Part 1: Page 1-6 Corona Virus (COVID-19) Infection *(The new Pandemic in 2020)*

Riaz A. Akhtar MD, FACC, CHCQM **7 April 2020**

Note: *This information collection was started over a month ago and has been changing in evolution every day. It is not practical to update every day*

Category	March 19, 2020 8:11	1 April 2020 5:20 pm	April 2020 8:00 pm
Diagnosed	244,421	932,605	1,412,103
Dead	11,010	46,810	81,200
Recovered		193,177	298,389

1. Introduction

- **China first reported** the "mysterious pneumonia outbreak". Initially this virus named **2019-nCoV**, the virus was renamed "severe acute respiratory syndrome coronavirus 2" **(SARS-CoV-2)** by the WHO and is now known as **COVID-19**. On 11 March 2020, the WHO decreed the outbreak to be a pandemic. While COVID-19 infection manifests primarily as respiratorysymptoms and in those with chronic conditions severe, life-threatening cardiovascular damage. This coronavirus has now spread all over the world. **The rate of new cases** have slowed dramatically in China and most cases (per WHO) in the country have recovered. However the expatriates Chinese returning home are being diagnosed alarmingly at high rate and created a new worry there.
- **Italy and South Korea** with the largest outbreaks outside China are reporting different results. South Korea, with aggressive testing, reported a 0.6% death rate in early March. Italy with the largest EU population of older adults reported highest death rate as of 29 March 2020.
- **Transmission:** Droplets of SARS-CoV-2 can travel roughly 3 feet in the air before dropping to surfaces, but it is recommended to stay 6 feet away from a person with COVID-19.
- **Future infections (Re-infection):** The virus appears to be mutating slower than the flu, at one to two mutations per month, and we don't know if it will be affected by seasonal weather and behaviors. As of now ***essentially no immunity*** against this virus in the population at the present time.[1]
- **Beware** there is no vaccine at present and the cold weather promotes and it means it is likely to return back in next winter (October 2020 on)
- **Economic impact:** It can and has produced financial collapse around the world. This picture is still in evolution.

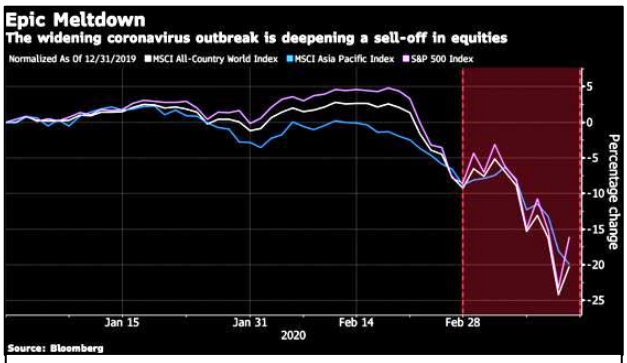


Fig. 2 Financial crash parallel to Corona 19 outbreak

- **One unexpected consequence (but good) of Corona virus.** This corona virus infection related lockdown around the world has shut down countries. A satellite picture from space *(that detects traces of human activity - tailpipe emissions from cars and trucks, fossil fuel burned in power plants and other industrial activities)* shows marked reductions in pollution since the outbreak first started. (Popovich, 3/17)[2]
- **US plan warns coronavirus pandemic could last 18 months: The Hill** (17 March, 2020). A plan developed by the US federal government to combat the coronavirus reportedly projects the pandemic will last 18 months or more and could feature multiple "waves," The New York Times reported. "Shortages of products may occur, impacting health care, emergency services, and other elements of critical infrastructure," the plan warns, according to the Times. "This includes

[1] *Dr. Nancy Messonnier, director of the CDC's National Center for Immunization and Respiratory Diseases*

[2] *Watch the Footprint of Coronavirus Spread Across Countries; New York Times, By Nadja Popovich. March 17, 2020*

potentially critical shortages of diagnostics, medical supplies (including PPE [personal protective equipment] and pharmaceuticals), and staffing in some locations." (Budryk, 3/17)[3]

2. Some definitions of disease occurrence: [4]

a) **Sporadic** refers to a disease that occurs infrequently and irregularly.
b) **Endemic** refers to the constant presence and/or usual prevalence of a disease or infectious agent in a population within a geographic area. The amount of a particular disease that is usually present in a community is referred to as the baseline or **endemic** level of the disease.
c) **Outbreak** is the same as epidemic, but is often used for a more limited geographic area.
d) **Cluster** refers to an aggregation of cases grouped in place and time that are suspected to be greater than the number expected, even though the expected number may not be known.
e) **Epidemic** refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area. **Epidemics** occur when an agent and susceptible hosts are present in adequate numbers, and the agent can be effectively conveyed from a source to the susceptible hosts.
f) **Pandemic** refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.

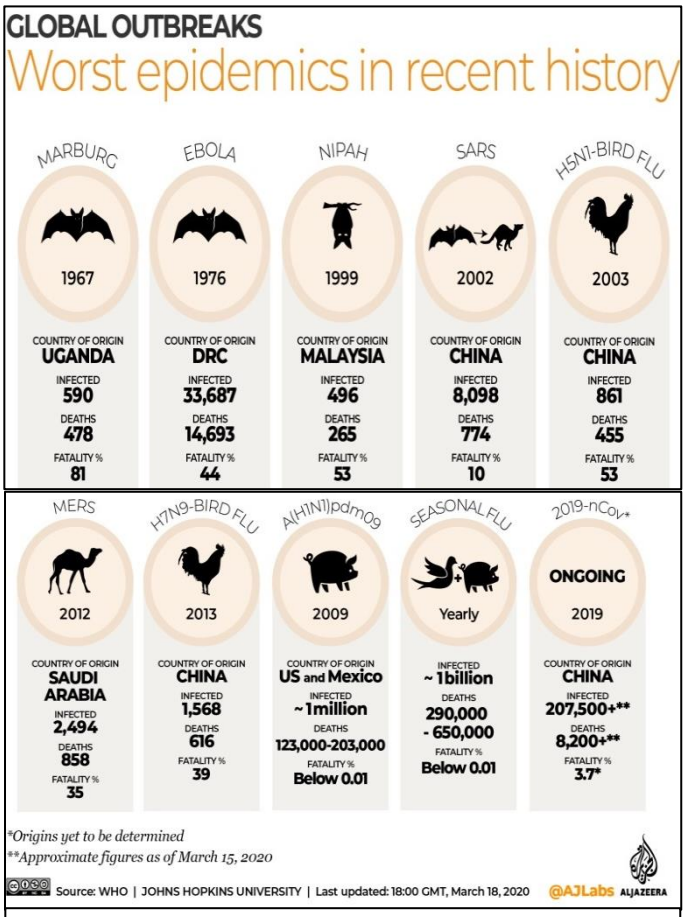


Fig. 3 Corona 19 and other virus outbreaks

3. Global (pandemics) Virus outbreaks:

Almost every 10 -15 years. We have had some wide spread infection originated and spread around the world e.g. SARS in the last decade and MERS before that. Just about every century or so there is a major global pandemic where the pathogen is both very deadly and very transmissible. Last one epidemic in 1918, Spanish Flu.

COVID-19. (From Wuhan city, China). On December 31, 2019, Chinese authorities have reported to the World Health Organization (WHO) about a series of a mysterious lung disease, like (serious) pneumonia, appearing in Wuhan at Huanan Wholesale Seafood Market. It is also called a wet market because sold live animals are slaughtered in front of the customer. In the process of skinning of dead animals in front of shoppers, whatever the animal is infected with, is aerosolized.

- **Russian flu pandemic** (1889-1894) is believed to have killed 1 million people. Nickol, M.E., Kindrachuk, J. (2019). [i] A year of terror and a century of reflection: perspectives on the great influenza pandemic of 1918–1919. BMC Infect Dis 19, 117 (2019).

[3] https://thehill.com/policy/healthcare/488156-us-plan-warned-coronavirus-pandemic-would-last-18-months-report
[4] *CDC. Centers for Disease Control and Prevention. https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section11.html*

- **The Spanish Flu in 1918:** Johnson and Mueller (2002) is that 50 million people died globally from this pandemic and this implies that 2.7% of the world population at the time died. The 1918 (Spanish) flu, which claimed 50 million lives worldwide, particularly affected young adults.
- **Asian Flu** death toll (1957-1958) about 1.5 - 4 million. Gatherer (2009) estimated 1.5 million; Michaelis et al. (2009) estimated 2–4 million.[ii]
- **Hong Kong Flu,** (1968-1969) killed 1 - 4 million people; WHO.[15] Michaelis et al. (2009) had a lower estimate of 1–2 million.[16]
- **The Russian Flu** 1977-78 caused by the same H1N1 virus that caused the Spanish flu. Michaelis et al. (2009) around 700,000 died.
- **SARS 2002-2004. Severe Acute Respiratory Syndrome,** similar virus in China in 2002, hardest hit over age 60. More than 8,000 confirmed cases in 30 countries, contracted the virus over 8 months, about 10% (more than 900) died. Most patients were in China (350 cases) and in Hong Kong (300 cases).
- **MERS-Cov. 2012. Middle East Respiratory Syndrome** Coronavirus, which first appeared in the Middle East.
- **The global death count of the** influenza as of 20 March 2019[5]**:** about 400,000 deaths/year (range 294,000 - 518,000 (average of 389,000); Paget et al (2019)

Table:1 SARS-CoV-2, MERS-CoV, and SARS-CoV - Infections:

	SARS-CoV-2[a]	MERS-CoV	SARS-CoV
Demographics			
o Detection date And place	**Dec. 2019 Wuhan, China**	**Jun. 2012 Jeddah, Saudi Arabia**	**Nov. 2002 Guangdong, China**
o Age average	49	56	39.9
o Age range	21–76	14–94	1–91
o Male: female ratio	2.7:1	3.3:1	1:1.25
o Confirmed cases	109,835[b]	2494	8096
o Case fatality rate	3,803[b] (3.5%)	858 (37%)	744 (10%)
o Health-care workers	16[c]	9.8%	23.1%
Symptoms			
o Fever	40 (98%)	98%	99–100%
o Dry cough	31 (76%)	47%	29–75%
o Dyspnea	22 (55%)	72%	40–42%
o Diarrhea	1 (3%)	26%	20–25%
o Sore throat	0	21%	13–25%
o Ventilator support	9.8%	80%	14–20%

Notes: ^ Symptoms were based on the first 41 patients. ^ Jump up to: [a] [b] Data as of 8 March 2020. ^ Data as of 21 January 2020; Published on 24 January 2020.

