbreak

CORONAVIRUS

TRAINING GUIDE

Don't Be Afraid
Be Protected Against **COVID-19** With These Prevention Methods!

Transmission

- AIR
- WILD ANIMAL CONTACT
- HUMAN CONTACT
- TOUCHING EYES WITH DIRTY HANDS

Prevention

- Wash your hand with soap
- Avoid close contact with contaged people
- Wearing a face mask
- Stay home when sick

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Introduction

Coronaviruses (CoV) are a large family of viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV).

Coronavirus disease (COVID-19) is a new strain that was discovered in 2019 and has not been previously identified in humans.

Coronaviruses are zoonotic, meaning they are transmitted between animals and people. Detailed investigations found that SARS-CoV was transmitted from civet cats to humans and MERS-CoV from dromedary camels to humans. Several known coronaviruses are circulating in animals that have not yet infected humans.

Common signs of infection include respiratory symptoms, fever, and cough, shortness of breath and breathing difficulties. In more severe cases, the infection can cause pneumonia, severe acute respiratory syndrome, kidney failure, and even death.

Standard recommendations to prevent infection spread include regular hand washing, covering mouth and nose when coughing and sneezing, thoroughly cooking meat and eggs. Avoid close contact with anyone showing symptoms of respiratory illness such as coughing and sneezing

COVID-19 OUTBREAK

CHAPTER 1

Corona Virus-
Introduction and origin

Coronaviruses (CoV) are an enormous group of infections that cause ailment running from the basic virus to increasingly extreme ailments, for example, Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). An epic coronavirus (nCoV) is another strain that has not been recently distinguished in people.

Novel coronavirus (COVID-19) was distinguished in 2019 in Wuhan, China. This is another coronavirus that has not been recently distinguished in people.

This course gives a general prologue to COVID-19 and rising respiratory infections and is expected for general wellbeing experts, episode directors and staff working for the United Nations, universal associations and NGOs.

As the official malady name was set up after material creation, any notice of nCoV alludes to COVID-19, the irresistible illness brought about by the most as of late found coronavirus.

Coronaviruses are zoonotic, which means they are transmitted among creatures and individuals. Nitty-gritty examinations found that SARS-CoV was transmitted from civet felines to people and MERS-CoV from dromedary camels to people. A

few known coronaviruses are circling in creatures that have not yet tainted people.

Regular indications of disease incorporate respiratory side effects, fever, and hack, the brevity of breath and breathing challenges. In increasingly extreme cases, the disease can cause pneumonia, serious intense respiratory disorder, kidney disappointment, and even passing.

Standard proposals to forestall contamination spread incorporate normal hand washing, covering mouth and nose when hacking and wheezing, completely cooking meat and eggs. Maintain a strategic distance from close contact with anybody demonstrating side effects of respiratory sickness, for example, hacking and wheezing.

1.Coronavirus disease 2019 (COVID-19) pandemic

A novel coronavirus, previously designated 2019-nCoV, was identified as the cause of a cluster of pneumonia cases in Wuhan, a city in the Hubei Province of China, at the end of 2019. It subsequently spread throughout China and elsewhere, becoming a global health emergency. In February 2020, the World Health Organization (WHO) designated the disease COVID-19, which stands for coronavirus disease in 2019. COVID-19 is discussed in detail elsewhere.

2. Virology

Coronaviruses are classified as a family within the Nidovirales order, viruses that replicate using a nested set of mRNAs ("Nido-" for "nest"). The coronavirus subfamily is further classified into four genera: alpha, beta, gamma, and delta coronaviruses. The human coronaviruses (HCoVs) are in two of these genera: alpha coronaviruses (HCoV-229E and HCoV-NL63) and beta coronaviruses

(HCoV-HKU1, HCoV-OC43, Middle East respiratory syndrome coronavirus [MERS-CoV], and the severe acute respiratory syndrome coronavirus [SARS-CoV]).

2.1 Viral composition

Coronaviruses are medium-sized enveloped positive-stranded RNA viruses whose name derives from their characteristic crown-like appearance in electron micrographs. These viruses have the largest known viral RNA genomes, with a length of 27 to 32 kb. The host-derived membrane is studded with glycoprotein spikes and surrounds the genome, which is encased in a nucleocapsid that is helical in its relaxed form but assumes a roughly spherical shape in the virus particle. Replication of viral RNA occurs in the host cytoplasm by a unique mechanism in which RNA polymerase binds to a leader sequence and then

detaches and re-attaches at multiple locations, allowing for the production of a nested set of mRNA molecules with common 3' ends.

The genome encodes four or five structural proteins, S, M, N, HE, and E. HCoV-229E, HCoV-NL63, and the SARS coronavirus possess four genes that encode the S, M, N, and E proteins, respectively, whereas HCoV-OC43 and HCoV-HKU1 also contain a fifth gene that encodes the HE protein.

- The spike (S) protein projects through the viral envelope and forms the characteristic spikes in the coronavirus "crown." It is heavily glycosylated, probably forms a homotrimer, and mediates receptor binding and fusion with the host cell membrane. The major antigens that stimulate neutralizing antibody, as well as important targets of cytotoxic lymphocytes, are on the S protein. Receptor usage is discussed below.
- The membrane (M) protein has a short N-terminal domain that projects on the external surface of the envelope and spans the envelope three times, leaving a long C terminus inside the envelope. The M protein plays an important role in viral assembly.
- The nucleocapsid protein (N) associates with the RNA genome to form the nucleocapsid. It may be involved in the regulation of viral RNA synthesis and may interact with M protein during virus budding. Cytotoxic T lymphocytes recognizing portions of the N protein have been identified.
- The hemagglutinin-esterase glycoprotein (HE) is found only in the betacoronaviruses, HCoV-OC43 and HKU1. The hemagglutinin moiety binds to neuraminic acid on the host cell surface, possibly permitting initial adsorption of the virus to the membrane. The esterase cleaves acetyl groups from neuraminic acid. The HE genes of coronaviruses have sequence homology with influenza C HE glycoprotein and may reflect early recombination between the two viruses.

- The small envelope (E) protein leaves its C terminus inside the envelope and then either span the envelope or bends around and projects its N terminus internally. Its function is not known, although, in the SARS-CoV, the E protein along with M and N is required for proper assembly and release of the virus.

2.2 Viral serotypes

Coronaviruses are widespread among birds and mammals, with bats being host to the largest variety of genotypes. Animal and human coronaviruses fall into four distinct genera. Five non-SARS coronavirus serotypes have been associated with disease in humans: HCoV-229E, HCoV-NL63, HCoV-OC43, HCoV-HKU1, and a novel coronavirus (MERS-CoV) that emerged in 2012.

- The alphacoronavirus genus includes two human virus species, HCoV-229E, and HCoV-NL63. HCoV-229E, like several animal alphacoronaviruses, utilizes aminopeptidase N (APN) as its major receptor. In contrast, HCoV-NL63, like the SARS-CoV (a betacoronavirus), uses angiotensin-converting enzyme-2 (ACE-2). Important animal alphacoronaviruses are transmissible gastroenteritis virus of pigs and feline infectious peritonitis virus. There are also several related bat coronaviruses among the alphacoronaviruses.
- Two of the non-SARS human species of the betacoronavirus genus, HCoV-OC43 and HCoV-HKU1, have hemagglutinin-esterase activity and probably utilize sialic acid residues as receptors. This genus also contains several bat viruses, MERS-CoV,and SARS-CoV, although the last two are genetically somewhat distant from HCoV-OC43 and HCoV-HKU1.
- Important animal betacoronaviruses are mouse hepatitis virus, a laboratory model for both viral hepatitis and demyelinating central nervous system disease, and bovine coronavirus, a diarrhea-causing virus

- of cattle. Bovine coronavirus is so similar to HCoV-OC43 that the two viruses have been merged into a single species termed betacoronavirus 1. HCoV-OC43 is thought to have jumped from one animal host to the other as recently as 1900.
- The gammacoronavirus genus contains primarily avian coronaviruses, the most prominent of which is the infectious bronchitis virus of chickens. This is an important veterinary pathogen causing respiratory and reproductive tract disease in chickens.
- The deltacoronavirus genus contains recently discovered avian coronaviruses found in several species of songbirds.

None of the community-acquired human coronaviruses (HCoV-OC43, HCoV-NE63, HCoV-HKU1, and HCoV-229E) replicate easily in tissue culture, and, until recently, this impeded progress in their study. Both HCoV-229E and HCoV-OC43 were discovered in the 1960s and were shown in volunteer experiments to produce common colds in adults. Studies in the 1970s and 1980s linked them to as much as one-third of upper respiratory tract infections during winter outbreaks, 5 to 10 percent of overall colds in adults, and some proportion of lower respiratory illness in children

Little further information developed after this until the emergence of SARS in 2002 and the development of molecular diagnostic methods. Then HCoV-NL63 and HCoV-HKU1 were quickly discovered and found to have a worldwide distribution. The polymerase chain reaction may be used for the diagnosis of each of the four human coronaviruses, and this technique has allowed substantial investigation into their epidemiology and pathogenicity.

3. Epidemiology

3.1 Seasonality

Community-acquired coronaviruses are ubiquitous; wherever investigators have looked, they have been detected. In temperate climates, coronavirus respiratory infections occur primarily in the winter, although smaller peaks are sometimes seen in the fall or spring, and infections can occur at any time of the year. A seven-year study of hospitalized children in Guangzhou, China, described the seasonality in a subtropical region, with outbreaks at almost any time of year but predominantly in the spring and fall. In other surveys, HCoV-OC43, HCoV-NL63, HCoV-229E, and HCoV-HKU1 predominate unpredictably in certain years and certain parts of the world. In almost all such surveys, HCoV-OC43 is the most common of the four strains, followed by HCoV-NL63, but the prevalence of the various strains in any particular year is often unpredictable.

A large polymerase chain reaction (PCR)-based study of viruses in adults and children with acute respiratory illness was performed in Scotland, with sampling

in over 44,000 episodes over nine years and gives some idea of the incidence and seasonality of community-acquired HCoV infections concerning other respiratory viruses in a temperate climate. HCoV infections were most common in the winter, were distributed across all age groups, and were less common than those caused by rhinovirus, influenza, or respiratory syncytial virus but more common than other respiratory viruses; coinfections were relatively common, particularly in young children.

A nine-year survey of all children under 16 years of age admitted for acute respiratory illness at the only hospital in Sør-Trøndelag County, Norway, a region with approximately 59,000 children, found that both HCoV-OC43 and HCoV-NL63 were detected most frequently and were epidemic every other winter, that HCoV-HKU-1 usually prevailed every other winter during the years when HCoV-OC43 and HCoV-NL63 did not, and that detection of 229E was unusual. HCoV-associated lower respiratory tract infection hospitalization rates for the population under five years were calculated at 1.5 per 1000 children per year.

3.2 Routes of transmission

Respiratory coronaviruses probably spread in a fashion similar to that of rhinoviruses, via direct contact with infected secretions or large aerosol droplets. Immunity develops soon after infection but wanes gradually over time. Reinfection is common, presumably because of waning immunity, but possibly because of antigenic variation within species. In hospital settings, spread among pediatric patients probably occurs through shedding by their infected caretakers. Outbreaks are common in long-term care facilities for older adults.

Middle East respiratory syndrome and severe acute respiratory syndrome are both zoonoses. Animals implicated in these infections are discussed in detail separately.

4. Summary and recommendations

- Coronaviruses are the cause of 5 to 10 percent of community-acquired upper respiratory tract infections in adults, occurring sporadically or in outbreaks of variable size, and probably also play a role in severe

respiratory infections in both children and adults, particularly adults with underlying pulmonary disease and older adults.

- Coronaviruses are medium-sized enveloped positive-stranded RNA viruses whose name derives from their characteristic crown-like appearance in electron micrographs.
- Community-acquired coronaviruses are ubiquitous; wherever investigators have looked, they have been detected. In temperate climates, coronavirus respiratory infections occur primarily in the winter, although smaller peaks are sometimes seen in the fall or spring, and infections can occur at any time of the year.

- Most community-acquired coronavirus infections are diagnosed clinically, although reverse-transcriptase polymerase chain reaction applied to respiratory secretions is the diagnostic test of choice.
- There is currently no treatment recommended for coronavirus infections except for supportive care as needed.
- Severe acute respiratory syndrome coronavirus and Middle East respiratory syndrome coronavirus are discussed in detail separately.
- In late 2019, a novel coronavirus was identified as the cause of a cluster of pneumonia cases in Wuhan, a city in China. It subsequently spread throughout China and elsewhere, becoming a global health emergency. In February 2020, the World Health Organization designated the disease COVID-19, which stands for coronavirus disease in 2019. Previously, this virus was referred to as 2019-nCoV. COVID-19 is discussed in detail elsewhere.

COVID-19
OUTBREAK

CORONAVIRUS SYMPTOMS

- HEADACHE & SORE THROAT
- FEVER
- COUGH
- SHORTNESS OF BREATH
- SHAKING CHILLS
- DHIARREA

CHAPTER 2

Disease caused by COVID-19 virus and its symptoms

This virus belongs to a family of viruses known as coronaviruses. Named for the crown-like spikes on their surfaces, they infect mostly bats, pigs, and small mammals. But they mutate easily and can jump from animals to humans and from one human to another. In recent years, they have become a growing player in infectious-disease outbreaks world-wide.

Seven strains are known to infect humans, including this new virus, causing illnesses in the respiratory tract. Four of those strains cause common colds. Two others, by contrast, rank among the deadliest of human infections: severe acute respiratory syndrome, or SARS, and Middle East respiratory syndrome, or MERS.

This new virus is called severe acute respiratory syndrome coronavirus 2, or Sars-CoV-2. The disease it causes is called Covid-19. (The number stands for 2019, the year it emerged.)

Where did the new coronavirus come from?

The new virus likely came originally from bats, scientists say. It isn't known exactly where or how it jumped to humans, though. Viruses from bats often infect another mammal first and then mutate to become more transmissible to humans. One hypothesis is that the intermediary animal for this new virus may be a pangolin, a small mammal sold in wildlife markets, prized for its meat and scales covering its body.

Health officials believe the outbreak originated in a large animal and seafood market in Wuhan, China.

Of the first 41 cases, 27 had some exposure to that market, according to a report in the Lancet. But three of the first four people to become ill, on Dec. 1 and Dec. 10, said they had no contact with the market.

A study in the New England Journal of Medicine found that 55% of patients in Wuhan who became ill before Jan. 1 had a link to the market, compared with 8.6% of those who became ill after that point. Scientists say it will take some time to identify the exact source.

1.SARS (severe acute respiratory syndrome)

SARS (severe acute respiratory syndrome) is caused by the SARS coronavirus, known as SARS CoV. Coronaviruses commonly cause infections in both humans and animals.

There have been 2 self-limiting SARS outbreaks, which resulted in a highly contagious and potentially life-threatening form of pneumonia. Both happened between 2002 and 2004.

Since 2004, there have not been any known cases of SARS reported anywhere in the world.

The World Health Organization (WHO) continues to monitor countries throughout the world for any unusual disease activity. If there was another SARS outbreak, it should be possible to limit the spread of infection.

1.1 The SARS pandemic

SARS originated in China in 2002. It's thought that a strain of the coronavirus usually only found in small mammals mutated, enabling it to infect humans.

The SARS infection quickly spread from China to other Asian countries. There were also a small number of cases in several other countries, including 4 in the UK, plus a significant outbreak in Toronto, Canada.

The SARS pandemic was eventually brought under control in July 2003, following a policy of isolating people suspected of having the condition and screening all passengers traveling by air from affected countries for signs of the infection.