- **SARS-CoV-2** (COVID-19) is not like the flu causes different and more severe symptoms, spreads and kills more readily, even more than MERS & SARS.
  The symptoms, include fever, cough, and difficulty of breathing Harvard T.H. Chan School of Public Health. [6]

[5] *Paget et al (2019) Global mortality associated with seasonal influenza epidemics: New burden estimates and predictors from the GLaMOR Project. In J Glob Health. 2019 Dec; 9(2): 020421. Published online 2019 Oct 22. doi: 10.7189/jogh.09.020421 PMCID: PMC6815659 PMID: 31673337.*
Burnet F. M., Clark E. (1942) – Influenza: A Survey of the Last 50 Years in the Light of Modern Work on the Virus of Epidemic Influenza. London: Macmillan.
[6] *https://www.webmd.com/lung/news/20200226/coronavirus-top-targets-men-seniors-smokers*

- **Zika** virus from Brazil (2015-2016) had an especially devastating effect on pregnant women, attacking the brains of their fetuses.
- **Spanish Flue vs. Current COVID-19. (Or Wuhan virus), age.**
  The Spanish flu in 1918 harmed infants and younger people, the most severely. The new COVID-19 is most lethal to the elderly, based on early evidence in China.

Flattening the curve

- Early control is important in an epidemic. We need to the lower the rate of spread of infection over longer time so that the health systems can care for patients across an outbreak in efficient manner, instead of running short of supplies compared to the need without overburdening.

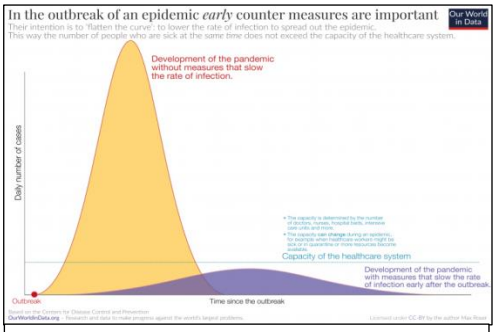


Fig: 4 Infection: Flattening the curve

4. Corona virus (COVID-19)

The name. Coronavirus disease (COVID-19) also now called "severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)" as the name of the new virus on 11 February 2020, is a new strain that was discovered in 2019 and has not been previously identified in humans. Coronaviruses are types of viruses that typically affect the respiratory tracts of birds and mammals, including humans.

COVID-19 Virus: Fairly large in size (about 400-500nm diameter), so any normal mask (not just the N95 feature) should be able to filter it out.

- **Viral features[7]:**
  - All features of the novel SARS-CoV-2 virus occur in related coronaviruses in nature. Outside the human body, the virus is killed by household soap, (bursts its protective bubble).
  - Genetic analysis has revealed that the coronavirus genetically clusters with the genus *Betacoronavirus*, in subgenus *Sarbecovirus* (lineage B) together with two bat-derived strains. It is 96% identical at the whole genome level to other bat coronavirus samples (BatCov RaTG13).

Viability of COVID-19 virus	
Hand	Few minutes
Copper:	4 hrs
Stainless steel:	6 hrs
Plastic:	7 hrs
Fabric	6-12 hrs
Cardboard:	24 hrs
Throat (Dry, sore):	3 – 4 days
Lungs:	5 – 6 days

- **Viability:** Depending on the material it is on and the conditions, around human coronaviruses can remain infectious from 2 hours to 9 days. Approximate duration of being live and able to infect. At temperatures of about:[8]
  - 4°C or 39.20F: up to 28 days.
  - 30–40°C (86–104°F): shorter or fewer days.
  - At room temperature, a coronavirus of the common cold (HCoV-229E) persisted significantly longer in 50% humidity than 30% humidity.

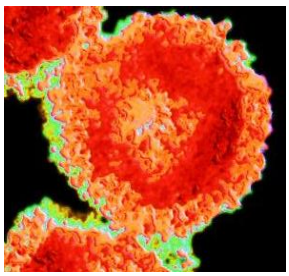
  "Human coronaviruses can remain infectious on inanimate surfaces at room temperature for up to 9 days. At a temperature of 30°C [86°F] or more, the duration of persistence is shorter. Veterinary coronaviruses have been shown to persist even longer for 28 d[ays]."
- **With sneeze or cough:** it travels 3 meters (about 10 feet) before it drops to the ground.

---

[7] *Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. (February 2020). "A Novel Coronavirus from Patients with Pneumonia in China, 2019". The New England Journal of Medicine.* ***382*** *(8): 727–733. doi:10.1056/NEJMoa2001017. PMC 7092803. PMID 31978945.*

[8] *https://www.journalofhospitalinfection.com/article/S0195-6701(20)30046-3/fulltext . Greifswald University Hospital and Ruhr-Universität Bochum, both in Germany, recently compiled information from 22 studies on coronaviruses.*

- **On hands: in Air: Surface:** Copper: 4 hrs; Stainless steel: 6 hrs. Plastic: 7 hrs.; fabric for 6-12 hours. Cardboard: 24 hrs; it will live for at least 12 hours. So remember if you come in contact with any metal surface, wash your hands with soap thoroughly.
- The virus can remain active on clothes and normal laundry detergent should kill the virus. Winter clothes (not requiring daily wash, put out under the sun to kill the virus. Handle diry clothes with disposable gloves, don't shake them to prevent them launch in air.



- Incubation period of COVID-19 to be 5.1 days (average) and 97.5 percent of those who develop symptoms appeared to do so within 2-14 days of infection. These estimates imply that, under conservative assumptions, 101 out of every 10,000 cases will develop symptoms after 14 days of active monitoring or quarantine, which supports current CDC recommendations"
- **The seasonal flu** (infected 34 million this season) in the U.S. so far has an incubation period of 1-4 days. The two viruses with some of similar symptoms, may cause misdiagnoses. Common flu: fever, cough, sore throat and aches. COVID-19 symptoms include fever, cough and shortness of breath, (CDC).

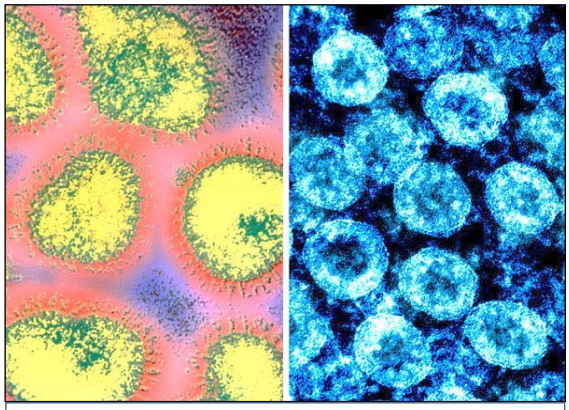


Fig. 5 Top & Left Flu virus. Right is SARS-CoV-2 COVID-19

- Though the virus is mainly spread from person to person through close contact and respiratory droplets. There is possible spread of the virus without showing symptoms.

5. How to inactivate or remove COVID-19 virus

- **Prevent it:** Social distance at least 6 ft. away, use mask (common mask – put 2-3 together) ; avoid exposure to risky areas. Those with low immune system and chronic medical conditions like heart disease, diabetes, smokers and lung disease especially above 60 are at very high risk.
- **Remove it:** Wash hands, face, clean clothes, surface commonly touched – keep clean. Each virus particle consists of a small set of genes, enclosed by a sphere of fatty lipid molecules, and because lipid shells are easily torn apart by soap, 20 seconds of thorough hand-washing can take one down.
- **Disinfect it:** COVID-19 is fragile to heat (at 133 F temperature) ultraviolet and gets inactivated with 75 % ethanol or surface disinfection with[9] 0.1% sodium hypochlorite (a chemical in bleach).
- **Inactivate or kill it:** Hot temperature kills the virus, and it replicates faster in cold, frequent warm water throat gurgels, sips of hot water every 15 minutes.
- **If infected and get sick, seek appropriate medical attention** and get it treated by physician/s early on before it replicates faster and not rely on folk treatments in the media.
- **Don't let it come back:** Diet very high in immune boosting factors. *(see more under Immune boosting diet section 25 and fasting)*

[9] *https://www.medicalnewstoday.com/articles/coronaviruses-how-long-can-they-survive-on-surfaces*

6. How bad is the Covid 19 infection? *(See more under 10. Treatment and 11. Clinical course)*

- **Covid 19 infection is worse than the flu** but comparisons with the flu are highly misleading. It is not just bad if you catch it and you're over 70 or if you're immunocompromised. Many fit and healthy people have been killed by this virus. Social distancing at this point is urgent; no shaking hands, hugging, sitting closer than 6 feet, even crowing or taking elevator is risky.
- **Once the virus enters into body cell:** it replicates into millions in just few hours, provokes inflammatory body response which can move to the following stages:
  - Fight, kill and remove the virus if body immune system strong and viral count low,
  - Be overwhelmed by moderate to very severe reponse – causing tissue destruction and its consequences depending upon its intensity of reaction: pneumonia, respiratory failure, ARDS, shock, viral mycadial damage, heart failure and death. It is not the virus but the tissue destruction caused by severity of the inflammatory resonse of the body which caused the higher mortality
  - Develop critical illness due in part to: **'CYTOKINE STORM'** as part of pathogenesis of the disease which typically occur around Day 10-12 and mainly responsible for ARDS & multigrain failure. Main mediator for this process is Interleukin-6 (IL-6)
- **Corona infection in USA.** *"Between 160 million and 214 million people in the U.S. could be infected over the course of the epidemic, according to one projection. That could last months or even over a year, with infections concentrated in shorter periods, staggered across time in different communities, experts said. As many as 200,000 to 1.7 million people could die"*[10]
- **Some (but not limited) signs of the emergency and for immediate medical help are:**
  - Shortness of breath or difficulty in breathing, bluish color of lips or fingers
  - Pain or pressure in the chest
  - Change in mental status, new confusion or inability to arouse

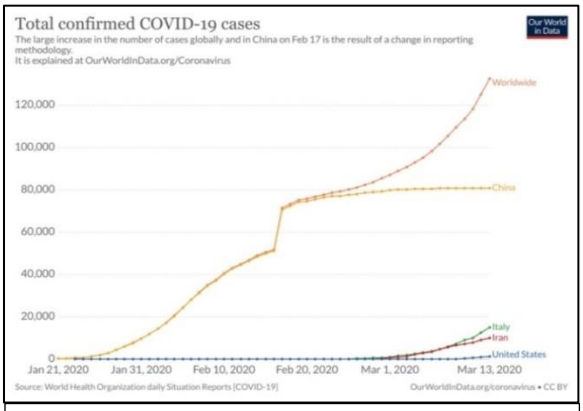


Fig: 6 COVID -19 spread

7. Spread of COVID-19

A. Most of spread takes place through droplets from one to other person within close range of 6 feet. Then it depends upon the strength of our body defences and immune system. The onset and duration of viral shedding and period of infectiousness for COVID-19[11] may be detectable in the upper or lower respiratory tract for weeks after illness onset.

B. Means of spread

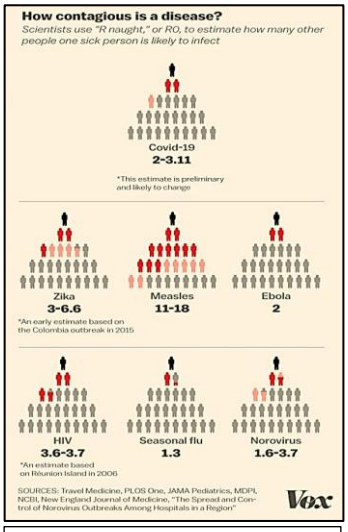


Fig: 7 Contagiousness

[10] *Friday March 13th the New York Times*

[11] *CDC. Centers for Disease Control and Prevention. CDC twenty four seven. Saving Lives, Protecting People Coronavirus Disease 2019 (COVID-19), as of* March 22, 2020

Virus can be transferred from handrails to toys to another person's hands. The first cases were most likely transferred from animals to humans, (in Huanan seafood and live animal market Lancet - January 30, 2020 and later spread from person to person. In January 2020 a man in Chicago, Illinois got it from his wife after she returned from China, and similar transfer occurred between spouses in California (CDC). The main ways the disease spreads are when respiratory droplets spread into the air) through people in close contact with the one who coughs or sneeze.

- **Direct spread - inhalation** *(close contact or crowded places like markets, elevators, gatherings)* within 6 feet distance via droplet inhalation through nose, or droplets are transferred from contaminated surface. Talking to somebody (who is infected) face to face, or if there is infected person in the crowded area. *So it is very critical that the infected person/s must:*
  - *wear mask and isolate away and not share.*
  - *observe social distancing to reduce the spread*
  - *disinfect all things before and after touching*
- **Touch and transfer:** shaking hands, touching door handles, or sharing materials (pens, phone), food utensils or a tabletop or phone that was coughed on, but not disinfected, in the past few hours or days, then touch your eyes, nose or mouth. The virus can live on your hands for few mins, then by touching eyes, mouth or throat and then it goes down:
  - *from throat – (sore throat, cough) to sinuses and or*
  - *from throat – down to lungs and damaging lower respiratory system (Pneumonia, cough, sputum, breathing difficulty)*
  - *touching your mouth, nose, face or eyes will spread inside*

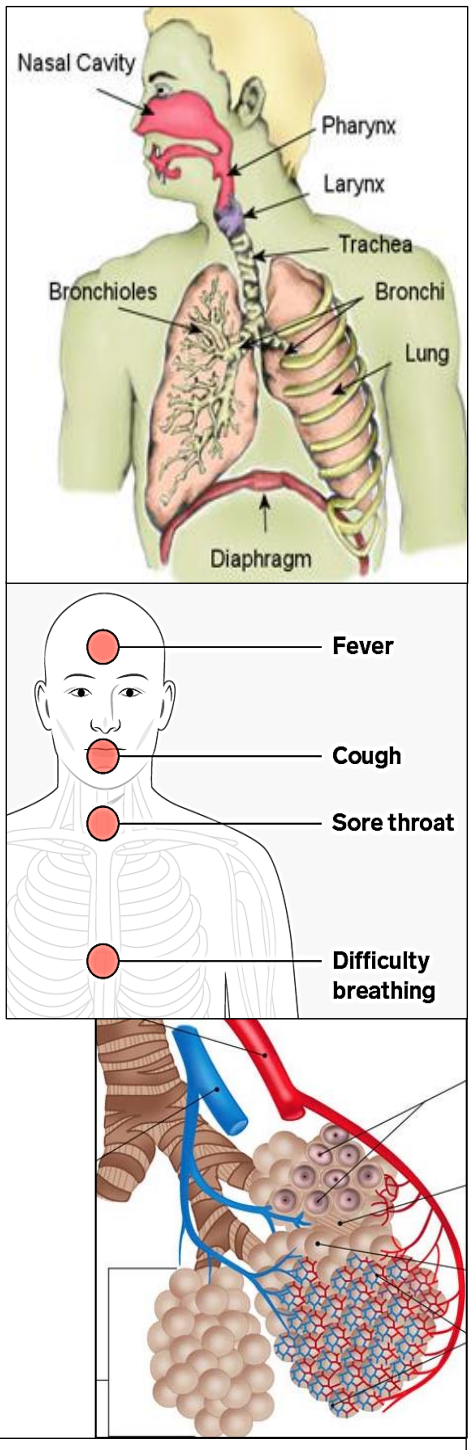


Fig. 8 Most common symptoms of COVID-19 virus infection

C. Which body fluids or sites have the virus?

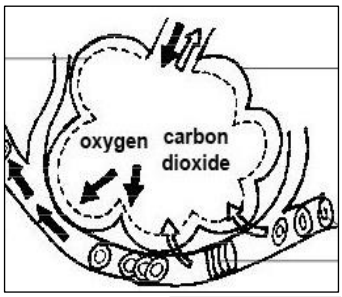
Very limited data are available about detection of SARS-CoV-2 and infectious virus in clinical specimens. SARS-CoV-2 RNA has been detected from:

- Upper and lower respiratory tract and bronchoalveolar lavage fluid
- Blood and stool specimens: SARS-CoV-2 RNA has been detected
- Saliva. COVID-19 detected in saliva of infected patients[12] (11 of 12 patients, in Chinese data)

D. Contagiousness from source to spread:

[12] *KKW, et al. Clin Infect Dis. 2020;doi:10.1093/cid/ciaa149. March 1, 2020. University of Hong Kong's department of microbiology*

- **Common examples:**
  - Inside a household or health care worker in the direct front like or those who are not yet taking social distancing seriously as should be, are at the high risk.
  - **Majority of virus** spread from the people with symptoms, without regard of the race, gender or ethnicity except likely to grow faster in those with low immunity and pre-existing conditions and people above age 60. Eventually it is expected to infect about 40-70 % of US population.
  - **Spread ratio.** Chinese experience shows that every infected coronavirus patient seems to infect about 2-2.5 (or more) additional people. An analysis of data from China found that 13% of cases were likely caused by people spreading coronavirus before they started coughing and feeling achy. COVID-19 infection is most contagious in the three or four days after symptoms begin[13] From animals? At this early stage what is known that you also don't get it from your pets. Dogs and cats may test positive for coronavirus, but rarely pass it on to the humans.
  - **Speed of spread.** This depends upon how people obey the rule of social distancing from each other around the world. China and S. Korea enforced this strictly.



8. Viral invasion into the lung.

(Pneumonia to Respiratory failure)

Once COVID-19 virus in the droplet inhalation travels down into the lowest warm and wet surface of the lung (alveolus or the breathing unit) virus particles get inside the body cell. The outer membrane of the virus consists of an oily layer embedded with jagged protein molecules called spike proteins. In the middle of the virus particle is a coiled strand of RNA, the virus's genetic material.

High levels of D-Dimer, BNP: This is significant risk factor for the development of acute respiratory distress syndrome **(ARDS)** and death in patients with COVID-19.

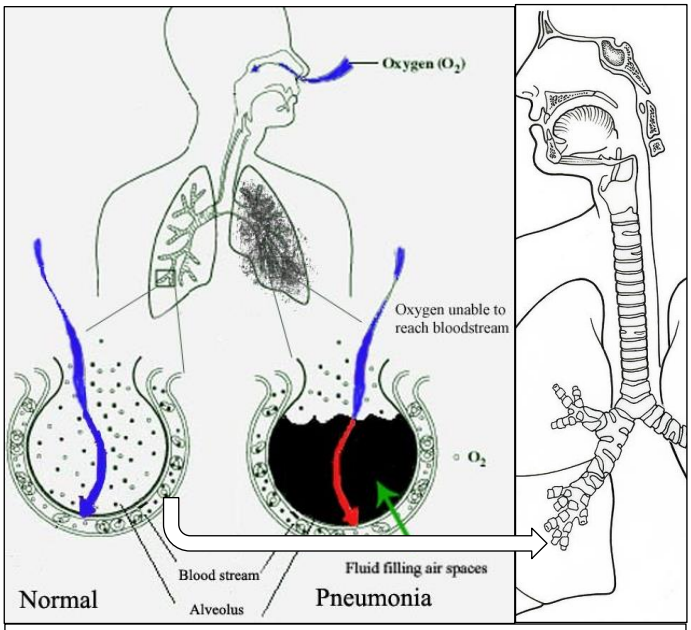


Fig. 9 Pneumonia process in COVID-19 virus infection

9. Symptoms (From study of 55,924 cases confirmed in China)

1) **The most common symptoms:** are fever (90% of cases)[14] over 100.5, cough, malaise, and occasionally nausea, diarrhea. In more severe cases, shortness of breath, chest pain and pneumonia will be apparent.[15]
   - **Dry cough.** About two-thirds (76 %) had a dry cough.
   - **Fatigue.** The 3rd most common symptom: fatigue (almost 40% of cases)

[13] *CDC*

[14] *One World Data.org.*

[15] *Dr. Linda Anegawa, with virtual health platform **PlushCare**; https://www.huffpost.com/entry/common-questions-coronavirus_l_5e5e94d9c5b67ed38b3972a0*

- **Sputum production** was experienced by every third person.
- **Shortness of breath.** From the less than 1-in-5 (18.6%) experienced shortness of breath (dyspnea). An earlier study, reported that a much higher share (55%) of cases suffered from (dyspnea) but this was based on a much smaller number of cases (835 patients).
- **Less often:**
  - **Muscle pain** about 15 % Headache, suffer from:
  - **Runny nose.** Many of the most common symptoms are shared with those of the common flu or cold. But COVID-19 infection seems to **rarely cause a runny nose**.
  - **Loss of smell** an abrupt and unexplained, total or partial loss of smell and taste is anosmia and dysgeusia) is being reported from around the world as significant symptoms associated with the COVID-19 pandemic. Anosmia, in particular, has been seen in patients ultimately testing positive with no other symptoms and possible serious consideration for self-isolation and testing of these individuals. [16]

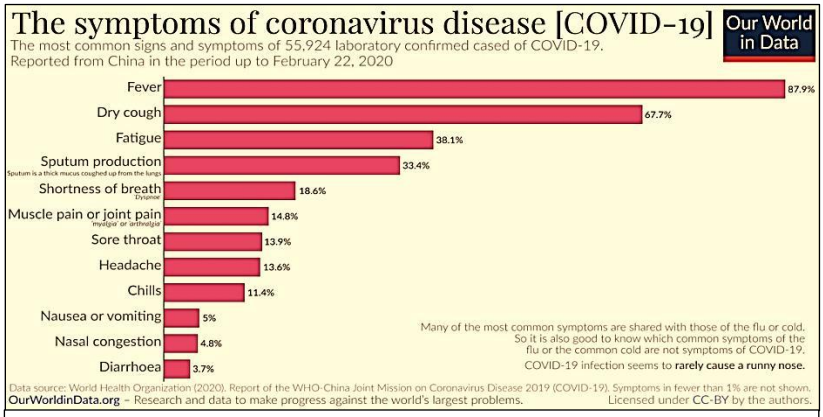


Fig. 10 Most common symptoms of COVID-19 virus infection

Table:2 Onset and progression of the of symptoms

Progression of the respiratory symptoms	Part of the general management
○ **Droplet inhaled** → Sinuses → Sinusitis: Headache, stuffy nose ○ Throat → Pharyngitis: Sore throat, dry cough, fever may start or next stage ○ Swallowed by mouth (virus found in saliva in Chinese studies)	○ Steam inhalation, ○ Sips of hot water every 15 min ○ Throat gurgles, Lozenges(Zinc) ○ Cough suppressants
○ **Upper respiratory tract** (Upper resp. infection, into trachea-bronchial tree: ○ Cough, (still mostly dry), nasal congestion as if drowning in water ○ Difficulty in breathing	○ Cough suppressants ○ Pain reliever, cough medicine
○ **Lower respiratory system;** Virus gets inside alveolar cells, multiply rapidly, ○ Symptoms worsened: Worsening of difficulty in breathing ○ Cough with sputum,	○ Cough medicine with guaifenesin ○ Pain meds
○ **Lower respiratory system;** Virus gets inside alveolar cells, multiply rapidly, ○ Symptoms worsened further: Cough with sputum, difficulty in breathing (alveoli filled with infected fluid), reduced oxygenation, chest pain with bad cough, may progress to next stage below:	○ ICU care, need Oxygen, ○ Highly infectious stage (to others), high risk of further worsening of disease stage, progression to organ failure ○ Intensify treatment ○ Drugs (various options used), see in the text
○ **Respiratory failure, ARDS, Shock** ○ Breathing difficulty, drowning in own fluids.	○ Ventilator support, fluids,
○ **Heart damage:** Symptoms of heart disease ○ Cardiac arrhythmias (Viral myocarditis) – myocardial damage will release Troponin (high) & BNP. Abnormal EKG.	○ No need to do cardiac cath - if no clinical heart attack, acute MI suspected. ○ Cardio-pulmonary support