During the period of infection, there were 8,098 reported cases of SARS and 774 deaths. This means the virus killed about 1 in 10 people who were infected. People over the age of 65 were particularly at risk, with over half of those who died from the infection being in this age group.

In 2004 there was another smaller SARS outbreak linked to a medical laboratory in China. It was thought to have been the result of someone coming into direct contact with a sample of the SARS virus, rather than being caused by animal-to-human or human-to-human transmission.

1.2 Viral mutations

Like all living things, viruses are constantly changing and evolving. A mutation is where the genetic information that's stored inside an organism changes.

Many global outbreaks of infectious illnesses (pandemics) that have happened in recent history are thought to have been caused by viruses previously only found in animals. After mutating, the viruses became capable of infecting humans.

Examples of mutated viruses include:

- SARS
- HIV – thought to be a mutated version of a virus found in monkeys
- bird flu (avian flu) – a mutated version of a flu virus found in birds
- swine flu – a mutated version of a flu virus thought to have originated in pigs

1.3 How SARS is spread

SARS is an airborne virus, which means it's spread in a similar way to colds and flu.

The SARS virus is spread in small droplets of saliva coughed or sneezed into the air by an infected person. If someone else breathes in the droplets, they can become infected.

SARS can also be spread indirectly if an infected person touches surfaces such as door handles with unwashed hands. Someone who touches the same surface may also become infected.

The SARS virus may also be spread through an infected person's poo. For example, if they do not wash their hands properly after going to the toilet, they may pass the infection on to others.

Evidence from the SARS pandemic of 2002 to 2003 showed people living with or caring for someone with a known SARS infection were most at risk of developing the infection themselves.

1.4 Symptoms of SARS

SARS has flu-like symptoms that usually begin 2 to 7 days after infection. Sometimes, the time between coming into contact with the virus and the start of symptoms (incubation period) can be up to 10 days.

The symptoms of SARS include:

- a high temperature (fever)
- extreme tiredness (fatigue)
- headaches
- chills
- muscle pain
- loss of appetite
- diarrhea

After these symptoms, the infection will begin to affect your lungs and airways (respiratory system), leading to additional symptoms, such as:

- a dry cough
- breathing difficulties
- an increasing lack of oxygen in the blood, which can be fatal in the most severe cases

1.5 Treatment for SARS

There's currently no cure for SARS, but research to find a vaccine is ongoing.

A person suspected of having SARS should be admitted to the hospital immediately and kept in isolation under close observation.

Treatment is mainly supportive, and may include:

- assisting with breathing using a ventilator to deliver oxygen
- antibiotics to treat bacteria that cause pneumonia
- antiviral medicines
- high doses of steroids to reduce swelling in the lungs

There's not much scientific evidence to show that these treatments are effective. The antiviral medicine ribavirin is known to be ineffective at treating SARS.

1.6 Preventing the spread of SARS

Do not travel to areas of the world where there's an uncontrolled SARS outbreak.

To reduce your risk of becoming infected, avoid direct contact with people who have the SARS virus until at least 10 days after their symptoms have gone.

To prevent spreading the infection, it's important to:

- wash your hands thoroughly using an alcohol-based hand detergent
- cover your mouth and nose when you sneeze or cough
- avoid sharing food, drink, and utensils
- regularly clean surfaces with disinfectant

In some situations, it may be appropriate to wear gloves, masks, and goggles to help prevent the spread of SARS.

2. Middle East respiratory syndrome coronavirus (MERS-CoV)

- The Middle East respiratory syndrome (MERS) is a viral respiratory disease caused by a novel coronavirus (Middle East respiratory syndrome coronavirus, or MERS-CoV) that was first identified in Saudi Arabia in 2012.
- Coronaviruses are a large family of viruses that can cause diseases ranging from the common cold to Severe Acute Respiratory Syndrome (SARS).
- Typical MERS symptoms include fever, cough, and shortness of breath. Pneumonia is common, but not always present. Gastrointestinal symptoms, including diarrhea, have also been reported. Some laboratory-confirmed cases of MERS-CoV infection are reported as asymptomatic, meaning that they do not have any clinical symptoms, yet they are positive for MERS-CoV infection following a laboratory test. Most of these asymptomatic cases have been detected following aggressive contact tracing of a laboratory-confirmed case.

- Approximately 35% of reported patients with MERS-CoV infection have died.
- Although most of the human cases of MERS-CoV infections have been attributed to human-to-human infections in health care settings, current scientific evidence suggests that dromedary camels are a major reservoir host for MERS-CoV and an animal source of MERS infection in humans. However, the exact role of dromedaries in the transmission of the virus and the exact route(s) of transmission are unknown.
- The virus does not seem to pass easily from person to person unless there is close contact, such as occurs when providing unprotected care to a patient. Healthcare-associated outbreaks have occurred in several countries, with the largest outbreaks seen in Saudi Arabia, the United Arab Emirates, and the Republic of Korea.

2.1 Symptoms

The clinical spectrum of MERS-CoV infection ranges from no symptoms (asymptomatic) or mild respiratory symptoms to severe acute respiratory disease and death. A typical presentation of MERS-CoV disease is fever, cough, and shortness of breath. Pneumonia is a common finding, but not always present. Gastrointestinal symptoms, including diarrhea, have also been reported. Severe illness can cause respiratory failure that requires mechanical ventilation and support in an intensive care unit. The virus appears to cause more severe disease in older people, people with weakened immune systems, and those with chronic diseases such as renal disease, cancer, chronic lung disease, and diabetes.

Approximately 35% of patients with MERS have died, but this may be an overestimate of the true mortality rate, as mild cases of MERS may be missed by existing surveillance systems and until more is known about the disease, the case fatality rates are counted only amongst the laboratory-confirmed cases.

2.2 Source of the virus

MERS-CoV is a zoonotic virus, which means it is a virus that is transmitted between animals and people. Studies have shown that humans are infected through direct or indirect contact with infected dromedary camels. MERS-CoVhas been identified in dromedaries in several countries in the Middle East, Africa, and South Asia.

The origins of the virus are not fully understood but, according to the analysis of different virus genomes, it is believed that it may have originated in bats and was transmitted to camels sometime in the distant past.

2.3 Transmission

Non-human to human transmission: The route of transmission from animals to humans is not fully understood, but dromedary camels are the major reservoir host for MERS-CoV and an animal source of infection in humans. Strains of MERS-CoV that are identical to human strains have been isolated from dromedaries in several countries, including Egypt, Oman, Qatar, and Saudi Arabia.

Human-to-human transmission: The virus does not pass easily from person to person unless there is close contact, such as providing unprotected care to an infected patient. There have been clusters of cases in healthcare facilities, where human-to-human transmission appears to have occurred, especially when infection prevention and control practices are inadequate or inappropriate. Human to human transmission has been limited to date and has been identified among family members, patients, and health care workers. While the majority of MERS cases have occurred in health care settings, thus far, no sustained human to human transmission has been documented anywhere in the world.

Since 2012, 27 countries have reported cases of MERS including Algeria, Austria, Bahrain, China, Egypt, France, Germany, Greece, Islamic Republic of Iran, Italy, Jordan, Kuwait, Lebanon, Malaysia, the Netherlands, Oman, Philippines, Qatar, Republic of Korea, Kingdom of Saudi Arabia, Thailand, Tunisia, Turkey, United Arab Emirates, United Kingdom, United States, and Yemen.

Approximately 80% of human cases have been reported by Saudi Arabia. What we know is that people get infected there through unprotected contact with infected dromedary camels or infected people. Cases identified outside the Middle East are usually traveling people who were infected in the Middle East and then traveled to areas outside the Middle East. On rare occasions, outbreaks have occurred in areas outside the Middle East.

2.4 Prevention and treatment

No vaccine or specific treatment is currently available; however several MERS-CoV specific vaccines and treatments are in development. Treatment is supportive and based on the patient's clinical condition.

As a general precaution, anyone visiting farms, markets, barns, or other places where dromedary camels and other animals are present should practice general hygiene measures, including regular hand washing before and after touching animals, and should avoid contact with sick animals.

The consumption of raw or undercooked animal products, including milk and meat, carries a high risk of infection from a variety of organisms that might cause disease in humans. Animal products that are processed appropriately through cooking or pasteurization are safe for consumption, but should also be handled with care to avoid cross-contamination with uncooked foods. Camel meat and camel milk are nutritious products that can continue to be consumed after pasteurization, cooking, or other heat treatments.

Until more is understood about MERS-CoV, people with diabetes, renal failure, chronic lung disease, and immune-compromised persons are considered to be at high risk of severe disease from MERS-CoV infection. These people should avoid contact with camels, drinking raw camel milk or camel urine, or eating meat that has not been properly cooked.

2.5 Health-care facilities

Transmission of the virus has occurred in health-care facilities in several countries, including from patients to health-care providers and between patients in a health care setting before MERS-CoV was diagnosed. It is not always possible to identify patients with MERS-CoV early or without testing because symptoms and other clinical features may be non-specific.

Infection prevention and control measures are critical to prevent the possible spread of MERS-CoV in health-care facilities. Facilities that provide care for patients suspected or confirmed to be infected with MERS-CoV should take appropriate measures to decrease the risk of transmission of the virus from an infected patient to other patients, health-care workers, or visitors. Health-care workers should be educated and trained in infection prevention and control and should refresh these skills regularly.

3. What are the symptoms of COVID-19 illness and how do you know if you have it?

The virus infects the lower respiratory tract. Patients initially develop a fever, cough and ache, and can progress to shortness of breath and complications from pneumonia, according to case reports. Other reported symptoms include fatigue, sore throat, headache, and nausea, with vomiting and diarrhea. Some people become only mildly ill, or are infected but don't get sick. Others are mildly ill for a few days, and then rapidly develop more severe symptoms of pneumonia.

Some patients haven't had a fever initially or might develop "walking pneumonia," meaning they might spread their infection to others because they aren't sick enough to be in a hospital.

4. How deadly is COVID-19?

The mortality rate has ranged between 2% and about 3.4%, according to calculations of confirmed cases and deaths worldwide, which change daily. But the true rate won't be known until epidemiologists can determine the denominator, meaning how many people have been infected. That number will include people who never had symptoms, or had a flulike illness but never got a test for Covid-19.

The mortality rate has differed by region, according to a report by an international mission of experts led by the World Health Organization to China. The mortality rate was 5.8% in the first several weeks in Wuhan, China, where the epidemic originated. But in other, less hard-hit areas of China, which had more time to prepare to care for patients, it was 0.7%. The rate in China has come down over time, the report said.

The overall mortality rate may be less than 1%, U.S. health officials suggested recently in the New England Journal of Medicine, if the number of asymptomatic or mildly ill cases is several times greater than that of reported cases.

That is still deadlier than seasonal flu, which has a mortality rate of about 0.1%.

Covid-19 appears to be less deadly than a related pathogen—SARS, which erupted in China in 2002 and spread globally in 2003. SARS killed about 10% of the people it infected. Covid-19 is far less deadly than MERS or Ebola.

But this new virus spreads from one person to another more easily than SARS, some disease modeling and case studies suggest.

5. How at risk is someone in the U.S.?

The current risk to the U.S. public is low, the U.S. Centers for Disease Control and Prevention says. The virus isn't believed to be spreading widely. But there have been localized outbreaks, such as in the Seattle area and the number of non-travel-related cases is growing.

The CDC says it expects the virus to spread more widely in the country. Federal and local health officials are preparing for that likelihood and urging the public to prepare to take precautions and for possible business and school closures. Some schools have been closed and events canceled proactively.

COVID-19
OUTBREAK

CHAPTER 3

WHAT CAUSES COVID-19 INFECTION?

As the COVID-19 pandemic spreads across the U.S. – canceling major events, closing schools, upending the stock market and disrupting travel and normal life – Americans are taking precautions against the new coronavirus that causes the disease sickening and killing thousands worldwide.

The World Health Organization and U.S. Centers for Disease Control and Prevention advise the public to be watchful for fever, dry cough and shortness of breath, symptoms that follow contraction of the new coronavirus known as SARS-CoV-2.

From infection, it takes approximately five to 12 days for symptoms to appear. Here's a step-by-step look at what happens inside the body when it takes hold.

1.Coronavirus infection

According to the CDC, the virus can spread person-to-person within 6 feet through respiratory droplets produced when an infected person coughs or sneezes.

It's also possible for the virus to remain on a surface or object, be transferred by touch and enter the body through the mouth, nose or eyes.

There's still a lot to learn but experts suspect the virus may act similarly to SARS-CoV from 13 years ago.

"It's a respiratory virus and thus it enters through the respiratory tract, we think primarily through the nose. But it might be able to get in through the eyes and mouth because that's how other respiratory viruses behave."

When the virus enters the body, it begins to attack.

1.1 Fever, cough and other COVID-19 symptoms

It can take two to 14 days for a person to develop symptoms after initial exposure to the virus. The average is about five days.

Once inside the body, it begins infecting epithelial cells in the lining of the lung. A protein on the receptors of the virus can attach to a host cell's receptors and penetrate the cell. Inside the host cell, the virus begins to replicate until it kills the cell.

This first takes place in the upper respiratory tract, which includes the nose, mouth, larynx, and bronchi.

The patient begins to experience a mild version of symptoms: dry cough, shortness of breath, fever and headache and muscle pain and tiredness, comparable to the flu.

Some patients have reported gastrointestinal symptoms such as nausea and diarrhea, however, it's relatively uncommon.

Symptoms become more severe once the infection starts making its way to the lower respiratory tract.

1.2 Pneumonia and autoimmune disease

The WHO reported last month about 80% of patients have a mild to moderate disease from infection. A case of "mild" COVID-19 includes a fever and cough more severe than the seasonal flu but does not require hospitalization.

Those milder cases are because the body's immune response can contain the virus in the upper respiratory tract. Younger patients have a more vigorous immune response compared to older patients.

The 13.8% of severe cases and 6.1% critical cases are due to the virus trekking down the windpipe and entering the lower respiratory tract, where it seems to prefer growing.

"The lungs are the major target".

As the virus continues to replicate and journeys further down the windpipe and into the lung, it can cause more respiratory problems like bronchitis and pneumonia.

Pneumonia is characterized by shortness of breath combined with a cough and affects tiny air sacs in the lungs, called alveoli. The alveoli are where oxygen and carbon dioxide are exchanged.

When pneumonia occurs, the thin layer of alveolar cells is damaged by the virus. The body reacts by sending immune cells to the lung to fight it off.

"And that results in the linings becoming thicker than normal." "As they thicken more and more, they essentially choke off the little air pocket, which is what you need to get the oxygen to your blood."

“So it’s a war between the host response and the virus,depending on who wins this war we have either good outcomes where patients recover or bad outcomes where they don’t.”

Restricting oxygen to the bloodstream deprives other major organs of oxygen including the liver, kidney, and brain.

A small number of severe cases that can develop into acute respiratory distress syndrome (ARDS), which requires a patient to be placed on a ventilator to supply oxygen.

However, if too much of the lung is damaged and not enough oxygen is supplied to the rest of the body, respiratory failure could lead to organ failure and death.

The outcome is uncommon for the majority of patients infected with the coronavirus. Those most at risk to severe developments are older than 70 and have weak immune responses. Others at risk include people with pulmonary abnormalities, chronic disease or compromised immune systems, such as cancer patients who have gone through chemotherapy treatment.

The coronavirus is like the flu because it goes through the same process within the body. Many people contract the flu and recover with no complications.

"People should remember that they're as healthy as they feel,and shouldn't go around feeling as unhealthy as they fear."

2. How are COVID-19 tests done?

The most common diagnostic tests for COVID-19 are the so-called “PCR tests”. These tests rely on swabbed samples from a patient’s nose and throat.