[16] *AAO-HNS: Anosmia, Hyposmia, and Dysgeusia Symptoms of Coronavirus Disease March 22, 2020https://www.entnet.org/content/aao-hns-anosmia-hyposmia-and-dysgeusia-symptoms-coronavirus-disease*

2) Onset of symptoms

a. **The average time** it takes people to get sick after being exposed to the virus is about 5 days. Some people get sick sooner, just a day after exposure, while others don't fall ill for about 2 weeks, which is why the U.S. has quarantined people for 14 days.

b. **About the symptoms** of the pneumonia caused by Coronavirus: The virus will first infect the throat, with dry sore throat feeling (3 to 4 days); then into the nasal fluid and drips into the trachea and enter the lungs, causing pneumonia take (5 to 6 days). With pneumonia, comes high fever and difficulty in breathing. The nasal congestion is not like the normal kind. You will feel like you are drowning in water. It's important to go seek immediate medical attention if you feel like this.

c. **Commonly the symptoms start**[17] **with** a fever, followed by a dry cough and change over time. After several days some patients experience shortness of breath, and chest pain. Symptoms can increase in severity. In severe and critical cases it can lead to severe pneumonia, respiratory failure, septic shock, and multiple organ dysfunction or failure.

d. **Respiratory symptoms** may worsen in the 2nd week of illness (about 8 or 9 days later)

3) Severity and the duration of symptoms

This is based on the 55,924 confirmed cases in China)[18]

a. **Mild cases:** The majority (81%) of the coronavirus disease cases were mild with and without mild pneumonia. WHO: "the median time from onset to clinical recovery for mild cases is about two weeks[19] (average duration of the disease) and can be taken care at home.

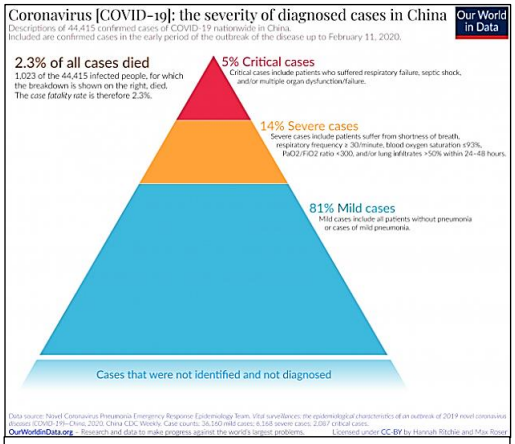


Fig. 11 COVID-19 virus infection, Severity of Illness.

b. **Severe cases**: About 14-15 % of people in China (positive for COVID-19) had severe symptoms of shortness of breath, rapid breathing (>30 breaths/min), low oxygen saturation ≤93%, PaO2/FiO2 ratio <300,[37] in their blood required oxygen and or ventilator use, and/or lung infiltrates >50% within 24–48 hours. Of the 138 hospitalized COVID-19 patients, those with underlying conditions (about 50 % at age 60 and above have one or more) are at higher risk of complications and or mortality for ICU patients. Critical illness due in part to: **'CYTOKINE STORM'** as part of pathogenesis of the disease which typically occur around Day 10-12 and mainly responsible for ARDS & multigrain failure. Main mediator for this process is Interleukin-6 (IL-6)

c. **Critical cases:** About 1 in 20 patients were in critical condition. These patients developed respiratory failure and organ failure. Critical cases include patients who suffered respiratory failure, septic shock, and/or multiple organ dysfunction or failure.

- 19.6% developed acute respiratory distress syndrome,

---

[17] *Coronavirus FAQ's by Dr. Megan Murray an infectious disease researcher at Harvard University.*

[18] *The Novel Coronavirus Pneumonia Emergency Response Epidemiology Team. The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus Diseases (COVID-19) — China, 2020[J]. China CDC Weekly, 2020, 2(8): 113-122. Online here: http://weekly.chinacdc.cn/en/article/id/e53946e2-c6c4-41e9-9a9b-fea8db1a8f51*

[19] *World Health Organization (2020). Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19). Available online at: https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf*

- 8.7% developed shock,
- 3.6% developed acute kidney injury.

d. The time from onset of symptom to death: Of those who eventually died, the time from onset of symptom to death was:
- Moderate to severe illness: after 2 to 8 weeks.
- Severe to critical illness: after 3 to 6 weeks

e. Hospitalization and length of stay. Patient hospitalized with a serious infection of coronavirus COVID-19 the average stay is 11 days, according to a study based on January 2020 data from Wuhan.

f. Incidence: 40-70 % will get in it (USA), 80 % have mild symptoms, 20 % hospitalized, 5-6 % will be ICU, and 1 % die due to respiratory and heart failure (overwhelming majority).

4) COVID-19 and the Heart disease [20]

A. Acute myocardial injury during COVD-19 infection

a) 40 % of hospitalized patients confirmed to have the virus have cardiovascular (viral myocarditis or cardiomyopathy) or cerebrovascular disease, "among patients with laboratory-confirmed COVID-19 in Wuhan, China, those with cardiac injury had a higher risk for in-hospital mortality than patients without cardiac injury." The findings were published in JAMA Cardiology.
- 16.7% developed arrhythmia,
- 7.2% developed acute cardiac injury. Mortality among patients with cardiac injury was 51.2%, compared with 4.5% among those without cardiac injury
- 19.6% developed acute respiratory distress syndrome,
- 8.7% developed shock.

b) Mechanism of cardiac injury: [21]

Guidance from American College of Cardiology for COVID-19 and heart disease.
- Infection has been associated with multiple direct and indirect cardiovascular complications including acute myocardial injury, myocarditis, arrhythmias and venous thromboembolism.
- COVID-19 and preexisting cardiovascular disease (CVD) have an increased risk of severe disease and death.
- **COVID-19 causes a severe inflammatory response** in the body and inflammation is the biggest cause of heart attacks.
- **ACE2. COVID-19 is thought to infect host cells** through ACE2 binding site and damaging cardiomyocytes, have been postulated causing myocarditis and might explain rise of hs-cTn in some cases, particularly as acute left ventricular failure, although the specific mechanisms are uncertain. Patients with underlying CVD and SARS-CoV-2 infection have an adverse prognosis. Therefore, particular attention should be given to cardiovascular protection during treatment for COVID-19.
- **Acute myocardial infarction (MI)** – either Type 1 MI based **plaque rupture** triggered by the infection, or Type 2 MI based on **supply-demand inequity** – is always possible. Importantly, a rise and/or fall of hs-cTn is not sufficient to secure the diagnosis of acute MI, which should be based on clinical judgment, symptoms/signs, and ECG changes.

[20] *ACC Guidance on Cardiac Implications of Coronavirus (February 13, 2020)*
[21] *https://www.acc.org/latest-in-cardiology/articles/2020/03/18/15/25/troponin-and-bnp-use-in-covid19*

c) **Troponin:** Rise and/or fall of troponin indicating myocardial injury is common among patients with acute respiratory infections and correlated with disease severity. Non-coronary myocardial damage is almost certainly the most common cause, and an abnormal troponin should not be considered evidence for an acute MI without corroborating evidence. So the measurement of troponin should be done if the diagnosis of acute MI is being considered clinically.

d) **BNP:** Natriuretic peptides are biomarkers of myocardial stress and are frequently elevated among patients with severe respiratory illnesses typically in the absence of elevated filling pressures or clinical heart failure. Much like troponin, elevation of BNP or NT-proBNP is associated with an unfavorable course among patients with ARDS. So high markers should be clinically co-related first before work up of heart failure.

e) **Use of echocardiography or coronary angiography** for COVID-19 patients with myocardial injury or elevated natriuretic peptide should be restricted to those patients in whom these procedures would be expected to meaningfully affect outcome.

B. Cardiac side effects of some of the drugs used during COVID-19 treatment :

- **Prolonged QTc interval:** Patients with a prolonged QTc are at a greater risk of a potentially dangerous arrhythmia (PVC's, Torsades de Pointes), which can also lead to sudden cardiac arrest and sudden cardiac death (SCD).
- **Several drugs** are currently being used off-label to treat COVID-19, including
  - Hydroxychloroquine (Elderly women with heart disease appear to be at particularly higher risk for drug-related QTc interval prolongation and *torsade de pointes*.) and
  - Azithromycin.[22] Also is likely to prolong QTc interval although may be less than Hydroxychloroquine. When combined the two together in patient with pre=existing heart disease, cardiac arrhythmias risks are greater.
- **Antivirals and cardiotoxicity:** These drugs can damage to the heart during COVID-19 treatment in a study of 138 patients with COVID-19. These are cardiac dysfunction, arrhythmias or other cardiovascular disorders. Therefore the patients treated with antivirals must be closely monitored for cardiotoxicity.

C. Pre-existing cardiovascular disease

Pre-existing cardiovascular diseases especially in elderly people (coronary artery disease, hypertension, and diabetes) are more likely to be infected with SARS-CoV-2, have more severe illness, poorer prognosis, higher death rate and account for a large proportion of deaths from COVID-19, due to myocardial ischemia or necrosis (myocarditis, arrhythmias.). The higher the Hg. AIC in diabetics, more likely the infection and its severity.

D. Current CVD medications in COVID-19 infection. The AHA, HFSA and the ACC recommend [23] continuation of angiotensin converting enzyme inhibitors (ACE-i) or angiotensin receptor blocker (ARB) medications for all patients already prescribed for indications such as heart failure, hypertension or ischemic heart disease.

The AHA, HFSA and the ACC recommend [24] continuation of angiotensin converting enzyme inhibitors (ACE-i) or angiotensin receptor blocker (ARB) medications for all patients already prescribed for indications such as heart failure, hypertension or ischemic heart disease. Cardiovascular disease patients who are diagnosed with COVID-19 should be fully evaluated before adding or removing any treatments, and any changes to their treatment should be

[22] *FDA Approves COVID-19 Guidelines for ECG Use to Measure QTc; MARCH 23, 2020, Kenny Walter MD*

[23] *Author: Kelly Schoonderwoerd. Original Article: Zheng et al. Nat Rev Cardiol. 2020 Mar 5.*

[24] *Author: Kelly Schoonderwoerd. Original Article: Zheng et al. Nat Rev Cardiol. 2020 Mar 5.*

based on the latest scientific evidence and shared-decision making with their physician and health care team.[25]

10. Treatment of COVID-19 at this time[26]

- **Hospitalization?**
  1) **Hospital admission** is essentially a supportive type at this time. Not all patients with COVID-19 require hospital admission. And not all patients with COVID-19 will require medical supportive care. Use clinical judgement based on case by case: clinical presentation, the severity of illness and the intensity of treatment not available as outpatient. In addition safe isolation, *(can also be provided at non-medical facilities and most homes) risk* of transmission to others. The isolation to be continued at home if the patient returns home. (CDC)
  2) **Clinical management for hospitalized patients with COVID-19** is focused on supportive care of complications, including advanced organ support for respiratory failure, septic shock, and multi-organ failure.

- **Drug treatment of COVID-19 at this time (29 March 2020)**

There are no US Food and Drug Administration (FDA)-approved drugs specifically for the treatment of patients with COVID-19. At present clinical management includes:

- Infection prevention and control measures and
- Supportive care: supplementary oxygen and ventilator support when clinically indicated.
- Drugs approved for other indications as well as several investigational drugs are being studied in several hundred clinical trials.

– The two of the approved drugs for trial at t his time with mixed results:

a) **Chloroquine** and **hydroxychloroquine** and
b) **Remdesivir** *(one of the investigational agents currently in use in the USA)*

A. Chloroquine: This old generic anti-malarial drug hydroxychloroquine (*Plaquenil*, Sanofi-Aventis), which is also used for the treatment of rheumatic disease, is now approved by the US Food and Drug Administration (FDA) to be tested as a treatment for COVID-19 after seeing encouraging results in China. But doctors there cautioned doctors and health officials about the drug's lethal side effects (including malignant cardiac arrhythmias) and rolled back its usage.

- **Mechanism of action:**[27] mode of action against COVID-19 is not established, many viruses enter host cells via endocytosis, as a result of which they are initially taken up into an intracellular 'compartment that is "typically fairly acidic". "Chloroquine would alter the acidity of this compartment, which can interfere with the ability of viruses to escape into the host cell and start replicating."
- **Short-term side effects** (well known) such as nausea, diarrhea and tinnitus while long-term use can irreversibly impair eyesight. It's forbidden for pregnant women as it can cause congenital defects in babies.
- **Chloroquine dosage** (under doctor supervision): It can now be given only to patients between 18 to 65 years of age for a seven-day treatment course. Patients weighing over 50 kilograms (110 pounds) can take 500mg twice a day — the usual dose — while those weighing less will be administered the drug just once a day after two days of use,

[25] *Scientific Statements/Guidelines, Advisories & Comments, Heart News, Stroke News, Published: March 17, 2020*
[26] *Interim Clinical Guidance for Management of Patients with Confirmed Coronavirus Disease 2019 (COVID-19)*
[27] *Robin May, Professor of Infectious Disease at the University of Birmingham, UK*

according to the latest guidelines. The commission recommended no more than a 10-day course of chloroquine for adult patients at 500mg — half a gram — twice a day.

- **China Health Commission** revised the dosage in a Feb. 29 notice about chloroquine use. The drug not be given to pregnant women, in heart disease, terminal liver and renal disease, retina and hearing loss and patients on \ azithromycin and steroids.

B. Azithromycin (brand: Zithromax)
This antibiotic is used x 5 days, in combination with **Chloroquine** to fight infection causing pneumonia, before going to ARDS.

C. Antivirals drugs: None of the drugs are approved at this time however many are planned to be fast-tracked for testing for coronavirus.

- **Favilavir,** the first anti-viral drug is approved by National Medical Products Administration of China *(Shenzhen, Guangdong)* for use as a treatment for coronavirus with minimal side effects in a clinical trial (70 patients).
- **AbbVie's HIV med Kaletra (Aluvia),** a combination of antiviral drugs lopinavir and ritonavir, failed across the board in a 199-patient clinical trial. **Kaletra** doesn't offer additional benefits over standard care in COVID-19.
- **Arbidol** (umifenovir). This is an antiviral treatment for influenza infection used in Russia and China. The drug is manufactured by Pharmstandard. Although some Russian studies have shown it to be effective, it is not approved for use in other countries. It is not approved by FDA for the treatment or prevention of influenza.
- **Prezcobix** (Darunavir-Cobicistat). This antiretroviral medicine usually used to treat HIV-1 infection in adults is also being used along with hydroxychloroquine with mixed results.

D. 'Cytokine storm'. The main mediator for this process is Interleukin-6 (IL-6) and currently Tocilizumab (IL-6 inhibitor)[28] is being used by for severe coronavirus disease 2019 (COVID-19) pneumonia, by some Infectious Disease consultants.

11. Clinical Course[29]

- Clinical presentation among reported cases of COVID-19 varies in severity from: **asymptomatic** infection - **mild** illness - **severe or fatal illness** clinical deterioration during the 2nd week of illness. Some patients developed dyspnea a median of 8 days after illness onset (range: 5–13 days).
- **Pneumonia, acute respiratory distress syndrome (ARDS)** in 17–29% of hospitalized patients. **Secondary infection** developed in 10%. In one report, the median time from symptom onset to ARDS was 8 days; 20-30% of hospitalized patients required intensive respiratory support care.
- **'Cytokine storm'** as part of pathogenesis of the disease which typically occur around the day 10-12 and mainly responsible for **ARDS & multi-organ failure** and the **leading cause of mortality**.[30]
- **High levels of D-Dimer, BNP:** This is significant risk factor for the development of acute respiratory distress syndrome **(ARDS)** and death in patients with COVID-19.
  - **Those not admitted to an intensive care unit, critically ill patients:** were older (median age 66 years versus 51 years), have underlying co-morbid conditions (72% versus 37%).
    - **Admitted in ICU, critically ill patients** 11–64% received high-flow oxygen therapy and 47-71% received mechanical ventilation; some hospitalized patients have required advanced

[28] *https://www.cancernetwork.com/news/fda-approves-phase-iii-clinical-trial-tocilizumab-covid-19-pneumonia*
[29] *Xu Z, Shi L, Wang Y, Zhang J, Huang L, Zhang C, Liu S, Zhao P, Liu H, Zhu L, Tai Y, Bai C, Gao T, Song J, Xia P, Dong J, Zhao J, Wang FS. Pathological findings of COVID-19 associated with acute respiratory distress syndrome. Lancet Respir Med. 2020 Feb 18. pii: S2213-2600(20)30076-X. doi: 10.1016/S2213-2600(20)30076-X.*
[30] *https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30628-0/fulltext*

organ support with endotracheal intubation and mechanical ventilation (4–42%). A few required extracorporeal membrane oxygenation (ECMO, 3–12%).
  - An overall case fatality proportion of 2.3% among confirmed cases of COVID-19 in China; majority being hospitalized so the estimate of mortality is likely biased upward.
  - Among hospitalized patients with pneumonia, the case fatality proportion has been reported as 4–15%. Among critically ill COVID-19 patients in China, the reported case fatality proportion was 49%. In a report from one hospital, 61.5% of critically ill patients with COVID-19 had died by day 28 of ICU admission.
- **Complications:** Pneumonia, ARDS, cardiac injury, arrhythmia, septic shock, liver dysfunction, acute kidney injury, and multi-organ failure. Post-mortem biopsies in one patient who died of ARDS reported pulmonary findings of diffuse alveolar damage. Very high risk of ARDS:
  - Age 60 and above especially 80 and above with heart disease, diabetes, hypertension
  - Symptoms and high fever
  - Lab: Neutrophilia; High liver enzymes, BUN, creatinine, D_Dimer, BNP, Troponin, hsCRP.

12. Discontinuation of precautions for patients with COVID-19[31]

CDC Guidance as of March 23, 2020. The decision to discontinue Transmission-Based Precautions should be made using a test-based strategy or a non-test-based strategy (i.e., time-since-illness-onset and time-since-recovery strategy). Meeting criteria for discontinuation of Transmission-Based Precautions is not a prerequisite for discharge.

➔ **Beware** there is no vaccine at present and the cold weather promotes and it means it is likely to return back in next winter (October 2020 onwards).

- **Exposure based:**
  - If infected then the symptoms usually develop within those 2 - 14 days. So self-quarantine period is 14 days.
  - If the test is positive for COVID, definite isolation which can end And that's really when free of fever for 72 hours without fever-reducing medications, your symptoms are improved and has been at least been seven days since symptom began, have two negative tests. But ach case need to be decided by the treating physician.
- **Transmission-based precautions:**

A. *Test-based strategy.*

  - Hospitalized or severely immunocompromised or being transferred to a long-term care or assisted living facility.
  - Resolution of fever without the use of fever-reducing medications **and**
  - Improvement in respiratory symptoms (e.g., cough, shortness of breath), **and**
  - Negative results of an FDA Emergency Use Authorized COVID-19 molecular assay for detection of SARS-CoV-2 RNA from at least two consecutive nasopharyngeal swab specimens collected ≥24 hours apart (total of two negative specimens) [1]. See Interim Guidelines for Collecting, Handling, and Testing Clinical Specimens for 2019 Novel Coronavirus (2019-nCoV).

B. *Non-test-based strategy*. (Test not done whatever reason)

[31] *CDC. Discontinuation of Transmission-Based Precautions and Disposition of Patients with COVID-19 in Healthcare Settings (Interim Guidance); Guidance as of March 23, 2020*

- At least 3 days (72 hours) have passed *since recovery* defined as resolution of fever without the use of fever-reducing medications **and** improvement in respiratory symptoms (e.g., cough, shortness of breath),
- At least 7 days have passed *since symptoms first appeared.*

- **Empiric Transmission-Based *Precautions*:** by excluding the diagnosis of COVID-19 for a suspected COVID-19 patient can be made based upon having negative results from at least one FDA Emergency Use Authorized COVID-19 molecular assay for detection of SARS-CoV-2.
  - If a higher level of clinical suspicion for COVID-19 exists, consider maintaining Transmission-Based Precautions and performing a second test for SARS-CoV-2.
  - If a patient suspected of having COVID-19 is never tested, the decision to discontinue Transmission-Based Precautions can be made based upon using the non-test-based strategy described above.

13. After discharge from the hospital care (CDC)

Patients can be discharged from the healthcare facility whenever clinically indicated.

A. If discharged to home:

- Isolation should be maintained at home if the patient returns home before discontinuation of Transmission-Based Precautions. The decision to send the patient home should be made in consultation with the patient's clinical care team and local or state public health departments. It should include considerations of the home's suitability for and patient's ability to adhere to home isolation recommendations. Guidance on implementing home care of persons who do not require hospitalization and the discontinuation of home isolation for persons with COVID-19 is available.