The first PCR tests were developed within two weeks of the disease being identified, and are currently part of the protocol recommended by the WHO

Some people require more than one test because of false-negative outcomes

Whilst the number of COVID-19 tests completed will be relatively similar to the number of people being tested for the disease, it is not the case these numbers should be expected to be the same.

This is because some people may need to be tested multiple times. The reason for this is that there are “false-negative” test outcomes.

False-negative outcomes correspond to people who initially receive a negative test result, but who are later found to have the disease upon re-testing. The World Health Organization (WHO), in its guidelines for laboratory testing of COVID-19, states that "one or more negative results do not rule out the possibility of COVID-19 virus infection."

An important implication from false-negative tests is that even in countries with extensive test coverage, it is still difficult to know the true total number of COVID-19 cases. In other words: false-negative tests may contribute to widening the gap between the true total number of cases, and the known number of confirmed cases.

Based on the limited number of studies on the prevalence of false-negative outcomes to date, it's still difficult to put a definitive number on how common they are. It is an active area of scientific research.

2.1 Why might COVID-19 tests fail?

There are several reasons why someone infected with COVID-19 may produce a false-negative result when tested:

- They may be in the early stage of the disease with a viral load that is too low to be detected.
- They may have no major respiratory symptoms, so there could be a little detectable virus in the patient's throat and nose.
- There may have been a problem with sample collection, meaning there was a very little sample to test.
- There may have been poor handling and shipping of samples and test materials.

- There may have been technical issues inherent in the test, e.g. virus mutation.

The WHO notes that a negative result can be found from an infected individual for the reasons listed above, and advises that depending on the specific situation of each patient, additional tests should be collected and tested

3. What effect does coronavirus have on pregnant women?

Generally, pregnant women do not appear to be more severely unwell than the general population if they develop coronavirus. As this is a new virus, how it may affect you is not yet clear. It is expected the large majority of pregnant women will experience only mild or moderate cold/flu-like symptoms.

More severe symptoms such as pneumonia appear to be more common in older people, those with weakened immune systems or long-term conditions.

If you are pregnant you are more vulnerable to getting infections than a woman who is not pregnant. If you have an underlying condition, such as asthma or diabetes, you may be more unwell if you have coronavirus.

If you develop more severe symptoms or your recovery is delayed this may be a sign that you are developing a more significant chest infection that requires enhanced care, and our advice remains that if you feel your symptoms are worsening or if you are not getting better you should contact your maternity care team or use the NHS 111 online service for further information and advice.

4. Why are pregnant women in a vulnerable group?

The pregnant woman was placed in a vulnerable group by the Chief Medical Officer on 16th March. This means you have been advised to reduce social contact through social distancing measures.

Based on the evidence we have so far, pregnant women are still no more likely to contract coronavirus than the general population. What we do know is that pregnancy in a small proportion of women can alter how your body handles severe viral infections. This is something that midwives and obstetricians have known for many years and are used to dealing with. As yet, there is no evidence that pregnant women who get this infection are more at risk of serious complications than any other healthy individuals.

What has driven the decisions made by officials is a desire to be very cautious about pregnant women. We know that some viral infections are worse in pregnant women. At the moment, there's no evidence that this is the case for coronavirus infection, but the amount of evidence is still quite limited.

5. Can humans become infected with the COVID-19 from an animal source?

Coronaviruses are a large family of viruses that are common in animals. Occasionally, people get infected with these viruses which may then spread to other people. For example, SARS-CoV was associated with civet cats and MERS-CoV is transmitted by dromedary camels. Possible animal sources of COVID-19 have not yet been confirmed.

To protect yourself, such as when visiting live animal markets, avoid direct contact with animals and surfaces in contact with animals. Ensure good food safety practices at all times. Handle raw meat, milk or animal organs with care to avoid contamination of uncooked foods and avoid consuming raw or undercooked animal products.

COVID-19

OUTBREAK

HOW IS COVID-19 DIGNOSED?

CHAPTER 4

If you develop symptoms of coronavirus disease 2019 (COVID-19) and you've been exposed to the virus, contact your doctor. Tell him or her if you've traveled to any areas with ongoing community spread of COVID-19 according to CDC and WHO. Also, let your doctor know if you've had close contact with anyone who has been diagnosed with COVID-19.

Your doctor may determine whether to conduct tests for COVID-19 based on your signs and symptoms. To decide whether to conduct tests for COVID-19, he or she may also consider whether you have had close contact with someone diagnosed with COVID-19 or traveled to or lived in any areas with ongoing community spread of COVID-19 in the last 14 days.

To test for COVID-19, your doctor may take samples, including a sample of saliva (sputum), a nasal swab and a throat swab, to send to a lab for testing.

1.Treatment

Currently, no antiviral medication is recommended to treat COVID-19. Treatment is directed at relieving symptoms and may include:

- Pain relievers (ibuprofen or acetaminophen)
- Cough syrup or medication
- Rest
- Fluid intake

If your doctor thinks you can be treated at home, he or she may give you special instructions, such as to isolate yourself as much as possible from family and pets while you're sick and to stay home for some time. If you're very ill, you may need to be treated in the hospital.

2. Coping and support

You may feel stress during the COVID-19 outbreak. You may feel fear and anxiety or have trouble sleeping.

Here are some tips that can help you cope with stress during the COVID-19 outbreak:

- Avoid watching or reading news about COVID-19 that makes you feel anxious.
- Limit reading or watching the news about COVID-19 to once or twice a day.
- Get the facts about COVID-19 and share them with others. Check reputable sites such as CDC and WHO for information.
- Take care of yourself — eat healthily, get enough sleep and get regular exercise. Consider deep breathing, stretching, and meditation exercises.

- Avoid alcohol and drugs.
- Do something you enjoy, such as reading a book, watching a movie or going on a walk.
- Keep connected with family and friends. Share your feelings with them.
- Aim to be positive and optimistic.
- Show appreciation for health care workers who care for those with COVID-19 in your community.

If stress is affecting your daily life after several days, contact your doctor. He or she may suggest that you talk to a mental health professional.

3. Preparing for your appointment

You may start by seeing your primary care doctor. Or you may be referred immediately to a doctor trained in treating infectious diseases. If you think you

have COVID-19, tell your doctor or clinic before coming in. The doctor and the medical team can then:

- Contact infection prevention and control and public health officials
- Prepare to move you to a room quickly
- Have a mask ready for you

Here's some information to help you get ready for your appointment.

3.1 Preparing for an appointment

When you make the appointment, ask if there's anything you need to do in advance. Make a list of:

- Your symptoms, including any that seem unrelated to the reason for your appointment
- Your recent travels, including any international travels
- Key personal information, including major stresses, recent life changes and family medical history
- All medications, vitamins or other supplements you take, including the doses
- Questions to ask your doctor

Take a family member or friend along, if possible, to help you remember the information you're given. Avoid bringing more than one or two people.

Some basic questions to ask your doctor include:

- How likely is it that the new coronavirus is causing my symptoms?
- What are other possible causes for my symptoms?

- What tests do I need?
- What course of action do you recommend?
- Are there restrictions I need to follow?
- Should I see a specialist?

3.2 What to expect from your doctor

Your doctor is likely to ask you several questions, such as:

- When did your symptoms begin?
- Where have you traveled recently?
- Who have you been in close contact with?
- How severe are your symptoms?

Since there is no effective treatment for coronavirus infections, establishing the diagnosis is of limited utility in patients suspected of having community-acquired coronavirus infections. In contrast, diagnosing coronavirus disease 2019 (COVID-19), Middle East respiratory syndrome coronavirus (MERS-CoV), and severe acute respiratory syndrome coronavirus (SARS-CoV) is critically important for understanding outbreak epidemiology and limiting transmission of infection. (See "Coronavirus disease 2019 (COVID-19)", the section on 'Evaluation and diagnosis' and "Middle East respiratory syndrome coronavirus: Clinical manifestations and diagnosis", the section on 'Diagnosis' and "Severe acute respiratory syndrome (SARS)", the section on 'Diagnosis'.)

Until recently, no sensitive, rapid method existed to detect all of the known human coronavirus strains. Rapid techniques that can be used to detect coronaviruses from nasopharyngeal samples include reverse-transcriptase

polymerase chain reaction (RT-PCR) and immunofluorescence antigen detection assays.

Because of its utility for detecting all four of the known human coronavirus strains to cause community-acquired infections, RT-PCR has supplanted other diagnostic methods. Although broadly reacting pan-coronavirus primers have been developed, they are less sensitive than primers designed for each of the four human strains. The sensitivity may be further improved by using real-time RT-PCR.

Community-acquired coronaviruses are difficult to replicate in tissue culture.

4. Self-Service Diagnosis of COVID-19

As the world grapples with the novel coronavirus (COVID-19), experts have called for increased access to health care resources, including diagnostic testing, particularly in light of the recent expansion of the Food and Drug Administration's Emergency Use Authority to make such testing more widely available in the United States. Despite rapid expansion, there are significant barriers to testing in ambulatory clinics, emergency departments, and hospitals, which are likely to see a substantial increase in demand. Such access points also pose risks due to overcrowding and nosocomial transmission.

Current policy solutions are trying to eliminate financial barriers as well as facilitate additional points of access through increased use of telemedicine. However, telemedicine itself has limitations, because patients still need to go to a health facility to have a specimen collected and sent for processing.

In the wake of this epidemic, other countries have expanded testing through "testing drive-thrus," which have also been employed in limited settings in the United States. Self-testing for COVID-19 has been proposed in the United States in a limited setting. We propose expanding access more widely with a self-service diagnostic pathway for COVID-19 using at-home nasopharyngeal swab collection.

4.1 New Delivery Model

Use of an at-home nasal swab enables a diagnostic pathway for COVID-19 to be delivered remotely using widely available tools:

- Step 1: Individuals experiencing symptoms would access a telemedicine service and be advised by a qualified clinician who would triage them and determine whether testing is appropriate per the latest CDC guidelines.
- Step 2: Individuals able to be safely tested at home would receive a test kit through home delivery from a local distribution site; pickup at a local clinic, pharmacy, or public health center; or by mail; and then swab their nasopharynx themselves or with the help of caregivers.
- Step 3: The test kit would then be delivered or mailed to a local laboratory, which would provide results to the individual and their ordering clinician.

4.2 Benefits

There are several benefits to a self-service model, including wider availability with lower costs and mitigated risk of exposure to the virus. Home testing would also decentralize care and promote social distancing, particularly for older adults

who have already been identified as high risk because of the increased mortality for adults over 50 years of age. Decreased use of health care facilities during an epidemic also has the advantage of allowing scarce resources to be allocated appropriately. Simply put, teams in hospitals, emergency departments, and clinics can focus on the patients with the highest-acuity health care needs and minimize nosocomial risks.

At-home testing could also promote health equity and patient-centeredness. Providing access to such testing could reduce language, cultural, or logistical barriers to seeking care at a clinic, emergency department, or hospital and reach rural communities where innovations such as drive-thru testing may not be feasible. Many individuals, particularly hourly workers and those without reliable childcare or ready access to transportation may be better able to obtain testing if necessary.

4.3 Evidence Base

COVID-19 is a new pathogen, and so research and experience with self-collection of nasal swabs are limited. Nasal swab testing for COVID-19 has recently been assessed with emerging data on the performance of the available reverse transcriptase-polymerase chain reaction tests.Self-testing for viral respiratory illnesses itself is not new and has been described in influenza, where there is more experience. A recent meta-analysis showed a pooled sensitivity of 87% (95% CI, 80%-92%) and specificity of 99% (95% CI, 98%-100%) compared with professional-collected swabs in the diagnosis of influenza.In another study, participants were asked to self-collect swabs in an emergency department, which were compared with swabs collected by health care professionals in the opposite nostril. Results were comparable; 90% of participants found self-collection to be easy or very easy, and only 21% preferred health care professional collection vs self-collection. Notably, a self-testing strategy would be offered only in the

direction of a clinician with an understanding that no test is perfect, much like many of our available tests for other illnesses.

4.4 Policy Considerations

In response to the COVID-19 pandemic, more than a dozen US states have declared states of emergency, and national policymakers are considering following suit. Critical shortages of testing supplies and kits remain a major concern. A key policy question is whether and when the US will have enough testing kits for the wide-scale rollout of self-testing. In the interim, a rapid study to assess the efficacy of self-testing is warranted.

We recommend that health care providers be allowed to develop and evaluate self-testing programs while calling on the federal government to mobilize the following actions in short order:

1. Accelerate health services research to establish and identify comparative effectiveness of various interventions, including self-testing, drive-thru testing, telemedicine for purposes of triage alone, and traditional face-to-face clinic- or facility-based visits. Key populations, such as those with higher risks, limited mobility, and language barriers, should be considered.

2. Identify how a self-directed testing strategy can be paired with a more robust monitoring mechanism to identify which states or regions may need more testing supply (eg, self-testing requests can be paired with the ability to monitor testing capacity as more academic and commercial labs are increasing capacity).

3. Issue guidance to health information vendors certified through the US Department of Health and Human Services Office of the National Coordinator for Health Information Technology to collaborate and develop a mechanism to rapidly share de-identified health information to

learnmore about positive results, clinical presentation, treatment course, and outcomes.

4. Consider self-testing as a recommended strategy in hot-spot areas with particular concern for the reliability of self-quarantine in asymptomatic cases with a confirmed likely COVID-19 contact.

5. Continue to press public and private payers to cover self-directed testing without any out-of-pocket costs.

5. Conclusion

Self-service diagnosis for COVID-19 as a new clinical pathway would need to be proactively monitored and assessed for effectiveness. But given the present limited state of access to testing for far too many individuals, the risk of inaction may be even greater.

COVID-19 Outbreak

CHAPTER 5

COVID-19 Treatment

COVID-19 is an infectious disease caused by a new coronavirus discovered after an outbreak in Wuhan, China, in December 2019.

Since the initial outbreak, this coronavirus, known as SARS-CoV-2, has spread to more than 100 countries around the world and has affected many thousands of people.

As yet, there's no vaccine against the novel coronavirus. Researchers are currently working on creating a vaccine specifically for this virus, as well as potential treatments for COVID-19.

The disease is more likely to cause symptoms in older adults and those with underlying health conditions. Most people who develop symptoms of COVID-19 experience:

- fever
- cough

- shortness of breath
- fatigue

Keep reading to learn more about the current treatment options for COVID-19, what types of treatments are being explored, and what to do if you develop symptoms.

1.What type of treatment is available for the novel coronavirus?

There currently isn't a vaccine against developing COVID-19. Antibiotics are also ineffective because COVID-19 is a viral infection and not bacterial.

If your symptoms are more severe, supportive treatments may be given by your doctor or at a hospital. This type of treatment may involve:

- fluids to reduce the risk of dehydration
- medication to reduce a fever
- supplemental oxygen in more severe cases

People who have a hard time breathing on their own due to COVID-19 may need a respirator.

2. What is being done to find an effective treatment?

Vaccines and treatment options for COVID-19 are currently being investigated around the world. There's some evidence that certain medications may have the potential to be effective concerning preventing illness or treating the symptoms of COVID-19.

However, researchers need to perform randomized controlled in humans before potential vaccines and other treatments become available. This may take several months or longer.

Here are some treatment options that are currently being investigated for protection against SARS-CoV-2 and treatment of COVID-19 symptoms.

2.1 Remdesivir

Remdesivir is an experimental broad-spectrum antiviral drug originally designed to target Ebola.

Researchers have found that remdesivir is highly effective at fighting the novel coronavirus in isolated cells.

This treatment is not yet approved in humans, but two clinical trials for this drug have been implemented in China. One clinical trial was recently also approved by the FDA in the United States.

2.2 Chloroquine

Chloroquine is a drug that's used to fight malaria and autoimmune diseases. It's been in use for more than 70 yearsand is considered safe.

Researchers have discovered that this drug is effective at fighting the SARS-CoV-2 virus in studies done in test tubes.

At least 10 clinical trialsare currently looking at the potential use of chloroquine as an option for combating the novel coronavirus.

2.3 Lopinavir and ritonavir

Lopinavir and ritonavir are sold under the name Kaletra and are designed to treat HIV.

In South Korea, a 54-year-old man was given a combination of these two drugs and had a significant reductionin his levels of the coronavirus.

According to the World Health Organization (WHO), there could be benefits to using Kaletra in combination with other drugs.

2.4 APN01

A clinical trial is set to start soon in China to examine the potential of a drug called APN01 to fight the novel coronavirus.

The scientists who first developed APN01 in the early 2000s discovered that a certain protein called ACE2 is involved in SARS infections. This protein also helped protect the lungs from injury due to respiratory distress.

From recent research, it turns out that the 2019 coronavirus, like SARS, also uses the ACE2 protein to infect cells in humans.

The randomized, dual-arm trial will look at the effect of the medication on 24 patients for 1 week. Half of the participants in the trial will receive the APN01

drug, and the other half will be given a placebo. If results are encouraging, larger clinical trials will be done.

2.5 Favilavir

China has approved the use of the antiviral drug favilavir to treat symptoms of COVID-19. The drug was initially developed to treat inflammation in the nose and throat.

Although the results of the study haven't been released yet, the drug has supposedly shown to be effective in treating COVID-19 symptoms in a clinical trial of 70 people.

3. What should you do if you think you have symptoms of COVID-19?

Not everyone with a SARS-CoV-2 infection will feel ill. Some people may even contract the virus and not develop symptoms. When there are symptoms, they're usually mild and tend to come on slowly.

COVID-19 seems to cause more severe symptoms in older adults and people with underlying health conditions, such as chronic heart or lung conditions.

If you think you have symptoms of COVID-19, follow this protocol:

1. **Gauge how sick you are.** Ask yourself how likely it is that you came into contact with the coronavirus. If you live in a region that has had an outbreak, or if you've recently traveled abroad, you may be at an increased risk of exposure.

2. **Call your doctor.** If you have mild symptoms, call your doctor. To reduce transmission of the virus, many clinics are encouraging people to call or use live chat instead of coming into a clinic. Your doctor will evaluate your symptoms and work with local health authorities and the Centers for Disease Control and Prevention (CDC) to determine if you need to be tested.

3. **Stay home.** If you have symptoms of COVID-19 or another type of viral infection, stay home and get plenty of rest. Be sure to stay away from other people and avoid sharing items like drinking glasses, utensils, keyboards, and phones.

4.When do you need medical care?

About 80 percent of people recover from COVID-19 without needing hospitalization or special treatment.

If you're young and healthy with only mild symptoms, your doctor will likely advise you to isolate yourself at home and to limit contact with others in your household. You'll likely be advised to rest, stay well hydrated, and to closely monitor your symptoms.

If you're an older adult, have any underlying health conditions, or a compromised immune system, be sure to contact your doctor as soon as you notice any symptoms. Your doctor will advise you on the best course of action.

If your symptoms worsen with home care, it's important to get prompt medical care. Call your local hospital, clinic, or urgent care to let them know you'll be coming in, and wear a face mask once you leave your home. You can also call 911 for immediate medical attention.

5. How to avoid infection from the coronavirus

The novel coronavirus is primarily transmitted from person to person. At this point, the best way to prevent getting infected is to avoid being around people who have been exposed to the virus.

Additionally, according to the CDC, you can take the following precautions to lower your risk of infection:

- **Wash your hands** thoroughly with soap and water for at least 20 seconds.
- **Use hand sanitizer** with at least 60 percent alcohol if the soap isn't available.
- **Avoid touching your face** unless you've recently washed your hands.
- **Stay clear of people** who are coughing and sneezing. The CDC recommends standing at least 6 feet away from anyone who appears to be sick.
- **Avoid crowded areas** as much as possible.

Older adults are at the highest risk of infection and may want to take extra precautions to avoid coming into contact with the virus.

The bottom line

At this point, there's no vaccine to protect you from the novel coronavirus, also known as SARS-CoV-2. There also are no special medications approved to treat the symptoms of COVID-19.

However, researchers around the world are working hard to develop potential vaccines and treatments.

There's emerging evidence that some medications may have the potential to treat the symptoms of COVID-19. More large-scale testing is needed to determine if these treatments are safe. Clinical trials for these drugs could take several months.

COVID-19 OUTBREAK

Sorting out symptoms of COVID-19, influenza, colds and allergies

CHAPTER 6

1.COVID-19(coronavirus)

As the COVID-19 pandemic grows, many health care systems across the country are beginning to become overrun with patients experiencing symptoms that are common to many illnesses. To alleviate the pressure on health care workers, here is a guide from the University of Alabama at Birmingham to help you determine whether you have a cold, the flu or allergies or are indeed infected with COVID-19.

1.1 COVID-19 is a new illness that can affect your lungs and airways. It's caused by a virus called coronavirus.

Primary symptoms of COVID-19 include:

- Fever
- Runny nose
- Dry cough

- Shortness of breath
- Fatigue
- Body aches

Severe symptoms include:

- Fever (100.4 degrees Fahrenheit or higher)
- Pneumonia

Transmission: COVID-19 is believed to spread from person to person through sneezing or coughing. Respiratory droplets containing the virus can remain on surfaces even after the ill person is no longer near.

1.2 Stay at home if you have coronavirus symptoms

Stay at home if you have either:

- a high temperature – this means you feel hot to touch on your chest or back (you do not need to measure your temperature)
- a new, continuous cough – this means coughing a lot for more than an hour, or 3 or more coughing episodes in 24 hours (if you usually have a cough, it may be worse than usual)

Do not go to a GP surgery, pharmacy or hospital.

Use the 111 online coronavirus service to find out what to do.

1.3 How long to stay at home

- if you have symptoms of coronavirus, you'll need to stay at home for 7 days
- if you live with someone who has symptoms, you'll need to stay at home for 14 days from the day the first person in the home started having symptoms

If you live with someone who is 70 or over, has a long-term condition, is pregnant or has a weakened immune system, try to find somewhere else for them to stay for 14 days.

If you have to stay at home together, try to keep away from each other as much as possible.

1.4 How to avoid catching and spreading coronavirus (social distancing)

Everyone should do what they can to stop coronavirus from spreading.

It is particularly important for people who:

- are 70 or over
- have a long-term condition
- are pregnant
- have a weakened immune system

<u>Do</u>

- wash your hands with soap and water often – do this for at least 20 seconds
- always wash your hands when you get home or into work
- use hand sanitizer gel if soap and water are not available
- cover your mouth and nose with a tissue or your sleeve (not your hands) when you cough or sneeze
- put used tissues in the bin immediately and wash your hands afterward
- avoid close contact with people who have symptoms of coronavirus
- only travel on public transport if you need to
- work from home, if you can

- avoid social activities, such as going to pubs, restaurants, theatres and cinemas
- avoid events with large groups of people
- use phone, online services, or apps to contact your GP surgery or other NHS services

Don't

- do not touch your eyes, nose or mouth if your hands are not clean
- do not have visitors to your home, including friends and family

1.5 How coronavirus is spread

Because it's a new illness, we do not know exactly how coronavirus spreads from person to person.

Similar viruses are spread in cough droplets.

It's very unlikely it can be spread through things like packages or food.

- Travel advice

There are some countries and areas where there's a higher chance of coming into contact with someone with coronavirus.

1.6 Treatment for coronavirus

There is currently no specific treatment for coronavirus.

Antibiotics do not help, as they do not work against viruses.

Treatment aims to relieve the symptoms while your body fights the illness.

You'll need to stay in isolation, away from other people, until you have recovered.

2. Influenza (Flu)

Influenza is a viral infection that attacks your respiratory system — your nose, throat, and lungs. Influenza is commonly called the flu, but it's not the same as stomach "flu" viruses that cause diarrhea and vomiting.

For most people, influenza resolves on its own. But sometimes, influenza and its complications can be deadly. People at higher risk of developing flu complications include:

- Young children under age 5, and especially those under 12 months
- Adults older than age 65
- Residents of nursing homes and other long-term care facilities
- Pregnant women and women up to two weeks postpartum
- People with weakened immune systems
- People who have chronic illnesses, such as asthma, heart disease, kidney disease, liver disease, and diabetes
- People who are very obese, with a body mass index (BMI) of 40 or higher

Though the annual influenza vaccine isn't 100 percent effective, it's still your best defense against the flu.

2.1 Symptoms

Initially, the flu may seem like a common cold with a runny nose, sneezing and sore throat. But colds usually develop slowly, whereas the flu tends to come on suddenly. And although a cold can be a nuisance, you usually feel much worse with the flu.

Common signs and symptoms of the flu include:

- Fever over 100.4 F (38 C)
- Aching muscles
- Chills and sweats
- Headache
- Dry, persistent cough
- Fatigue and weakness
- Nasal congestion
- Sore throat

2.2 When to see a doctor

Most people who get the flu can treat themselves at home and often don't need to see a doctor.

If you have flu symptoms and are at risk of complications, see your doctor right away. Taking antiviral drugs may reduce the length of your illness and help prevent moreserious problems.

2.3 Causes

Flu viruses travel through the air in droplets when someone with the infection coughs, sneezes or talks. You can inhale the droplets directly, or you can pick up the germs from an object — such as a telephone or computer keyboard — and then transfer them to your eyes, nose or mouth.

People with the virus are likely contagious from the day or so before symptoms first appear until about five days after symptoms begin. Children and people with weakened immune systems may be contagious for a slightly longer time.

Influenza viruses are constantly changing, with new strains appearing regularly. If you've had influenza in the past, your body has already made antibodies to fight that particular strain of the virus. If future influenza viruses are similar to those you've encountered before, either by having the disease or by getting vaccinated, those antibodies may prevent infection or lessen its severity.

But antibodies against flu viruses you've encountered in the past can't protect you from new influenza strains that can be very different immunologically from what you had before.

2.4 Risk factors

Factors that may increase your risk of developing influenza or its complications include:

- **Age.** Seasonal influenza tends to target children younger than 12 months of age and adults 65 years old or older.
- **Living or working conditions.** People who live or work in facilities with many other residents, such as nursing homes or military barracks, are more likely to develop influenza. People who are hospitalized are also at higher risk.

- **Weakened immune system.** Cancer treatments, anti-rejection drugs, long-term use of steroids, organ transplants, blood cancer or HIV/AIDS can weaken your immune system. This can make it easier for you to catch influenza and may also increase your risk of developing complications.

- **Chronic illnesses.** Chronic conditions, including lung diseases such as asthma, diabetes, heart disease, neurological or neurodevelopmental disease, an airway abnormality, and kidney, liver or blood disease, may increase your risk of influenza complications.

- **Aspirin use under age 19.** People who are younger than 19 years of age and receiving long-term aspirin therapy are at risk of developing Reye's syndrome if infected with influenza.

- **Pregnancy.** Pregnant women are more likely to develop influenza complications, particularly in the second and third trimesters. Women who are up to two weeks postpartum also are more likely to develop influenza-related complications.

- **Obesity.** People with a body mass index (BMI) of 40 or more have an increased risk of complications from the flu.

2.5 Complications

If you're young and healthy, seasonal influenza usually isn't serious. Although you may feel miserable while you have it, the flu usually goes away in a week or two with no lasting effects. But children and adults at high risk may develop complications such as:

- Pneumonia

- Bronchitis

- Asthma flare-ups

- Heart problems
- Ear infections

Pneumonia is the most serious complication. For older adults and people with a chronic illness, pneumonia can be deadly.

2.6 Prevention

The Centers for Disease Control and Prevention (CDC) recommends annual flu vaccination for everyone age 6 months or older.

Each year's seasonal flu vaccine contains protection from the three or four influenza viruses that are expected to be the most common during that year's flu season. This year, the vaccine will be available as an injection and as a nasal spray.

In recent years, there was concern that the nasal spray vaccine wasn't effective enough against certain types of flu. However, the nasal spray vaccine is expected to be effective in the 2019-2020 season. The nasal spray still isn't recommended for some groups, such as pregnant women, children between 2 and 4 years old with asthma or wheezing, and people who have compromised immune systems.

Most types of flu vaccines contain a small amount of egg protein. If you have a mild egg allergy — you get hives only from eating eggs, for example — you can receive the flu shot without any additional precautions. If you have a severe egg allergy, you should be vaccinated in a medical setting and be supervised by a doctor who is able to recognize and manage severe allergic conditions.

2.7 Controlling the spread of infection

The influenza vaccine isn't 100 percent effective, so it's also important to take measures such as these to reduce the spread of infection:

- **Wash your hands.** Thorough and frequent hand-washing is an effective way to prevent many common infections. Or use alcohol-based hand sanitizers if soap and water aren't readily available.
- **Contain your coughs and sneezes.** Cover your mouth and nose when you sneeze or cough. To avoid contaminating your hands, cough or sneeze into a tissue or the inner crook of your elbow.
- **Avoid crowds.** The flu spreads easily wherever people congregate — in child care centers, schools, office buildings, auditoriums, and public transportation. By avoiding crowds during peak flu season, you reduce your chances of infection. And if you're sick, stay home for at least 24 hours after your fever subsides so that you lessen your chance of infecting others.

Influenza (flu) can cause mild to severe illness, and at times can lead to death. Flu is different from a cold. Flu usually comes on suddenly. People who have the flu often feel some or all of these symptoms:

- Fever or feeling feverish/chills
- Cough
- Sore throat
- Runny or stuffy nose
- Muscle or body aches
- Headaches
- Fatigue

Some people may have vomiting and diarrhea, though this is more common in children than adults.

It is important to note that not everyone with the flu will have a fever. Symptoms typically last one week.

2.8 Common cold

While both colds and the flu are caused by viruses and typically lead to a stuffy nose, coughing and a sore throat, knowing the difference between cold and flu symptoms, many of which overlap, can make a world of difference when it comes to figuring out the type of infection you may have.

A cold happens gradually and is felt mainly in the head and the nose, usually with more mild symptoms and fatigue. While you may feel crummy, if you do not have a fever, you can still generally continue to go about your day.

However, if you have the flu, symptoms are much more severe than with a cold and have a quick onset.

3. Allergies

An allergy is an immune system response to a foreign substance that's not typically harmful to your body. These foreign substances are called allergens. They can include certain foods, pollen, or pet dander.

Your immune system's job is to keep you healthy by fighting harmful pathogens. It does this by attacking anything it thinks could put your body in danger. Depending on the allergen, this response may involve inflammation, sneezing, or a host of other symptoms.

Your immune system normally adjusts to your environment. For example, when your body encounters something like pet dander, it should realize it's harmless. In people with dander allergies, the immune system perceives it as an outside invader threatening the body and attacks it.

Allergies are common. Several treatments can help you avoid your symptoms.

3.1 Symptoms of allergies

The symptoms you experience because of allergies are the result of several factors. These include the type of allergy you have and how severe the allergy is.

If you take any medication before an anticipated allergic response, you may still experience some of these symptoms, but they may be reduced.

3.2 For food allergies

Food allergies can trigger swelling, hives, nausea, fatigue, and more. It may take a while for a person to realize that they have a food allergy. If you have a serious reaction after a meal and you're not sure why to see a medical professional immediately. They can find the exact cause of your reaction or refer you to a specialist.

3.3 For seasonal allergies

Hay fever symptoms can mimic those of a cold. They include congestion, runny nose, and swollen eyes. Most of the time, you can manage these symptoms at home using over-the-counter treatments. See your doctor if your symptoms become unmanageable.