B. Home Care guidelines

- The patient is stable, has a caregivers are available at home, without sharing immediate space with others, and access to all necessities.
- The patient and household members have personal protective supplies etc. (gloves facemask, hand washing, sanitizer and education about cough etiquettes).
- Beware and protect household members who may be high risk COVID-19 infection:60 years and older, young children, pregnant women, immunocompromised, heart, lung, or kidney problems.

C. If discharged to a long-term care or assisted living facility, AND

- Transmission-Based Precautions are still required, they should go to a facility with an ability to adhere to infection prevention and control recommendations for the care of COVID-19 patients. Preferably, the patient would be placed in a location designated to care for COVID-19 residents.
- Transmission-Based Precautions have been discontinued, but the patient has persistent symptoms from COVID-19 (e.g., persistent cough), should be placed in a single room, be restricted to their room, and wear a facemask during care activities until all symptoms are completely resolved or until 14 days after illness onset, whichever is longer.
- Transmission-Based Precautions have been discontinued and the patient's symptoms have resolved, do not require further restrictions, based upon their history of COVID-19.

14. COVID-19, Flu and the Common Cold

Type	Table: 3 Characteristic clinical features of 3 virus infections
o **COVID-19**	o **Lower respiratory tract infection symptoms:** Fever: 88%, Dry cough: 68%, Fatigue: 38%, Coughing up sputum, or thick phlegm, from the lungs: 33%, Shortness of breath: 19%, Bone or joint pain: 15%, Sore throat: 14%, Headache: 14%, Chills: 11%, Nausea or vomiting: 5%, Stuffy nose: 5%, Diarrhea: 4%, Coughing up blood: 1%, Swollen eyes: 1% o **Mild/moderate symptoms** (about 80 % of those who gotten sick in China), had mild to moderate symptoms including mild pneumonia. So most people in the U.S. will be able to manage their symptoms at home. o **Complications about 20 %:** when the virus travels to the lower respiratory tract where complications become worse. Patient with COVID-19 become seriously ill, can develop severe pneumonia or respiratory failure and may require oxygen or ○ severe complications: 14% have more like severe pneumonia, and ○ multiple organ failure: 6% are critical with respiratory failure, require mechanical ventilation, or septic shock.
o **Common colds** [32]	o **Upper respiratory tract infection, Sore throat and runny nose are usually the first signs of a cold, followed by coughing, sneezing,** headaches and body aches o **Most people recover in about 7-10 days.** These are less common symptoms of COVID-19. get a runny nose and sinus congestion. (rare in people with COVID-19). o **Most people** get colds in the winter and spring, but it is possible to get a cold any time of the year. o **Some people** with weakened immune systems, asthma, or respiratory conditions may develop serious illness, such as bronchitis or pneumonia. o **There is no cure** for a cold. To feel better, lots of rest and drink plenty of fluids. Antibiotics do not help in cold caused by a respiratory virus.
o **Flu**	○ **The flu caused by influenza viruses,** also spreads and causes illness around the same time as the common cold, have similar symptoms, it can be difficult (or even impossible) to tell the difference between them. ○ **Flu symptoms** are worse than the common cold (fever or feeling feverish/chills, cough, sore throat, runny or stuffy nose, muscle or body aches, headaches and fatigue (tiredness). ○ **Flu can cause very serious complications.** CDC recommends a yearly flu vaccination as the first and best way to prevent the flu. If you get the flu, antiviral drugs may be a treatment option.
➔ ***Whether you are at home, at work, traveling, or already sick, good hand hygiene can prevent many sicknesses affecting you, your family, and others around you.*** [33]	

- **Seasonal flu** cases are found year-round, the flu does wane when the weather gets warm. In the U.S., each flu season varies, but the number of new flu cases tends to peak between December - February, and tail off in May. A new vaccine is developed each year to combat

[32] *https://www.cdc.gov/features/rhinoviruses/index.html*
[33] *https://www.cdc.gov/handwashing/show-me-the-science.html*

the latest flu strains. This flu season, the CDC says that around 160-170 million flu shots were shipped out — enough to cover about half the U.S. population.

- **Allergies.** Also tend to be seasonal, usually lasts for weeks or months, related with certain things in environment (pollens etc.). Symptoms tend to be sneezing, itchy and watery eyes and runny stuffy nose, and (less often) dry cough and post-nasal drip.
- **COVID-19 infection.** Fever, cough, sputum etc. (see more under Symptoms)

15. High risk patients

- **Age risk:** 60 and older, the mortality rate starts getting up there," del Rio said. One reason, he says, could be that at that age "pulmonary reserve capacity is lower." Over 80 years old, the mortality rate reaches above 21%, WHO said Monday.

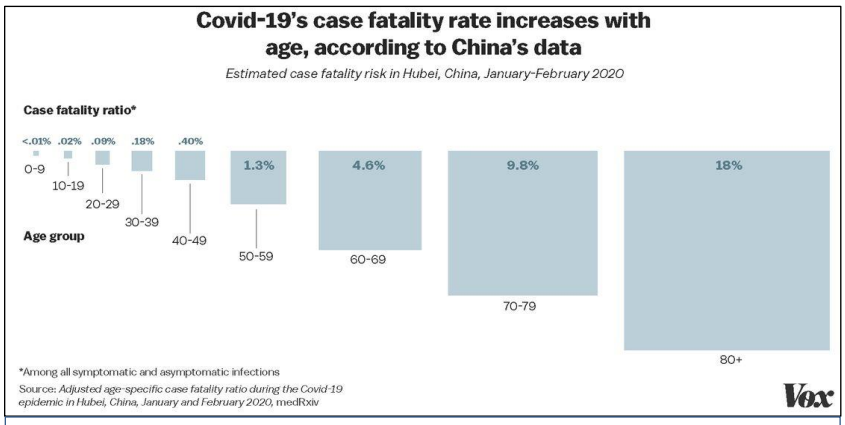
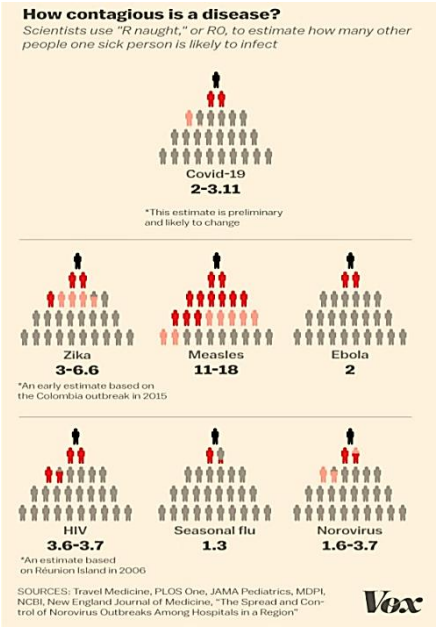


Fig. 12 Increased death rate with age from COVID-19

- **High Risk patients:**
  - This virus spreads easily from person to person and because for new virus, that no one has immunity against it, no vaccine yet. Patients 60 and above there is higher morbidly and mortality with other conditions, i.e. diabetes, cardiovascular disease, or and/or chronic lung disease. Respiratory symptoms can turn into pneumonia, severe acute respiratory syndrome, kidney failure, and in exteme cases, shock and death. WHO says the mortality rate for people with cardiovascular disease is 13%, diabetes 9%, chronic respiratory disease 8%, and patients on chemotherapy at 5%.



  - **Highest risk** by age or serious illness from COVID-19: over the age of 60, or people who have underlying medical conditions like high blood pressure, diabetes, heart disease, lung disease, or cancer, obesity, diabetes, liver, cardiopulmonary, or kidney disease, weakened immune systems.
  - **Adults over age 80,** the highest number of deaths in China -- 22% -- has been in this age with heart problems, diabetes, or lung issues like COPD are also at a higher risk for severe disease and death, women pregnant. Young children.
  - **Recently noted *(in NY) about 40 % of hospitalized*** *patients were of between 20-40 years age*

16. Diagnosis and testing for COVID-19

Some of the clinical symptoms may overlap with current/seasonal Flue situation. The testing allows infected people to *know*, get the needed care; take precautions to reduce the spreading

and infecting others[34]. Eighty percent have milder is milder or somewhat moderate symptoms. Many people especially younger out for work , don't know they are infected risk infecting others. So wide spread availability of testing for COVID-19 (as been done in China and S. Korea) is also crucial for an appropriate response to the pandemic. We need to prevent /slow down the spread of the disease.[7] The actual capacity for COVID-19 testing is low in many countries around the world. So the true picture of the spread of the disease in this pandemic is ambiguous for now.

The COVID-19 Test: Swab samples taken from a patient's nose and throat (PCR test) is a part of the protocol recommended by the WHO. Some issues:

- **No centralized database** (WHO) on COVID-19 testing to evaluate the disease in detail.
- **False-negative** tests:
  - Patient may be in the early stage of the disease with too low viral load to be detected. In *negative but highly suspicious*, the test must be repeated.
  - 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.
  - False-negative tests may miss many cases. Difficult to know- how common is the disease ? Tests should be repeated in all negative cases when possible symptoms present.
  - Other issues: no major respiratory symptoms, inadequate sample collection, poor handling and transport of test samples.

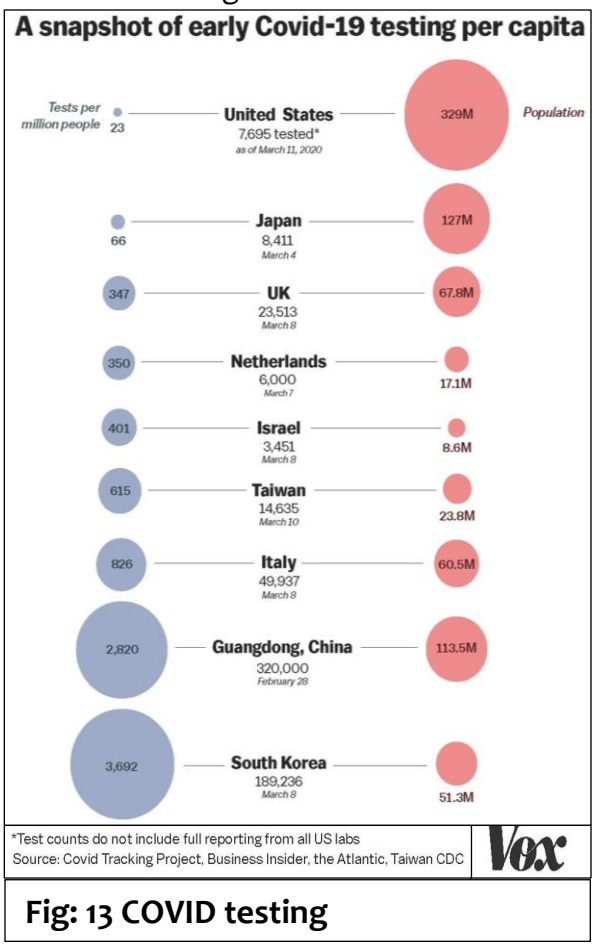


Fig: 13 COVID testing

17. How long it took for the number of confirmed cases to double?

- **Data variation:** Countries – like China and Korea – have very substantial counter measures in place and new daily confirmed cases have declined. But many other countries do not have comparable measures in place and, as the table shows, numbers are rising fast. Because of these large differences between countries it is crucial to look at situation in each country.[35]
- **Contagiousness:** During the past 10 days from 19 March to 29 March at 10:11 am look at the how cases have multiplied. Each infected person will infect 2.5 to 3.5 cases.
- **Spread:** First 100,000 cases reach in – 67 days, 2nd 100,000 cases in 11 days, 3rd 100,000 in 4 days. In USA its double every 2 days now.
- **Mutations:** Covid-19 is bad but Covid-20 and Covid-21 will likely be worse. Spanish flu came in 3 waves with each wave becoming increasingly dangerous. In coming warm days it will most

[34] *https://ourworldindata.org/coronavirus*
[35] *https://ourworldindata.org/coronavirus. 2019 Novel Coronavirus COVID-19 (2019-nCoV) Data Repository by Johns Hopkins CSSE*

likely slow down and probably pick up and return again in cold October onwards unless drastic measures taken to control it with everyone's cooperation all around the world.