3.4 For severe allergies

Severe allergies can cause anaphylaxis. This is a life-threatening emergency that can lead to breathing difficulties, lightheadedness, and loss of consciousness. If

you're experiencing these symptoms after coming in contact with a possible allergen, seek medical help immediately.

Everyone's signs and symptoms of an allergic reaction are different.

3.5 Allergies on skin

Skin allergies may be a sign or symptom of an allergy. They may also be the direct result of exposure to an allergen.

For example, eating a food you're allergic to can cause several symptoms. You may experience tingling in your mouth and throat. You may also develop a rash.

Contact dermatitis, however, is the result of your skin coming into direct contact with an allergen. This could happen if you touch something you're allergic to, such as a cleaning product or plant.

Types of skin allergies include:

- **Rashes.** Areas of skin are irritated, red, or swollen, and can be painful or itchy.

- **Eczema.** Patches of skin become inflamed and can itch and bleed.
- **Contact dermatitis.** Red, itchy patches of skin develop almost immediately after contact with an allergen.
- **Sore throat.** Pharynx or throat is irritated or inflamed.
- **Hives.** Red, itchy, and raised welts of various sizes and shapes to develop on the surface of the skin.
- **Swollen eyes.** Eyes may be watery or itchy and look "puffy."
- **Itching.** There's irritation or inflammation in the skin.
- **Burning.** Skin inflammation leads to discomfort and stinging sensations on the skin.

Rashes are one of the most common symptoms of a skin allergy.

3.6 Causes of allergies

Researchers aren't exactly sure why the immune system causes an allergic reaction when a normally harmless foreign substance enters the body.

Allergies have a genetic component. This means parents can pass them down to their children. However, only a general susceptibility to an allergic reaction is genetic. Specific allergies aren't passed down. For instance, if your mother is allergic to shellfish, it doesn't necessarily mean that you'll be, too.

Common types of allergens include:

- **Animal products. These include** pet dander, dust mite waste, and cockroaches.
- **Drugs.** Penicillin and sulfa drugs are common triggers.
- **Foods.** Wheat, nuts, milk, shellfish, and egg allergies are common.

- **Insect stings.** These include bees, wasps, and mosquitoes.
- **Mold.** Airborne spores from mold can trigger a reaction.
- **Plants.** Pollens from grass, weeds, and trees, as well as resin from plants such as poison ivy and poison oak, are very common plant allergens.
- **Other allergens.** Latex, often found in latex gloves and condoms, and metals like nickel are also common allergens.

Seasonal allergies, also known as hay fever, are some of the most common allergies. These are caused by pollen released by plants. They cause:

- itchy eyes
- watery eyes
- runny nose
- coughing

Food allergies are becoming more common.

3.7 Allergy treatments

The best way to avoid allergies is to stay away from whatever triggers the reaction. If that's not possible, there are treatment options available.

- Medication

Allergy treatment often includes medications like antihistamines to control symptoms. The medication can be over the counter or prescription. What your doctor recommends depends on the severity of your allergies.

Allergy medications include:

- antihistamines like diphenhydramine (Benadryl)

- corticosteroids
- cetirizine (Zyrtec)
- loratadine (Claritin)
- cromolyn sodium (Gastrocrom)
- decongestants (Afrin, Suphedrine PE, Sudafed)
- leukotriene modifiers (Singulair, Zyflo)

Singulair should only be prescribed if there are no other suitable treatment options. This is because it increases your risk of serious behavioral and mood changes, such as suicidal thoughts and actions.

- Immunotherapy

Many people opt for immunotherapy. This involves several injections over a few years to help the body get used to your allergy. Successful immunotherapy can prevent allergy symptoms from returning.

- Emergency epinephrine

If you have a severe, life-threatening allergy, carry an emergency epinephrine shot. The shot counters allergic reactions until medical help arrives. Common brands of this treatment include EpiPen and Twinject.

Some allergic responses are a medical emergency. Prepare for these emergencies by knowing the allergic reaction first aid.

3.8 Natural remedies for allergies

Many natural remedies and supplements are marketed as a treatment and even a way to prevent allergies. Discuss these with your doctor before trying them. Some natural treatments may contain other allergens and make your symptoms worse.

For example, some dried teas use flowers and plants that are closely related to plants that might be causing you serious sneezing. The same is true for essential oils. Some people use these oils to relieve common symptoms of allergies, but essential oils still contain ingredients that can cause allergies.

Each type of allergy has a host of natural remedies that may help speed up recovery. There are also natural options for children's allergies, too.

3.9 How allergies are diagnosed

Your doctor can diagnose allergies in several ways.

First, your doctor will ask about your symptoms and perform a physical exam. They'll ask about anything unusual you may have eaten recently and any substances you may have come in contact with. For example, if you have a rash on your hands, your doctor may ask if you put on latex gloves recently.

Lastly, a blood test and skin test can confirm or diagnose allergens your doctor suspects you have.

3.10 Allergy blood test

Your doctor may order a blood test. Your blood will be tested for the presence of allergy-causing antibodies called immunoglobulin E (IgE). These are cells that react to allergens. Your doctor will use a blood test to confirm a diagnosis if they're worried about the potential for a severe allergic reaction.

3.11 Skin test

Your doctor may also refer you to an allergist for testing and treatment. A skin test is a common type of allergy test carried out by an allergist.

During this test, your skin is pricked or scratched with small needles containing potential allergens. Your skin's reaction is documented. If you're allergic to a particular substance, your skin will become red and inflamed.

Different tests may be needed to diagnose all your potential allergies.

3.12 Preventing symptoms

There's no way to prevent allergies. But there are ways to prevent the symptoms from occurring. The best way to prevent allergy symptoms is to avoid the allergens that trigger them.

Avoidance is the most effective way to prevent food allergy symptoms. An elimination diet can help you determine the cause of your allergies so you know how to avoid them. To help you avoid food allergens, thoroughly read food labels and ask questions while dining out.

Preventing seasonal, contact, and other allergies come down to knowing where the allergens are located and how to avoid them. If you're allergic to dust, for example, you can help reduce symptoms by installing proper air filters in your home, getting your air ducts professionally cleaned, and dusting your home regularly.

Proper allergy testing can help you pinpoint your exact triggers, which makes them easier to avoid. These other tips can also help you avoid dangerous allergic reactions.

3.13 Complications of allergies

While you may think of allergies as those pesky sniffles and sneezes that come around every new season, some of these allergic reactions can be life-threatening.

Anaphylaxis, for example, is a serious reaction to the exposure of allergens. Most people associate anaphylaxis with food, but any allergen can cause the telltale signs:

- suddenly narrowed airways
- increased heart rate

- possible swelling of the tongue and mouth

Allergy symptoms can create many complications. Your doctor can help determine the cause of your symptoms as well as the difference between sensitivity and a full-blown allergy. Your doctor can also teach you how to manage your allergy symptoms so that you can avoid the worst complications.

3.14 Asthma and allergies

Asthma is a common respiratory condition. It makes breathing more difficult and can narrow the air passageways in your lungs.

Asthma is closely related to allergies. Indeed, allergies can make existing asthma worse. It can also trigger asthma in a person who's never had the condition.

When these conditions occur together, it's a condition called allergy-induced asthma, or allergic asthma. Allergic asthma affects about 60 percent of people who have asthma in the United States, estimates the Allergy and Asthma Foundation of America. Many people with allergies may develop asthma.

COVID-19 OUTBREAK

CHAPTER 7

Protection against COVID-19

Stay aware of the latest information on the COVID-19 outbreak, available on the WHO website and through your national and local public health authority. Many countries around the world have seen cases of COVID-19 and several have seen outbreaks. Authorities in China and some other countries have succeeded in slowing or stopping their outbreaks. However, the situation is unpredictable so check regularly for the latest news.

You can reduce your chances of being infected or spreading COVID-19 by taking some simple precautions:

- Regularly and thoroughly clean your hands with an alcohol-based hand rub or wash them with soap and water.

  Why?Washing your hands with soap and water or using alcohol-based hand rub kills viruses that may be on your hands.

- Maintain at least 1 meter (3 feet) distance between yourself and anyone who is coughing or sneezing.

Why? When someone coughs or sneezes they spray small liquid droplets from their nose or mouth which may contain the virus. If you are too close, you can breathe in the droplets, including the COVID-19 virus if the person coughing has the disease.

- Avoid touching eyes, nose and mouth.

Why? Hands touch many surfaces and can pick up viruses. Once contaminated, hands can transfer the virus to your eyes, nose or mouth. From there, the virus can enter your body and can make you sick.

- Make sure you, and the people around you, follow good respiratory hygiene. This means covering your mouth and nose with your bent elbow or tissue when you cough or sneeze. Then dispose of the used tissue immediately.

Why? Droplets spread the virus. By following good respiratory hygiene you

protect the people around you from viruses such as cold, flu and COVID-19.

- Stay home if you feel unwell. If you have a fever, cough and difficulty breathing, seek medical attention and call in advance. Follow the directions of your local health authority.

  Why? National and local authorities will have the most up to date information on the situation in your area. Calling in advance will allow your health care provider to quickly direct you to the right health facility. This will also protect you and help prevent the spread of viruses and other infections.

- Keep up to date on the latest COVID-19 hotspots (cities or local areas where COVID-19 is spreading widely). If possible, avoid traveling to places – especially if you are an older person or have diabetes, heart or lung disease.

Why? You have a higher chance of catching COVID-19 in one of these areas.

Protection measures for persons who are in or have recently visited (past 14 days) areas where COVID-19 is spreading

- Follow the guidance outlined above (Protection measures for everyone)
- Self-isolate by staying at home if you begin to feel unwell, even with mild symptoms such as headache, low-grade fever (37.3 C or above) and a slight runny nose, until you recover. If you need to have someone bring you supplies or to go out, e.g. to buy food, then wear a mask to avoid infecting other people.

  Why? Avoiding contact with others and visits to medical facilities will allow these facilities to operate more effectively and help protect you and others from possible COVID-19 and other viruses.

- If you develop fever, cough and difficulty breathing, seek medical advice promptly as this may be due to a respiratory infection or other serious condition. Call in advance and tell your provider of any recent travel or contact with travelers.

  Why? Calling in advance will allow your health care provider to quickly direct you to the right health facility. This will also help to prevent the possible spread of COVID-19 and other viruses.

Older adults and people who have severe underlying chronic medical conditions like heart or lung disease or diabetes seem to be at higher risk for developing more serious complications from COVID-19 illness. Please consult with your health care provider about additional steps you may be able to take to protect yourself.

- There is currently no vaccine to prevent coronavirus disease in 2019 (COVID-19).
- The best way to prevent illness is to avoid being exposed to this virus.
- The virus is thought to spread mainly from person-to-person.
  - ✓ Between people who are in close contact with one another (within about 6 feet).
  - ✓ Respiratory droplets produced when an infected person coughs or sneezes.
- These droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs.

1.Take steps to protect yourself

1.1 Clean your hands often

- Wash your hands often with soap and water for at least 20 seconds especially after you have been in a public place, or after blowing your nose, coughing, or sneezing.
- If soap and water are not readily available, use a hand sanitizer that contains at least 60% alcohol. Cover all surfaces of your hands and rub them together until they feel dry.
- Avoid touching your eyes, nose, and mouth with unwashed hands.

1.2 Avoid close contact

- Avoid close contact with people who are sick
- Put distance between yourself and other people if COVID-19 is spreading in your community. This is especially important for people who are at higher risk of getting very sick.

2 Take steps to protect others

2.1 Stay home if you're sick

- Stay home if you are sick, except to get medical care. Learn what to do if you are sick.

2.2 Cover coughs and sneezes

- Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow.
- Throw used tissues in the trash.

- Immediately wash your hands with soap and water for at least 20 seconds. If soap and water are not readily available, clean your hands with a hand sanitizer that contains at least 60% alcohol.

2.3 Wear a facemask if you are sick

- **If you are sick:** You should wear a facemask when you are around other people (e.g., sharing a room or vehicle) and before you enter a healthcare provider's office. If you are not able to wear a facemask (for example, because it causes trouble breathing), then you should do your best to cover your coughs and sneezes, and people who are caring for you should wear a facemask if they enter your room.

- **If you are NOT sick:** You do not need to wear a facemask unless you are caring for someone who is sick (and they are not able to wear a facemask). Facemasks may be in short supply and they should be saved for caregivers.

2.4 Clean and disinfect

- **Clean AND disinfect frequently touched surfaces daily**. This includes tables, doorknobs, light switches, countertops, handles, desks, phones, keyboards, toilets, faucets, and sinks.

- **If surfaces are dirty, clean them:** Use detergent or soap and water before disinfection.

3. Control and Prevention

Measures for protecting workers from exposure to, and infection with, the novel coronavirus, COVID-19 depend on the type of work being performed and exposure risk, including potential for interaction with infectious people and contamination of the work environment. Employers should adopt infection control strategies based on a thorough hazard assessment, using appropriate

combinations of engineering and administrative controls, safe work practices, and personal protective equipment (PPE) to prevent worker exposures.

For all workers, regardless of specific exposure risks, it is always a good practice to:

- Frequently wash your hands with soap and water for at least 20 seconds. When soap and running water are unavailable, use an alcohol-based hand rub with at least 60% alcohol. Always wash hands that are visibly soiled.
- Avoid touching your eyes, nose, or mouth with unwashed hands.
- Avoid close contact with people who are sick.

The U.S. Centers for Disease Control and Prevention has developed interim guidance for businesses and employers to plan for and respond to COVID-19. The interim guidance is intended to help prevent workplace exposure to acute respiratory illnesses, including COVID-19. The guidance also addresses considerations that may help employers prepare for more widespread, community outbreaks of COVID-19, in the event that this kind of transmission begins to occur. The guidance is intended for non-healthcare settings; healthcare workers and employers should consult guidance specific to them, below.

Interim guidance for most U.S. workers and employers of workers unlikely to have occupational exposures to COVID-19

For most types of workers, the risk of infection with COVID-19 is similar to that of the general American public.

Employers and workers in operations where there is no specific exposure hazard should remain aware of the evolving outbreak situation. Changes in outbreak conditions may warrant additional precautions in some workplaces not currently highlighted in this guidance.

Interim guidance for U.S. workers and employers of workers with potential occupational exposures to COVID-19

Workers and employers involved in healthcare, deathcare, laboratory, airline, border protection, and solid waste and wastewater management operations and travel to areas with ongoing, person-to-person transmission of COVID-19 should remain aware of the evolving outbreak situation.

As discussed on the Hazard Recognition page, employers should assess the hazards to which their workers may be exposed; evaluate the risk of exposure; and select, implement, and ensure workers use controls to prevent exposure. Control measures may include a combination of engineering and administrative controls, safe work practices, and PPE.

4. Identify and Isolate Suspected Cases

In all workplaces where exposure to the COVID-19 may occur, prompt identification and isolation of potentially infectious individuals is a critical first step in protecting workers, visitors, and others at the worksite.

- Immediately isolate people suspected of having COVID-19. For example, move potentially infectious people to isolation rooms and close the doors. On an aircraft, move potentially infectious people to seats away from passengers and crew, if possible and without compromising aviation safety.

In other worksites, move potentially infectious people to a location away from workers, customers, and other visitors.

- Take steps to limit the spread of the person's infectious respiratory secretions, including by providing them a facemask and asking them to wear it, if they can tolerate doing so. Note: A surgical mask on a patient or other sick person should not be confused with PPE for a worker; the mask acts to contain potentially infectious respiratory secretions at the source (i.e., the person's nose and mouth).
- If possible, isolate people suspected of having COVID-19 separately from those with confirmed cases of the virus to prevent further transmission, including in screening, triage, or healthcare facilities.
- Restrict the number of personnel entering isolation areas, including the room of a patient with suspected/confirmed COVID-19.
- Protect workers in close contact* with the sick person by using additional engineering and administrative control, safe work practices, and PPE.