- Is it a global punishment with Divine permission *(depending upon individual spiritual beliefs)*

Table: 4 Total cases COVID-19 on:
Confirmed diagnosis: (March 19, 2020 8:11) [36] **:** 244,421 → **7 April *2020 7:00 pm:* 1,412,103**
Confirmed dead (19 March 2020): 11,010 [37] → **7 April *2020 7:00 pm:* 81,200**[38]**; Recovered: 298,389**

	Cases on 19 Mar. 2020	30 Mar. 2020	Days cases to double	Days Death to Double	Total deaths	Recovered
World wide	244,421	**740,157-**	6 days	6 days	**35,114--**	156,838-
USA	9,415	**143,532-**	2 days	3 days	**2,191**	4,865-
Italy	35,713	**92,472**	4 days	7 days	**10,779**	13,030-
Spain	13,716	**85,195-**	4 days	4 days	**7,340-**	16,780-
Germany	8,198	**63,929-**	4 days	4 days	**560-**	9,211 -
Iran	17,361	**41,495-**	8 days	days	**2,757**	13,911-
France		**40,751-**		4 days	**2,606-**	7,228-
UK	2,630	**19,821-**	4 days	3 days	**1,228-**	151-
South Korea	8,652	**9,661-**	13 days	13 days	**158-**	5,228-
Turkey		**9,217-**		4 days	**131-**	105-
Canada	690	**6,320-**	3 days	4 days	**60**	466-
Australia	565	**4,203-**	4 days	4 days	**14**	244-
Russia		**1,836-**		2 days	**5**	66-
Pakistan		**1,650-**		6 days	**20-**	29-
India		**1,071-**		4 days	**29-**	100-
China	81,238	**82,198-**	38 days	43 days		75,923-
Morocco		**516-**		2 days	**23**	14-

18. General prevention and essential hygiene

- **Objectives:** Limit the spread of Germs and prevent Infection
  - **Social distance** (talking to someone at minimum of 6 or more feet, no hand shaking, hugging staying away from the sick with symptoms (most infectious at this stage) etc. *Avoid any close contact* who are sick; protect them from getting sick too. Use phone. **KEEP YOUR DISTANCE**.
  - Washing your towels minimum of 2 – 3 times a week; wash clothes separately.
  - **Proper use of**: Hands washing and sanitizers (see table: 5, next page)
  - **Good hand washing** is the best and most effective of prevention beside social distancing, see more below). Immediately dispose of used tissues in a biohazard container when possible. Avoid touching your eyes, nose or mouth**.**
  - **Cover your mouth and nose** with a tissue when coughing or sneezing. It may prevent those around you from getting sick.

[36] *https://ourworldindata.org/coronavirus*
[37] *https://www.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6*
[38] *https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html?fbclid=IwAR3prf7gRuznOnGiv_wZpjhVQ-YZAtQcVJYorx1Yfu3Tutt4nn2dUQaGbyo#/bda7594740fd40299423467b48e9ecf6*

- **Practice other good health habits**. Get plenty of sleep, be physically active, manage your stress, drink plenty of fluids, and eat nutritious food.

Table: 5 Hands washing and Sanitizers

Each time the benefits may be similar to vaccinations or wearing seatbelts

- **CDC guide about hand washing in general:**

  "Handwashing with soap could protect about 1 out of every 3 young children who get sick with diarrhea and almost 1 out of 5 young children with respiratory infections like pneumonia."
- **Soap** (mildly antibacterial), wipes out viruses including COVID-19 but it does not kill viruses. After washing hands to dislodge them it's the rinsing thoroughly is the key to washing away any viruses. Antibacterial products basically expensive version of soap do almost the same thing.
- **The hands** are quite rough with lines and wrinkle, so we need to wet, leather and rub and soak them to make sure the soap reaches every part of the skin,
- **Water temperature to hot or not?** Simply use a comfortable temperature, warmer the better.

Hand Washing; must wash your hands after:

- Entering your house from outside or work place wash your face also beside the hands.
- Preparing food and again before eating
- Using the toilet, changing a diaper or cleaning up a child who has used the toilet
- Touching an animal, animal feed or animal waste
- Blowing your nose, coughing or sneezing
- Treating wounds or caring for a sick person
- Handling garbage

How to wash your hands with soap & water correctly:

- Wash your hands often. Using running water and soap to wash your hands is more effective than a dab of gel.[39]
- Get your hands wet **first** and NOT reach for soap. Apply adequate amount of soap - make enough leather and wash multiple times depending upon how dirty they may be.
- Rub your hands vigorously. Keep washing your hands for 20 seconds or more. Without 20 seconds or more lathering and scrubbing germs won't get killed or removed.
- Now make sure that both front and back of your hands are covered enough in soap lather before rinsing your hands thoroughly. Using a huge amount of soap can also be harmful.
- Dry your hands with a clean towel. Use the paper towels, dry completely before leaving the restroom or touching any surfaces. Wet hands can yet transfer germs.
- Use a towel to turn off the faucet.

Hand Sanitizer (70% Alcohol-based):

1st choice: Soap and water, if that is not possible, use hand gel. Beware of what you touch (door handles and bus poles and if you can't wash your hands or use gel after coming into contact with things, Avoid touching anything you don't need to touch, do not touch your face. Choose which one do you need. Apply some amount of hand sanitizer to one hand.

- Rub the sanitizer which has again at least 60-70 % alcohol all over your palms, the backs of your hands and in between your fingers. (better to trim nails also to clean areas under nails also).Then let it dry completely. Rub your hands together until the sanitizer evaporates.

- **General cleansing habits.** Clean and disinfect the following

[39] *Ryohei Hirose, Takaaki Nakaya,; 2019 study by the American Society for Microbiology. DOI: 10.1128/mSphere.00474-19*

- **Handles and knobs:** Refrigerator, vacuum cleaner, door knobs, car, steering wheel, keys, kitchen appliances at home, toilet flusher, mail box
- **Delivered groceries and packages:** Have them leave outside and clean before you bring them in. Leave them in the garage for couple of days unless need them urgently.
- **Delivered food.** Beware of possible droplets on surfaces of the packages, there have been some news on TV that the delivery person may have taken/eaten some food out of the package (pay attention to this). Discard the packaging, take the food out, and don't use the containers or utensils that came in the bag. Use your own utensil. Clean all the surface/s your touched and wash your hands. Best option: cook your own food at home.

19. Quarantine preparedness (for about 2 weeks)

1. **First do not do panic buying** and hoarding. There others who may need the most.
2. **Medical:**
   - **Regular prescription drugs** to ensure a continuous supply in your home.
   - Soap, hand sanitizer, N-95 face masks, medical quality disinfecting wipes, disinfectant spray, rubber gloves, thermometer, clean humidifier
   - antibiotic ointment, sterile gauze, bandages, and other first aid supplies
   - **Nonprescription drugs** and other health supplies on hand, anti-diarrheal medicine, antacid tablets, (antacids), anti-diarrheal drugs (Imodium), constipation (laxatives), and bloating (anti-gas caplets). electrolyte tablets, decongestants, cough and cold medicines, band aids, fluids with electrolytes, and vitamins.
     - **Pain relievers.** Avoid taking nonsteroidal anti-inflammatory drugs (NSAIDs), like ibuprofen or naproxen. Take acetaminophen, to lowers the fever without damping down the immune system's inflammatory response to fight infection. If you routinely take anti-inflammatory medication, contact your doctor on how to treat a fever.
     - **Antihistamines** like diphenhydramine (Benadryl) for excessive mucus or runny nose. For mild allergic reactions, or loratadine (Claritin). Best is to check with your doctor.
     - **Decongestants** (pseudoephedrine or phenylephrine) reduce nasal swelling.
     - **Guaifenesin** is a drug that thins mucus and makes it easier to expel (cough out).
   - **Copies of health records** from doctors, hospitals, pharmacies and other sources and store them, some medical information, electronic health records access.
3. **Cleaning and laundry supplies,** detergent, paper towels , toilet paper, , bleach, black trash bags (the really heavy duty contractors bags).
4. **Other stuff:**
   - Cash enough for 2 weeks (or about one paycheck worth)
   - Reading and learning material, some basic exercise equipment
   - Don't forget to keeps the bills paid upto date. (don't rely on anything/anyone)
   - Talk to family members about the care and live plan in case anyone is sick, methods of isolation to implement
5. **Foods: Healthy foods to build immunity:** Eat plant-based and anti-inflammatory food: citrus fruits, tomatoes, cruciferous vegetables, and omega fats with odd numbers, like omega-3s found in salmon, chia seeds, and flax seeds and omega-9s in olive oil, walnuts, and almonds. Look under Improve body immunity. (dried foods, nuts, seeds etc.)
   - Store a two week supply of water, beans, pasta, eggs, evaporated milk, tea or coffee,
   - Frozen meals, and other simple easy ready meals. Canned fish tuna, salmon or sardines; beans. Eat plant-based and anti-inflammatory food: citrus fruits, tomatoes, cruciferous vegetables, and omega fats with odd numbers, like omega-3s found in

salmon, chia seeds, and flax seeds and omega-9s in olive oil, walnuts, and almonds. Look under Improve body immunity.

Table: 6 during a Pandemic
1. **Avoid close contact** with people who are sick. 2. When you are sick, **keep your distance** from others to protect them from getting sick too. 3. **Cover your mouth and nose** with a tissue when coughing or sneezing. It may prevent those around you from getting sick. 4. **Washing your hands** often will help protect you from germs. 5. **Avoid touching your eyes, nose or mouth**. 6. **Practice other good health habits**. Get plenty of sleep, be physically active, manage your stress, drink plenty of fluids, and eat nutritious food. 7. **Limit the spread of germs** and prevent Infection.

20. If you get sick

- Sick with symptoms but not tested yet for Coronavirus yet. The best method is the prevention, if sick, isolate with 14 day quarantine (see above CDC guidelines) and face mask.