*CDC defines "close contact" as being about six (6) feet (approximately two (2) meters) from an infected person or within the room or care area of an infected patient for a prolonged period while not wearing recommended PPE. Close contact also includes instances where there is direct contact with infectious secretions while not wearing recommended PPE. Close contact generally does not include brief interactions, such as walking past a person.

5. Environmental Decontamination

When someone touches a surface or object contaminated with the virus that causes COVID-19, and then touches their own eyes, nose, or moth, they may expose themselves to the virus.

Because the transmissibility of COVID-19 from contaminated environmental surfaces and objects is not fully understood, employers should carefully evaluate whether or not work areas occupied by people suspected to have a virus may have been contaminated and whether or not they need to be decontaminated in response.

Outside of healthcare and deathcare facilities, there is typically no need to perform special cleaning or decontamination of work environments when a person suspected of having the virus has been present unless those environments are visibly contaminated with blood or other body fluids. In limited cases where further cleaning and decontamination may be necessary, consult U.S. Centers for Disease Control and Prevention (CDC) guidance for cleaning and disinfecting environments, including those contaminated with other coronaviruses.

Workers who conduct cleaning tasks must be protected from exposure to blood, certain body fluids. In these cases, the PPE and Hazard Communication standards may also apply. Do not use compressed air or water sprays to clean potentially contaminated surfaces, as these techniques may aerosolize infectious material.

6. Worker Training

Train all workers with reasonably anticipated occupational exposure to COVID-19 (as described in this document) about the sources of exposure to the virus, the hazards associated with that exposure, and appropriate workplace protocols in place to prevent or reduce the likelihood of exposure. Training should include information about how to isolate individuals with suspected or confirmed COVID-19 or other infectious diseases, and how to report possible cases. Training must be offered during scheduled work times and at no cost to the employee.

Workers required to use PPE must be trained. This training includes when to use PPE; what PPE is necessary; how to properly don (put on), use, and doff (take

off) PPE; how to properly dispose of or disinfect, inspect for damage, and maintain PPE; and the limitations of PPE. Applicable standards include the PPE, Eye and Face Protection, Hand Protection, and Respiratory Protection standards. When the potential exists for exposure to human blood, certain body fluids, or other potentially infectious materials, workers must receive the training required by the Bloodborne Pathogens (BBP) standard, including information about how to recognize tasks that may involve exposure and the methods, such as engineering controls, work practices, and PPE, to reduce exposure.

Interim guidance for specific worker groups and their employers

This section provides information for specific worker groups and their employers who may have potential exposures to COVID-19. Guidance for each worker group generally follows the hierarchy of controls, including engineering controls, administrative controls, safe work practices, and PPE. However, not all types of controls are provided in each section; in those cases, employers and workers should consult the interim general guidance for U.S. workers and employers of workers with potential occupational exposures to COVID-19, above.

COVID-19 OUTBREAK

CHAPTER 8

How does COVID-19 spread?

People can catch COVID-19 from others who have the virus. The disease can spread from person to person through small droplets from the nose or mouth which are spread when a person with COVID-19 coughs or exhales. These droplets land on objects and surfaces around the person. Other people then catch COVID-19 by touching these objects or surfaces, then touching their eyes, nose or mouth. People can also catch COVID-19 if they breathe in droplets from a person with COVID-19 who coughs out or exhales droplets. This is why it is important to stay more than 1 meter (3 feet) away from a person who is sick.

WHO is assessing ongoing research on the ways COVID-19 is spread and will continue to share updated findings.

Human coronaviruses cause infections of the nose, throat, and lungs. They are most commonly spread from an infected person through:

- respiratory droplets generated when you cough or sneeze
- close, prolonged personal contact, such as touching or shaking hands
- touching something with the virus on it, then touching your mouth, nose or eyes before washing your hands

Current evidence suggests person-to-person spread is efficient when there is close contact.

At this time, there is no vaccine for COVID-19 or any natural health products that are authorized to protect against it.

1.If you have COVID-19

1.1 Reduce contact with others

If you are sick, reduce contact with others by:

- staying at home and self-isolating (unless directed to seek medical care)
- if you must leave your home, wear a mask or cover your mouth and nose with tissues, and maintain a **2-meter distance** from others
- avoiding individuals in hospitals and long-term care centers, especially older adults and those with chronic conditions or compromised immune systems
- avoiding having visitors to your home
- covering your mouth and nose with your arm when coughing and sneezing
- having supplies delivered to your home instead of running errands
- supplies should be dropped off outside to ensure a 2-meter distance

It is important to know how you can prepare in case you or a family member become ill.

1.2 Self-monitor, self-isolate and isolate

There is a difference between advice to self-monitor, advice to self-isolate and advice to isolate. It is important to note these measures are in place to protect health and safety.

- Self-monitor
- Self-isolate
- Isolate

1.3 Social distancing

Together, we can slow the spread of COVID-19 by making a conscious effort to keep a physical distance between each other. Social distancing is proven to be one of the most effective ways to reduce the spread of illness during an outbreak. With patience and cooperation, we can all do our part.

This means making changes in your everyday routines to minimize close contact with others, including:

- avoiding non-essential gatherings
- avoiding common greetings, such as handshakes
- avoiding crowded places such as concerts, arenas, conferences, and festivals
- limiting contact with people at higher risk like older adults and those in poor health
- keeping a distance of at least 2 arms lengths (approximately 2 meters) from others, as much as possible
- keeping a distance of at least 2 arms-length (approximately 2 meters) from others

1.4 Hygiene

Proper hygiene can help reduce the risk of infection or spreading the infection to others:

- wash your hands often with soap and water for at least 20 seconds, especially after using the washroom and when preparing food
    - ✓ use alcohol-based hand sanitizer if soap and water are not available
- when coughing or sneezing:

- ✓ cough or sneeze into a tissue or the bend of your arm, not your hand
- ✓ dispose of any tissues you have used as soon as possible in a lined wastebasket and wash your hands afterward

- avoid touching your eyes, nose, or mouth with unwashed hands
- clean the following high-touch surfaces frequently with regular household cleaners or diluted bleach (1 part bleach to 9 parts water):
  - ✓ toilets
  - ✓ toys
  - ✓ phones
  - ✓ electronics
  - ✓ door handles
  - ✓ bedside tables
  - ✓ television remotes

1.5 Wearing masks

If you are a healthy individual, the use of a mask is not recommended for preventing the spread of COVID-19.

Wearing a mask when you are not ill may give a false sense of security. There is a potential risk of infection with improper mask use and disposal. They also need to be changed frequently.

However, your health care provider may recommend you wear a mask if you are experiencing symptoms of COVID-19 while you are seeking or waiting for care. In this instance, masks are an appropriate part of infection prevention and control measures. The mask acts as a barrier and helps stop the tiny droplets from spreading you when you cough or sneeze.

2 Risks of getting coronavirus

People are advised to avoid all non-essential travel.

There is an increased risk of more severe outcomes:

- aged 65 and over

- with compromised immune systems
- with underlying medical conditions

As well, the risk for COVID-19 may be increased for certain settings such as:

- cruise ships
- heavily affected areas
- international conferences and other large gatherings in enclosed spaces

It is important for all travelers to:

- self-isolate for 14 days after your return from travel outside
- self-monitor for symptoms of COVID-19 (fever, cough or difficulty breathing) for 14 days after returning
- avoid places where you cannot easily separate yourself from others if you become ill

If you have even mild symptoms, **stay home** and call the public health authority in the province or territory you are in to inform them. They will provide advice on what you should do.

We will continue to adapt our risk assessment based on the latest data available.

3 Pregnant women

Throughout pregnancy, women experience changes in their bodies that may increase the risk of some illnesses, including viral respiratory infections, such as the flu. At this time, there is **insufficient evidence** to suggest that pregnant women are at a greater risk for more serious outcomes related to COVID-19.

It is always important for pregnant women to protect themselves from illnesses and take the appropriate steps to avoid and prevent infection. Proper hygiene can help reduce the risk of getting an infection or spreading the infection to others.

If you are pregnant and concerned about COVID-19, speak to your health care provider.

4 Products shipped from outside

Coronaviruses generally do not survive on surfaces after being contaminated. The risk of spread from products shipped over days or weeks at room temperature is **very low**.

There is no known risk of coronaviruses entering on parcels or packages coming from affected regions.

4.1 Food

There is currently no evidence to suggest that food is a likely source or route of transmission of the virus. Scientists and food safety authorities across the world are closely monitoring the spread of COVID-19.

If we become aware of a potential food safety risk, appropriate actions will be taken to ensure the safety of food supply.

4.2 Animals

There is currently no evidence to suggest that this virus is circulating in animals.

It is possible that some types of animals can be infected with COVID-19 but there is no evidence that pets or other animals can spread the virus. There are still many unknowns about COVID-19 and this is an area that remains to be studied and understood.

Until we know more, if you have been diagnosed with COVID-19 and have a pet or other animal:

- avoid close contact with them
  - ✓ do not snuggle or kiss them, or let them lick you, sit on your lap, or sleep in your bed
- practice good cough etiquette
  - ✓ avoid coughing and sneezing on your animals
- have another member of your household care for your animals
  - ✓ if this is not possible, always wash your hands before touching or feeding them
- limit your animal's contact with other people and animals
  - ✓ this may mean keeping them indoors

To date, there have not been any reports of livestock being infected by COVID-19 anywhere. However, livestock producers should follow normal biosecurity measures as always. This includes limiting visitors or workers who may have traveled to, or been in contact with, someone from an affected area. For more information on-farm disease prevention, producers are encouraged to consult

4.3 Animals in or from other countries

Although the current spread and growth of the COVID-19 outbreak are primarily associated with spread from person to person, experts agree that the virus likely originated from bats and may have passed through an intermediary animal source (currently unknown) in China before being transmitted to humans.

It is recommended that individuals who travel to an affected country or region avoid contact with animals, including wild meat and wet (live animal) markets.

If you are considering travel, check the latest travel health notices for the most up-to-date travel advice before traveling.

All animals entering must meet the import requirements set. There are currently no specific requirements in place in restricting animal importation related to the COVID-19 outbreak. This is because there is no evidence that pets or other domestic animals can spread the virus.

However, importers, rescue organizations and adoptive families should limit or postpone importing animals from affected areas. If animals are imported from an affected area:

- they should be closely monitored for signs of illness
- you should contact a veterinarian if they become sick
    - ✓ call ahead to ensure they are aware of the circumstances

COVID-19
OUTBREAK

CHAPTER 9

IS THERE A VACCINE OR DRUG TREATMENT FOR COVID-19?

The mysterious coronavirus outbreak in the Chinese city Wuhan, now termed as Covid-19, and its fast spread to many other countries, endangers thousands of lives. The pandemic has catalyzed the development of novel coronavirus vaccines across the biotech industry, both by pharmaceutical companies and research organizations such as the National Institutes of Health (NIH), US.

The first Covid-19 vaccine in China is expected to be ready for clinical trials by the end of April, according to XuNanping, China's vice-minister of science and technology. Inovio Pharmaceuticals plans to begin clinical trials on a coronavirus vaccine in April this year.

Health officials from WHO has noted that Gilead's remdesivir has demonstrated efficacy in treating the coronavirus infection.

1.Favilavir, the first approved coronavirus drug in China

The National Medical Products Administration of China has approved the use of Favilavir, an anti-viral drug, as a treatment for coronavirus. The drug has reportedly shown efficacy in treating the disease with minimal side effects in a clinical trial involving 70 patients. The clinical trial is being conducted in Shenzhen, Guangdong province.

Pharmaceutical companies involved in developing coronavirus drugs/vaccines

Here is a list of the major coronavirus drugs that pharmaceutical companies across the world are developing that have the potential to become major coronavirus vaccines or antivirals for treating the contagious coronavirus infection.

2. Novel coronavirus vaccines

Listed below are the coronavirus vaccines in various stages of development, across the world.

2.1 TJM2 by I-MabBiopharma

I-MabBiopharma is developed TJM2, a neutralizing antibody, as a treatment for cytokine storm in patients suffering from a severe case of coronavirus infection. The drug targets the human granulocyte-macrophage colony-stimulating factor (GM-CSF), which is responsible for acute and chronic inflammation.

The company will commence development after receiving approval for the Investigational New Drug (IND) application from the U.S. Food and Drug Administration (FDA).

2.2 Vaccine by Medicago

Medicago is developing drug candidates against COVID-19 after having produced Virus-Like Particles (VLP) of the coronavirus. The company has formed a collaboration with Laval University's Infectious Disease Research Centre to develop antibodies against SARS-CoV-2.

The company's research activities are being partly funded by the Canadian Institutes for Health Research (CIHR).

2.3 AT-100 by Airway Therapeutics

Airway Therapeutics is exploring its novel human recombinant protein named AT-100 (rhSP-D) as a treatment for coronavirus. The company has announced a filing with the Respiratory Diseases Branch of the National Institutes of Health to evaluate the drug.

AT-100 has shown efficacy in preclinical studies in reducing inflammation and infection in the lungs, while also generating an immune response against various respiratory diseases.

2.4 TZLS-501 by Tiziana Life Sciences

Tiziana Life Sciences is developing its monoclonal antibody named TZLS-501 for the treatment of COVID-19. TZLS-501 is a human anti-interleukin-6 receptor (IL-6R), which helps in preventing lung damage and elevated levels of IL-6.

The drug works by binding to IL-6R and depleting the amount of IL-6 circulating in the body thereby reducing chronic lung inflammation.

2.5 OYA1 by OyaGen

OyaGen's OYA1 has shown strong antiviral efficacy against coronavirus in laboratory essays. It was found to be more effective than chlorpromazine HCl in inhibiting SARS-CoV-2 from replicating in cell culture.

OYA1 was earlier approved as an investigational new drug for treating cancer but abandoned due to a lack of efficacy. OyaGen plans to conduct further research on the drug to determine the efficacy in treating coronavirus.

2.6 BPI-002 by BeyondSpring

BeyondSpring's BPI-002 is a small molecule agent indicated for treating various infections including COVID-19. It can activate CD4+ helper T cells and CD8+ cytotoxic T cells and generating an immune response in the body.

If combined with another COVID-19 vaccine, the drug can generate long-term protection against viral infections. BeyondSpring has filed US patent protection for the drug for treating viral infections.

2.7 Altimmune's intranasal coronavirus vaccine

An intranasal Covid-19 vaccine is being developed by US-based clinical-stage biopharmaceutical company, Altimmune.

Design and synthesis of the single-dose vaccine have been completed, while animal testing will follow.

The coronavirus vaccine is being developed based on a vaccine technology platform that is similar to NasoVAX, an influenza vaccine developed by Altimmune.

2.8 INO-4800 by Inovio Pharmaceuticals and Beijing Advaccine Biotechnology

Inovio Pharmaceuticals has collaborated with Beijing Advaccine Biotechnology Company to advance the development of the former's vaccine, INO-4800, as a novel coronavirus vaccine. The company has started pre-clinical testing for clinical product manufacturing.

The vaccine development is supported by a $9m grant from the Coalition for Epidemic Preparedness Innovations (CEPI).

Inovio announced an accelerated timeline for the development of the vaccine on 03 March. Preclinical trials are ongoing and the designs for human clinical trials have been completed. The company has also prepared 3,000 doses for human clinical trials planned to be conducted across the US, China, and South Korea. Plans for large-scale manufacturing have also been developed.

Human clinical trials in 30 healthy volunteers are expected to commence in April 2020 in the US, followed by China, and South Korea. A phase one clinical trial is planned to be conducted in parallel in China, by Beijing Advaccine. Results from the clinical trials are expected to be available in September 2020.

Inovio aims to produce one million doses of the vaccine by the end of 2020 to perform additional clinical trials or emergency use.

2.9 NP-120 (Ifenprodil) by Algernon Pharmaceuticals

Algernon Pharmaceuticals has announced that it is exploring its NP-120 (Ifenprodil) as a potential treatment Covid-19. Ifenprodil is an N-methyl-d-

aspartate (NDMA) receptor glutamate receptor antagonist sold under the brand name Cerocal. It has demonstrated efficacy in improving survivability in mice infected with H5N1.

2.10 APN01 by University of British Columbia and APEIRON Biologics

A drug candidate developed by APEIRON Biologics named APN01 is being tested in China in a phase one pilot trial as a treatment for Covid-19. APN01 is based on research conducted by a professor at the University of British Columbia for treating SARS. The research revealed that the ACE2 protein was the main receptor for the SARS virus.

The clinical trial will test the drug's efficacy in reducing the viral load in patients. Data from the trial will be used to determine if additional clinical trials are required to be conducted in a larger number of patients.

2.11 mRNA-1273 vaccine by Moderna and Vaccine Research Center

Moderna and the Vaccine Research Center, a unit of the National Institute of Allergy and Infectious Diseases (NIAID), have collaborated to develop a vaccine for coronavirus. The vaccine targets the Spike (S) protein of the coronavirus.

The first vials of the vaccine have been manufactured at Moderna's Massachusetts manufacturing plant and shipped to NIAID for phase one clinical trial, which is scheduled to start in April.

2.12 Avian Coronavirus Infectious Bronchitis Virus (IBV) vaccine by MIGAL Research Institute

The MIGAL Research Institute in Israel announced that an Infectious Bronchitis Virus (IBV) vaccine developed to treat avian coronavirus has been modified to treat Covid-19. The vaccine has demonstrated efficacy in pre-clinical trials conducted by the Volcani Institute.

The IBV vaccine was developed after four years of research and has high genetic similarity to the human coronavirus. The institute has genetically modified the vaccine to treat Covid-19 and will be available in the oral form.

The institute is currently exploring potential partners for producing the vaccine in the next eight to ten weeks and obtaining the necessary safety approvals for in-vivo testing.

2.13 TNX-1800 by Tonix Pharmaceuticals

Tonix Pharmaceuticals has partnered with Southern Research, a non-profit research organization, to develop a coronavirus vaccine named TNX-1800. The vaccine is a modified horsepox virus developed using Tonix's proprietary horsepox vaccine platform.

TNX-1800 is designed to express a protein derived from the virus that causes the coronavirus infection. Southern Research will be responsible for evaluating the efficacy of the vaccine, under the partnership.

2.14 Brilacidin by Innovation Pharmaceuticals

Innovation Pharmaceuticals announced that it is evaluating Brilacidin, a defensin mimetic drug candidate, as a potential treatment for coronavirus. Brilacidin has shown antibacterial, anti-inflammatory and immunomodulatory properties in several clinical trials.

The company is planning to explore research collaborations and seek federal grants to develop the coronavirus drug. It is already investigating the drug for inflammatory bowel disease and oral mucositis in cancer patients.

Innovation has signed two material transfer agreements with a university in the US and 12 biocontainment labs in the US for evaluation of Brilacidin as a

treatment for Covid-19. One of the biocontainment labs is scheduled to commence testing of the drug in the third week of March.

2.15 Recombinant subunit vaccine by Clover Biopharmaceuticals

Clover Biopharmaceuticals is developing a recombinant subunit vaccine using its patented Trimer-Tag© technology. The company is developing the vaccine based on the trimeric S protein (S-Trimer) of the Covid-19 coronavirus, which is responsible for binding with the host cell and causing a viral infection.

Using Trimer-Tag© technology, Clover successfully produced the subunit vaccine in a mammalian cell-culture based expression system on 10 February. The company also identified antigen-specific antibodies in the serum of fully recovered patients who were previously infected by the virus.

A highly purified form of the S-Trimer vaccine is expected to be available in six to eight weeks for performing pre-clinical studies. The company is equipped with in-house cGMPbiomanufacturing capabilities to scale-up production if the vaccine is proven to be successful.

Clover is also collaborating with GSK to develop a vaccine using the latter's pandemic adjuvant system.

2.16 Vaxart's coronavirus vaccine

Vaxart is developing an oral recombinant vaccine in tablet formulation using its proprietary oral vaccine platform, VAAST.

The company plans to develop vaccines based on the published genome of 2019-nCOV to be tested in pre-clinical models for mucosal and systemic immune responses.

2.17 CytoDyn-leronlimab

CytoDyn is examining leronlimab (PRO 140), a CCR5 antagonist, as a potential coronavirus drug.

The drug is already being investigated in phase two clinical trials as a treatment for HIV and has been awarded fast-track approval status by the United States Food and Drug Administration.

2.18 Linear DNA Vaccine by Applied DNA Sciences and Takis Biotech

Applied DNA Sciences' subsidiary LineaRx and Takis Biotech formed a joint venture on 07 February to develop a linear DNA vaccine as a treatment for coronavirus. The JV will use Polymerase Chain Reaction (PCR)-based DNA manufacturing technology to develop the vaccine.

The PCR technology offers several advantages including high purity, increased production speed, and absence of antibiotics and bacterial contaminants. Further, the vaccine gene developed through this technology can be effective without being inserted into the patient's genome.

The design for four DNA vaccine candidates is expected to be produced using the PCR technology for carrying out animal testing. The design of one of the vaccine candidates is based on the entire spike gene of the coronavirus, while the remaining are designed based on the antigenic portions of the protein.

2.19 BXT-25 by BIOXYTRAN to treat late-stage acute respiratory distress syndrome (ARDS)

BIOXYTRAN announced that it is exploring partners to develop its lead drug candidate, BX-25, as a treatment for Acute Respiratory Distress Syndrome (ARDS) in late-stage patients infected with the coronavirus. The diffusion of oxygen to the blood is comprised of patients suffering from ARDS leading to fluid build-up in the lungs.

BX-25 is designed to be 5,000 times smaller than blood cells and efficiently transport oxygen through the body for nine hours before being processed by the liver. The drug can help in supplying oxygen to the vital organs and enable the patient to recover and survive.

3. MERS CoV vaccines for coronavirus

3.1 Novavax's MERS coronavirus vaccine candidate

Novavax developed a novel Middle East Respiratory Syndrome (MERS) coronavirus vaccine candidate in 2013, post the identification of the first MERS coronavirus ((MERS-CoV) in Saudi Arabia in 2012. It is a crucial target for coronavirus vaccine development by the Coalition for Epidemic Preparedness Innovations (CEPI) and is a priority disease for the World Health Organisation (WHO).

The candidate is designed to primarily bind to the major surface S-protein and developed using the company's recombinant nanoparticle vaccine technology. Tested along with the Novavax's proprietary adjuvant Matrix-M™, it inhibited infection by inducing immune responses in the laboratory studies.

Novavax has received $4m in funding from CEPI to advance the development of the vaccine. The company has produced several nanoparticle vaccine candidates for testing in animal models and aims to carry out human trials in 2020.

The MERS coronavirus is related to the severe acute respiratory syndrome (SARS) coronavirus, for which the company had previously developed a recombinant nanoparticle vaccine candidate.

3.2 InovioPharma's INO-4700

The investigational DNA immunotherapy, INO-4700 (GLS-5300) is being developed by Inovio in partnership with GeneOne Life Science. It is delivered as a vaccine intramuscularly, using the Cellectra® delivery device.

The company has received a $5m grant from the Bill and Mellinda Gates foundation to accelerate the development of the Cellectra® delivery device.

The vaccine was well-tolerated and demonstrated high immune responses against the MERS-CoV in 94% of patients in the early-stage clinical trial in July 2019.

It also generated broad-based T cell responses in 88% of the subjects.

"Research organizations such as the National Institutes of Health (NIH), US are also developing a vaccine for the coronavirus."

4. Coronavirus drugs

The novel coronavirus drugs in various stages of development globally are listed below.

4.1 Remdesivir (GS-5734) by Gilead Sciences

An ebola drug developed by Gilead Sciences that was found to be ineffective is now being tested in two phases III randomized clinical trials in Asian countries.

The trials are being performed on 761 patients in a randomized, placebo-controlled, double-blind study at multiple hospitals in Wuhan, the epicenter of the novel coronavirus outbreak. The results from the trials are expected to be available over the next few weeks.

According to a report by The New England Journal of Medicine (NEJM), remdesivir, when administered to a coronavirus patient in the US, appeared to have improved the clinical condition.

The University of Nebraska Medical Center is also carrying out clinical trials to test the safety and efficacy of the drug. The first patient to be administered the drug is an evacuee from the Diamond Princess cruise ship.

4.2 Actemra by Roche to treat coronavirus-related complications

China approved the use of Roche's Actemra for the treatment of severe complications related to coronavirus. Drugs like Actemracan prevent cytokine storms or overreaction of the immune system, which is considered as the main reason behind organ failure leading to death in some coronavirus patients.

Actemra is also being evaluated in a clinical trial in China, which is expected to enroll 188 coronavirus patients. The clinical trial is expected to be conducted until May 10.

4.3 BiocrystPharma'sGalidesivir, a potential antiviral for coronavirus treatment

The antiviral drug Galidesivir (BCX4430) has shown broad-spectrum activity against a wide range of pathogens including coronavirus. It is a nucleoside RNA polymerase inhibitor that disrupts the process of viral replication.

The drug has already shown survival benefits in patients against deadly viruses such as Ebola, Zika, Marburg, and Yellow fever.

Galidesivir is currently in advanced development stage under the Animal Rule to combat multiple potential viral threats including coronaviruses, flavivirusesfiloviruses, paramyxoviruses, togaviruses, bunyaviruses, and arenaviruses.

4.4 Regeneron's REGN3048-3051 and Kevzara

Discovered by Regeneron, the combination of neutralizing monoclonal antibodies REGN3048 and REGN3051 is being studied against coronavirus infection in a

first-in-human clinical trial sponsored by the National Institute of Allergy and Infectious Diseases (NIAID). The safety and tolerability of the drug will be studied in 48 patients.

Both the antibodies bind to the S-protein of MERS coronavirus. The intravenous administration of the drug in the mouse model of MERS resulted in the high-level neutralization of the MERS coronavirus in circulating blood with reduced viral loads in the lungs.

Regeneron has partnered with Sanofi to evaluated Kevzara, a fully-human monoclonal antibody, in phase two/three clinical trials in patients with severe COVID-19 infection. Kevzara is approved for the treatment of rheumatoid arthritis and is known to block the interleukin-6 (IL-6) pathway, which causes an overactive inflammatory response in the lungs of Covid-19 patients.

4.5 AmnioBoost by Lattice Biologics

Lattice Biologics is exploring the efficacy of its amniotic fluid concentrate, AmnioBoost, in treating acute respiratory distress syndrome (ARDS) in COVID-19 patients. AmnioBoost was developed for chronic adult inflammatory conditions such as osteoarthritis.

The drug has shown efficacy in reducing the inflammatory conditions caused by several diseases including coronavirus. It reduces the production of pro-inflammatory cytokines while boosting the production of anti-inflammatory cytokines.

5. Other companies developing coronavirus vaccines/drugs

Companies such as Inovio Pharmaceuticals, Moderna, and Novavax have been reported to be developing coronavirus vaccines. A total of 30 therapies are

planned to be tested, including few traditional medicines for coronavirus treatment by Chinese scientists. Chloroquine phosphate has shown efficacy in treating symptoms of the disease, among the 30 therapies. Patients administered with the drug achieved a better drop in fever and shorter recovery time in clinical trials being conducted in hospitals in the Guangdong province and Hunan province.

5.1 Enanta Pharmaceuticals

Enanta Pharmaceuticals has announced its plans to develop antiviral drug candidates to treat COVID-19 patients. The company is testing compounds from its existing antiviral compound library for potential efficacy in treating COVID-19. It has also launched a drug discovery programme to develop direct-acting drug candidates to treat COVID-19.

5.2 Predictive Oncology

Predictive Oncology has launched an AI Platform for the discovery and development of vaccines against coronavirus. The company has signed an agreement with InventaBioTech to acquire Soluble Therapeutics, which provides it with access to HSC™ Technology.

Predictive will use the HSC™ Technology along with its predictive modeling platform to deploy an AI discovery platform that can screen the ideal combination of additives and excipients for protein formulations.

5.3 Emergent BioSolutions

Emergent BioSolutions is developing two plasma-derived product candidates or hyperimmune using its hyperimmune platforms for the treatment of coronavirus. The hyperimmune platforms have been used previously for the development of several approved products including vaccines for smallpox, botulism, and anthrax.

The hyperimmune are polyclonal antibodies derived from plasma, which are capable of generating an immune response and protecting against infection. Product candidate derived from human plasma is named COVID-HIG, while COVID-EIG is derived from equine plasma. Both will be explored for the treatment of patients with a severe case of infection.

5.4 Integral Molecular

Integral Molecular has launched a vaccine programme using its two technology platforms including Shotgun Mutagenesis Epitope Mapping and the Membrane Proteome Array. The technologies will help in understanding the human immune response to the coronavirus and isolate the cellular receptors that enable the virus to spread quickly.

The Shotgun technology helps in identifying more than 1,000 binding sites for antibodies, while the Membrane Proteome Array technology is capable of identifying the receptors through which viruses infect cells.

5.5 CEL-SCI

CEL-SCI is developing immunotherapy against Covid-19 using its proprietary LEAPS peptide technology, which utilizes conserved areas of the coronavirus proteins to generate T-cell responses and reduce viral load. The technology can also be used to develop immunotherapeutic peptides with both antiviral and anti-inflammatory properties.

The peptides developed using this technology can help in reducing tissue damage from inflammation caused due to lung infection, which is a major cause of mortality in elderly patients.

5.6 AJ Vaccines

AJ Vaccines has launched the development of a vaccine against Covid-19. The company will use the latest technology to develop antigens that can mimic the native structures of the virus. The vaccine will be capable of inducing a strong immune response in the body thereby protecting against the infection.

5.7 Takeda Pharmaceutical Company

Takeda Pharmaceutical Company has announced plans to develop a plasma-derived therapy against coronavirus. The anti-SARS-CoV-2 polyclonal hyperimmune globulin (H-IG) therapy will be designed to treat high-risk patients. The H-IG therapy includes concentrated pathogen-specific antibodies derived from plasma of recovered patients. These antibodies have the potential to generate an immune response when injected into a new patient.

5.8 Heat Biologics

Heat Biologics has announced plans to develop a vaccine to treat or prevent coronavirus infection using its proprietary gp96 vaccine platform. The technology is capable of reprogramming live cells to produce antigens that can bind to the gp96 protein and generate an immune response against those antigens.

5.9 Pfizer

Pfizer announced that it has identified certain under development antiviral compounds that may be effective in treating coronavirus. The company is planning to partner with a third party to screen and identify potential compounds by the end of March and begin testing in April.

5.10 Mateon Therapeutics

Mateon Therapeutics has launched an antiviral response programme to develop coronavirus treatments using its therapeutic and artificial intelligence (AI) platforms. It has also established a division, which will adopt a multi-modal

approach to developing Covid-19 treatments as well as other future zootonic outbreaks.

5.11 Hong Kong University of Science and Technology

The Hong Kong University of Science and Technology has identified several vaccine targets, which can be developed as a treatment for coronavirus. Researchers at the university have identified B-cell and T-cell epitopes, which are capable of generating an immune response against the SARS virus and a similar response against the coronavirus.

Some of the epitopes identified may be capable of generating an immune response specifically against Covid-19.

5.12 Vaccine by Generex

Generex has announced that it is developing a COVID-19 vaccine following a contract from a Chinese consortium comprising of China Technology Exchange, Beijing Zhonghua Investment Fund Management, Biology Institute of Shandong Academy of Sciences and Sinotek-Advocates International Industry Development.

The company will utilize its Ii-Key immune system activation technology to produce a Covid-19 peptide for human clinical trials.

Generex will receive an upfront payment of $1m to commence the groundwork for the vaccine development and $5m licensing fee for its Ii-Key technology. It is also eligible to receive a 20% royalty on every dose of vaccine produced under the contract.

5.13 Coronavirus drugs by Columbia University

Researchers at Columbia University have been awarded a $2.1m grant by the Jack Ma Foundation to develop a coronavirus cure. Four different teams at the

university will adopt various approaches towards the development of a vaccine against coronavirus.

5.14 Vaccine by Tulane University

Tulane University has launched a research programme to identify a potential medicine for coronavirus in the form of a vaccine. The university will utilize a grant from the Brown Foundation to carry out the research activities.

5.15 Coronavirus vaccine by ImmunoPrecise Antibodies

ImmunoPrecise Antibodies has launched a vaccine and therapeutic antibody programme to develop a vaccine as well as antibodies against Covid-19. The company will use its B Cell Select™ and DeepDisplay™ discovery platforms to therapeutic compounds against the coronavirus.

The company has updated its research efforts and noted that it will be using the PolyTopemAbTherapy™ and EVQLV's artificial intelligence platforms to develop a COVID-19 therapy.

5.16 Serum Institute of India

Serum Institute of India (SII) is collaborating with Codagenix, a US-based biopharmaceutical company, to develop a coronavirus cure using a vaccine strain similar to the original virus. The vaccine is currently in the pre-clinical testing phase, while human trials are expected to commence in the next six months. SII is expected to launch the vaccine in the market by early 2022.

5.17 Southwest Research Institute

Southwest Research Institute is using its virtual screening called Rhodium to identify potential drug candidates for treating coronavirus from more than two million drug compounds. The most promising compounds will be identified for further development.

5.18 ZydusCadila

ZydusCadila announced the launch of an accelerated research programme to develop a vaccine for Covid-19 using two novel approaches. The first approach includes the development of a DNA vaccine against the viral membrane protein of the virus, while a live attenuated recombinant measles virus (rMV) vectored vaccine will be developed in the second approach. The rMV-based vaccine works by inducing specific neutralizing antibodies, which will protect from the coronavirus infection.

5.19 NanoViricides

NanoViricides, a clinical-stage company, is working on developing a treatment for nCoV-2019 using its nanoviricide® technology. The company's technology is used to develop ligands that can bind to the virus in the same way as a cognate receptor and attack various points of the virus.

5.20 Vir Biotechnology

Vir Biotechnology, a clinical-stage immunology company, announced on 12 February that it has identified two monoclonal antibodies that can bind to the virus that causes Covid-19. The antibodies target the spike (S) protein of the virus by entering through the cellular receptor ACE2.

The company has formed a partnership with WuXi Biologics on 25 February to commercialize the antibodies identified to treat coronavirus. If approved, Wuxi will have the rights to market the therapies in China, while Vir will retain the marketing rights in other countries.

Vir has also partnered with Alnylam Pharmaceuticals to identify siRNA candidates targeting SARS-CoV-2. It has formed another partnership with Biogen for cell line and process development and manufacturing of the antibodies.

6. HIV drugs for coronavirus treatment

Abbvie's HIV protease inhibitor, lopinavir is being studied along with ritonavir for the treatment of MERS and SARS coronaviruses. The repurposed drug is already approved for the treatment of HIV infection under the trade name Kaletra®.

The combination is listed in the WHO list of essential medicines. Lopinavir is believed to act on the intracellular processes of coronavirus replication and demonstrated reduced mortality in the non-human primates (NHP) model of the MERS.

Lopinavir/ritonavir in combination with ribavirin showed reduced fatality rate and milder disease course during an open clinical trial in patients in the 2003 SARS outbreak.

Cipla is also reportedly planning to repurpose its HIV drug LOPIMUNE, which is a combination of protease inhibitors Lopinavir and Ritonavir, for the treatment of coronavirus.

A licensed generic of Kaletra®, LOPIMUNE is currently available in packs of 60 tablets each, containing 200mg of Lopinavir and 50mg of Ritonavir.

Janssen Pharmaceutical Companies, a subsidiary of Johnson & Johnson, donated its PREZCOBIX® HIV medication (darunavir/cobicistat) for use in research activities aimed at finding a treatment for Covid-19.

Darunavir is a protease inhibitor marketed by Janssen. Anecdotal reports suggest darunavir as potentially having antiviral activity against Covid-19. It is, however, currently approved only for use with a boosting agent, and in combination with other antiretrovirals, for the treatment of HIV-1.

Janssen has no in vitro or clinical data to support the use of darunavir as a treatment for Covid-19. The drug is in the process of being evaluated in vitro for any potential activity against the coronavirus.

Further, Janssen has partnered with the Biomedical Advanced Research and Development Authority (BARDA) to expedite the development of a Covid-19 treatment.

7. Coronavirus transmission

“Coronavirus transmission can happen human-to-human as well as from infected animals such as dogs and cats.”

Covid-19 is a beta coronavirus that has origin in bats, according to the Centers for Disease Control and Prevention (CDC).

Believed to have transmitted from animals and reptiles such as snakes, coronaviruses cause respiratory issues such as upper respiratory tract illnesses and lower respiratory illnesses such as pneumonia and bronchitis.

Coronavirus transmission can happen human-to-human as well as from infected animals such as dogs and cats.

COVID-19 OUTBREAK

CHAPTER 10

Who is at the risk of developing serious illness from COVID-19? Conclusion

Early information out of China, where COVID-19 first started, shows that some people are at higher risk of getting very sick from this illness. This includes:

- Older adults
- People who have serious chronic medical conditions like:
  - ✓ Heart disease
  - ✓ Diabetes
  - ✓ Lung disease

1.What Should High-risk People Do?

Older adults and people who have severe chronic medical conditions like heart, lung or kidney disease and those with weakened immune systems seem to be at higher risk for more serious COVID-19 illness.

Early data suggest older people are twice as likely to have serious COVID-19 illness.

People at high risk include anyone:

- Over 65 years of age, or
- With underlying health conditions including heart disease, lung disease, or diabetes, or
- With weakened immune systems.

NCDHHS recommends that people at high risk of severe illness from COVID-19 stay at home to the extent possible to decrease the chance of infection.

2. What others can do to support older adults?

2.1 Community support for older adults

- Community preparedness planning for COVID-19 should include older adults and people with disabilities, and the organizations that support them in their communities, to ensure their needs are taken into consideration.
    - ✓ Many of these individuals live in the community, and many depend on services and supports provided in their homes or in the community to maintain their health and independence.
- Long-term care facilities should be vigilant to prevent the introduction and spread of COVID-19.

2.2 Family and caregiver support

- Know what medications your loved one is taking and see if you can help them have extra on hand.
- Monitor food and other medical supplies (oxygen, incontinence, dialysis, and wound care) needed and create a back-up plan.
- Stock up on non-perishable food to have on hand in your home to minimize trips to stores.
- If you care for a loved one living in a care facility, monitor the situation, ask about the health of the other residents frequently and know the protocol if there is an outbreak.

3. Adult Congregate Living Facilities

NCDHHS recommends that all facilities that serve as residential establishments for high-risk persons described above should restrict visitors. These establishments include nursing homes, independent and assisted living facilities, correctional facilities, and facilities that care for medically vulnerable children.

4. What are the risks of COVID-19 to people with rheumatic conditions?

People with the rheumatic disease may be at greater risk of developing infections and more severe infections, although we don't know this for sure yet. This is due to the diseases themselves and to the medications used to treat these diseases.

This vulnerability can affect people with several rheumatic conditions, including lupus, myositis, rheumatoid arthritis, scleroderma, undifferentiated connective tissue disease, vasculitis and many others.

Other people who may be predisposed to developing serious cases of COVID-19 include those who are aged 65 years or older, have diabetes (type 1 or type 2) or renal (kidney) disease, and women who are pregnant.

4.1 What should I do if I feel sick?

If you develop a fever, shortness of breath or a cough, particularly if you have traveled to areas with outbreaks or have been exposed to someone with COVID-19 infection, it is very important to communicate with your health care provider. Communication is particularly essential for older patients, those who are pregnant, those with underlying lung or heart disease and those on immunosuppressive drugs. We don't advise walk-in visits: Unless you need to get to an emergency room with a true emergency, it is recommended that you call ahead – call your doctor, or an urgent care center, or your hospital – so that you can be advised on what to do and whether you need to be seen in person or not.

4.2 Should I stop taking my medications if I have a rheumatic disease and am concerned about COVID-19?

In patients without symptoms of COVID-19, the decision to stop or reduce immune-suppressing medications is an individual one, to be shared by physicians

and patients. In some patients, the risk of a disease flare might outweigh the possible benefits of stopping medications. Little if anything is known about how rheumatology medications affect COVID-19 infections.

4.3 How can I protect myself from COVID-19?

As with any respiratory illness, there are certain preventive measures that you can take. These include:

- Avoid close contact with people who are sick.
- Avoid touching your eyes, nose, and mouth with unwashed hands.
- Wash your hands often with soap and water for at least 20 seconds.
- Use an alcohol-based hand sanitizer when not near soap and water.
- Clean and disinfect areas you and others touch often.
- CDC does not recommend healthy people wear facemasks for protection.

Concerning travel, we are advising many of our patients to limit or cancel unnecessary domestic and international travel. You may also wish to avoid

crowded areas and large gatherings, public transportation and working remotely when possible. Immunosuppressed patients may want to reach out to their doctors for the letter to work from home if need be.

As the number of people in the U.S. with coronavirus disease (COVID-19) continues to grow, there is an increasing concern for adults who have a higher risk of developing serious illness if they are infected. The majority of people who become infected are expected to be asymptomatic or recover without needing special treatment, according to the World Health Organization. However, based on the most current information made available by the Centers for Disease Control and Prevention (CDC), older people and younger adults with serious medical conditions, such as heart disease, diabetes and lung disease, have a greater risk of becoming severely ill if they get infected with coronavirus. CDC has issued specific guidance for people who fall into these categories.

To inform discussions about the challenges associated with coronavirus in the U.S., we analyzed data from the 2018 Behavioral Risk Factor Surveillance System (BRFSS) to estimate the total number of adults nationwide, and by state, who have an elevated risk of serious illness if they are infected with the coronavirus. We recognize that our collective understanding of risk factors will continue to evolve as the disease spreads, and as CDC and others learn more about its effects on different populations. Based on information currently available, our definition of high risk includes older adults (ages 60 or older) and younger adults between the ages of 18 and 59 with heart disease, cancer, chronic obstructive pulmonary disease (COPD) or diabetes. We were unable to include hypertension as a risk factor because it is not tracked by the survey.

- About four in ten adults (41%) ages 18 and older in the U.S. (105.5 million people) have a higher risk of developing serious illness if they are infected with coronavirus, due to their older age (60 and older) or health condition

- Most of those at higher risk of developing a serious illness are older (72.4% or 76.3 million adults); however, the remaining 29.2 million adults ages 18-59 are at risk due to an underlying medical condition.

- Adults who are both older and have these underlying medical conditions have an even greater risk of developing severe illness if they become infected. Among adults age 60 or older, more than half also have a serious medical condition (54%), rising to nearly two thirds (62%) of people age 80 and older.

- The share of adults ages 18 and older who have a higher risk of developing a more serious illness varies across the country, ranging from 31 percent (Washington, D.C.) to 51 percent (West Virginia). In Washington State, California and New York, some of the states hardest hit by COVID-19 thus far, the share of adults at high risk is 40 percent, 37 percent, and 40 percent respectively.

- An estimated 5.7 million adults who are at higher risk of getting a serious illness if they become infected with coronavirus are uninsured, including 3.9 million adults under age 60 and 1.8 million who are ages 60-64.

The majority of people who become infected with coronavirus are not expected to become seriously ill, but a large segment of the U.S. adult population – 41 percent of adults ages 18 and older – have a higher risk of serious illness if they do become infected due to their age or underlying medical condition.

One group, particularly at risk,is the 1.3 million people living in nursing homes in the US. As the number of people who test positive for coronavirus continues to rise, and as more is learned about the progression of illness and treatment among those who become seriously ill, the current set of risk factors available to estimate the size of the at-risk population is likely to be refined.

5. Patients with Heart Conditions

If you have a heart condition, you should take extra care to protect yourself during the COVID-19 outbreak. Here are some ways to stay healthy.

5.1 Defend Against Infection

It's important for patients with heart disease to follow CDC recommendations to prevent infection. The virus is thought to spread from person to person among individuals within 6 feet of one another after someone with the virus sneezes or coughs. Defensive steps everyone can take include:

- Avoid people who are sick
- Wash hands thoroughly with soap and water for at least 20 seconds
- Cover your mouth when you cough or use the inside of your elbow
- Cover your nose when you sneeze or use the inside of your elbow
- Avoid touching your eyes, nose, and mouth

- Clean surfaces touched often like doorknobs, handles, steering wheels, or light switches with a disinfectant to remove the virus

Also, people at higher risk should practice social distancing by avoiding large gatherings and limiting travel.

5.2 Get Vaccinated

Although there is not yet a vaccine for coronavirus, people with heart conditions should stay up to date on their vaccinations such as those for pneumonia and flu.

5.3 Ask About Telehealth (Remote/Virtual) Visits

If you live in an area with a coronavirus outbreak and are managing your heart condition well, it might be an option to substitute a telehealth visit for a routine, in-person medical visit. That would help limit possible contact with others who may have the virus. Talk to your health care professional to find out if this would be appropriate for you.

5.4 Keep up Healthy Habits

While the news about the virus outbreak may seem overwhelming at times, it's important not to lose sight of your overall health. Remember to eat healthily, exercise, get enough sleep, and manage stress.

If you experience symptoms, such as fever, cough, or shortness of breath, call your health care professional.

Treatment for virus infections, including COVID-19, typically involves rest and staying hydrated. If you have heart failure, excess fluid in your body may be a concern. So, ask your health care professional about extra monitoring you might need.

Also, if you are taking medicine for a health condition, including heart disease or diabetes, problems may occur if you skip a dose or stop it altogether. Don't

change your medications or treatment without first talking to your health care professional.

Conclusion

A pandemic is a global outbreak of disease. Pandemics happen when a new virus emerges to infect people and can spread between people sustainably. Because there is little to no pre-existing immunity against the new virus, it spreads worldwide. The virus that causes COVID-19 is infecting people and spreading easily from person-to-person. Cases have been detected in most countries worldwide and community spread is being detected in a growing number of countries. On March 11, the COVID-19 outbreak was characterized as a pandemic by the WHO.

More cases of COVID-19 are likely to be identified in the United States in the coming days, including more instances of community spread. CDC expects that widespread transmission of COVID-19 in the United States will occur. In the coming months, most of the U.S. population will be exposed to this virus.

Widespread transmission of COVID-19 could translate into large numbers of people needing medical care at the same time. Schools, childcare centers, and workplaces may experience more absenteeism. Mass gatherings may be sparsely attended or postponed. Public health and healthcare systems may become overloaded, with elevated rates of hospitalizations and deaths. Other critical infrastructure, such as law enforcement, emergency medical services, and sectors of the transportation industry may also be affected. Healthcare providers and hospitals may be overwhelmed. At this time, there is no vaccine to protect against COVID-19 and no medications approved to treat it. Non-pharmaceutical interventions will be the most important response strategy to try to delay the spread of the virus and reduce the impact of the disease.