Table: 7 If you are sick with COVID-19:
1. **Stay home when you are sick. Use quarantine protocol:** a) **Isolation:** Stop movement in the community, avoid contact with others, including parties, meetings, and events, try to stay in a specific room and away from other people in your home; use a separate bathroom, if available. To discontinue isolation precautions depends on a case-by-case basis, by healthcare providers and state and local health departments. **a) Animals:** Avoid contact with pets and other animals also while being sick with COVID-19. **b) Facemask: W**ear a facemask when you are around other people (e.g., sharing a room or vehicle) or pets and before you enter a healthcare provider's office. **c) Sharing:** Do not share dishes, drinking glasses, cups, eating utensils, towels, with other people or pets, water bottles, cigarettes/vapes, lipstick/makeup, bedding etc. After use these items, should be washed separately and thoroughly with soap and water. **d) Disinfection:** High touch surfaces include counters, tabletops, doorknobs, bathroom fixtures, toilets, phones, keyboards, tablets, and bedside tables. Clean any surfaces that may have blood, stool, or body fluids on them with cleaning spray or wipe, diluted household bleach solutions (read label instructions) , alcohol solutions with at least 70% alcohol, and most common EPA-registered household disinfectants should be effective.[40] 2. **Return to work:** Those who have symptoms of respiratory illness must stay home, not go to work until free of fever, and any other symptoms for at least 24 hours, without the use of fever-reducing or other symptom-altering medicines (e.g., cough suppressants).[41] Then they must have medical clearance by physician experienced in this and other communicable diseases. Viral shedding may continue in some patients even after symptoms disappear. 3. **Call your health care provider's office** in advance of a visit; let them know about your COVID-19 virus illness. Put on a facemask before you enter the facility. 4. **Following dietary suggestions** (under # 25 page 27). DECREASE SUGAR INTAKE

[40] *COVID-19: Resources for Households | CDC. www.cdc.gov › 2019-ncov › community › home › cleaning-disinfection*
[41] *https://hr.harvard.edu/corona-virus-workplace-policies*

21. General things to Do's and Don'ts for everyone [42]

Table: 8 The things to Do
1. **Wash your hands** for at least 20 seconds, several times a day. Use soap and water or a hand sanitizer with at least 70% alcohol. o **Health education.** Learn all about the most common symptoms (very similar to flu: fever, cough, shortness of breath). Most often runny nose is in the flu, not in COVID-19. o **At this time the highest-risk groups** seniors and people with preexisting conditions like heart disease, chronic respiratory diseases, and diabetes. Look for more under High Risk patients. 2. **Social distancing is** the most effective way to slow down the spread. o **Look at the example of China and S. Korea's** of their strict enforcement of rules to prevent spread and success. And in Italy they might have taken it too easy with the highest fatality. o **Avoid any gatherings** even with children living separately and try to stay at 6 feet away from anyone who's coughing or sneezing. Somehow this difficult time will come to pass, so that you can survive healthy and live to tell about it later. o **Take extra precautions** and stay out of public places especially if you're over 60 years old, or have medical condition, otherwise you have a higher risk of developing the disease. o **This social isolation** could be viewed from religious and spiritual aspect as an opportunity forced upon all over the world from our Creator (depending upon your Faith & belief) that we have lost touch with Almighty God. Did we have **EGO (E**xpel **G**od **O**ut**)?** Are these Global calamities due to the global trends in our changing life style? 3. **Travel.** Reconsider and actually cancel except real urgent travel to the affected areas in this and other countries, especially if you have underlying conditions. For people in a higher-risk group -- seniors and people with preexisting conditions, best will be to postpone nonessential travel and cruise trips. Find the latest advisories with CDC. 4. **Prioritize** your health, healthy life and the life itself over temporary inconvenience. Now is not the time to burn the candle at both ends, skip workouts, or ignore a healthy diet—that can weaken your immune system. 5. **Prepare yourself for quarantine.** Read more under quarantine above on page 22. At this time testing here is USA is only being done on really sick, not for mild or moderate sickness. 6. **Check** upon (by calling) neighbors especially high-risk older adults and people with serious chronic medical conditions. Help in their food and medical supplies. 7. **Doctor's appointment** early if have fever, cough, or breathing problem. Do not go without making appointment for them to prepare a room for isolation, use mask. Prevent spreading. 8. **Cough or sneeze** into the crook of your elbow or a tissue, and dispose of the tissue immediately in a covered bin. Do these whether or not you suspect COVID-19, prevent spread of any germs. 9. **Mask, when do wear it properly and** follow the guidelines. The World Health Organization has videos to shown how to use a mask properly. 10. **At home:** o **Educate the family** about how to clean properly. Coronaviruses can live on surfaces for a few hours or up to several days. Use: o **Disposable** gloves, clean surfaces with soap and water, twipe with disinfectant (kill virus). o **Bleach solution** of 5 tablespoons per gallon/4 teaspoons per quart of water, solutions with at least 70% alcohol, or one of the EPA-approved items on this list.

[42] *https://www.webmd.com/lung/news/20200228/preparing-for-coronavirus-dos-and-donts*

Table: 9 Things → Not to do
→ **Do not panic,** get yourself medical check, tell all your information to your doctor 1. **DO not** touch your eyes, nose, and mouth. If you *have* somehow come into contact with the virus, touching your face can help it enter your body. Must → wash your hands! 2. **DO not travel** if you have a fever. If you get sick on flight, tell crew immediately. When you get home, contact a health professional. 3. **DO not skip** the flu shot. The symptoms of COVID-19 and flu overlap enough that it can complicate diagnosis. If you've had a flu shot, you're less likely to catch the flu or have a case serious enough to require treatment. 4. **DO not go out** except to see your doctor, after calling first. And if you do have to go out, avoid public transportation, taxis, and ride-sharing. 5. **DO not socialize at any level.** 6. **DO not use antibiotics** or any, medications without medical supervision these days in particular. Some medicines have serious side effects when combined with others. And antibiotics work only on illnesses caused by bacteria, and the coronavirus is a virus. 7. **DON'T** wear a mask unless you're sick or in high risk area. Masks help protect others from catching the virus, but wearing one when you're healthy won't do much. High worldwide need and demand has created shortages for medical professional now. Leave the masks for people who really need them, like the sick or health care professionals.

22. Medical professionals

- **For professionals (from CDC)** [43]: Close contact occurs while caring for a patient, including:
  - Being within about 6 feet of a patient with COVID-19 for a prolonged period of time.
  - Having direct contact with infectious secretions from a patient with COVID-19. Infectious secretions may include sputum, serum, blood, and respiratory droplets.
  - Minimize chances of exposure, including placing a facemask on the patient and placing them in an examination room with the door closed.
  - If close contact occurs while not wearing all recommended PPE, healthcare personnel are at risk of infection.
  - Management of laundry, food service utensils, and medical waste should also be performed in accordance with routine procedures.
  - If you develop symptoms consistent with COVID-19 (fever, cough, or difficulty breathing), do not report to work. Contact your department and occupational health services.

23. Face masks

Most people, with no symptoms do not need the face mask (per CDC). Best practice is to focus on essential hygiene by regular washing of hands well with soap and water for at least 20 seconds (and also try to wash face as well), disinfection of surfaces, and avoid people who are sick and social distancing. As of today 30 March face mask are in short supply for the medical professionals since general public has acquired a bulk of these whether or not they need it. The **face mask** is the best protection, besides **social isolation** and frequent **hand washing. As of today, 7 April 2020 since the COVID-19 infection has reached new height, new suggestion:** that anyone who gets out of the house must wear a mask. If N95 is not available, double or triple up the regular mask, or make a mask by folding a cloth.

[43] *What Healthcare Personnel Should Know about Caring for Patients with Confirmed or Possible COVID-19 Infection. https://www.cdc.gov/coronavirus/2019-ncov/hcp/caring-for-patients.html*

- **Medical professionals or the people caring for someone** with coronavirus definitely need because of their direct contact. Doctors and other medical personnel are usually trained to use these masks properly, and the general public isn't. Best one is N95.[44] It filters out at least 95% of particles in the air you breathe in. There is a acute shortage of masks all over the world.
- **Reminder.** Masks are good reminder not to touch your face, keep infected sneeze and cough droplets from getting out and prevent spreading. Masks can also give false sense of security and become lazy in essential hygiene of hand washing, *and increased chance of infection.*
- **Surgical masks,** which many people end up buying in stores, are designed to keep what's in a surgeon's mouth and nose from getting into a surgical field, he points out. "They're really quite effective at doing that, but they're not air tight around the edges.
- **Painter's masks** are "worthless for respiratory protection"[45]
- **Reusable respirator,** isn't helpful unless you're going to wash it every time someone sneezes or coughs around you.

Fig: 14 N95. Face

- **Panic buying of face mask** can result in shortages and put those people who actually need them the most *(like healthcare workers and others mentioned above; U.S. Surgeon General), at a very high risk of sickness and spread to others.*
- **Protection rate:** Aymptomatic virus carriers (remain unknown for a while until tested) will infect others. Mishandling of used mask can also spread the infection. Using mak correctly will provide **protection** to about: 50 %; Hand washing: 50-65 %; mask + hand washing + other precaution: 90 %.

24. CPR in Corona virus (COVID-19) infection[46]

The American Heart Association (AHA) has issued interim guidance for CPR and emergency cardiovascular care for patients with known or suspected coronavirus (COVID-19) infection to help reduce the risk for transmission of SARS-CoV-2, the virus that causes COVID-19. Coronavirus COVID19 Resources for CPR Training. Interim Guidance issued March 19, 2020.

AHA Guidance for CPR, Emergency CV Care Amid COVID-19. (as of March 23, 2020)

AHA advices standard and transmission-based precautions be used when caring for patients with suspected or confirmed COVID-19. Among the specific guidance included in the three-page document:[47] ***Best to use one-way traffic where possible.***

1) **Aerosol-generating procedures** such as CPR and endotracheal intubation expose providers to a greater risk of disease transmission. Only providers essential for patient care and procedural support should be present during the procedure performed in **airborne infection isolation rooms** (AIIRs), reserved for patients undergoing aerosol-generating procedures).
2) **All medical personnel** should use respiratory and **personal protection equipment (PPE)** and the room should be cleaned and disinfected following the procedure. Wear eye protection, gloves, and gowns. Patients with known or suspected COVID-19 should be cared for in a single-person room with the door closed. – to prevent spread.

---

[44] *Particulate Respirator 8210V, N95 Respiratory Protection*

[45] *William Schaffner, M.D. Professor, Preventive Medicine, Health Policy. Division of Infectious Diseases, Vanderbilt University*

[46] *American Heart Association CPR & ECC; CPR& First Aid, Emergency Cardiovascular Care. CPR information during COVID-19 https://cpr.heart.org/resources/coronavirus-covid19-resources-for-cpr-training.*

[47] *https://www.medscape.com/viewarticle/927389?nlid=134654_3861&src=WNL_mdplsfeat_200324_mscpedit_card&uac=120730FV&spon=2&impID=2322975&faf=1*

3) N95 respirators or respirators that offer a higher level of protection should be used instead of a face mask during aerosol-generating procedures.
4) Providers should put on a respirator or facemask (if a respirator is not available) before entering a patient's room or care area. Facilities should return to use of respirators for patients with known or suspected COVID-19 once the supply chain is restored.
5) When gowns are in short supply, they should be prioritized for aerosol-generating procedures, care activities where splashes and sprays are anticipated, and high-contact patient care activities that provide opportunities for transfer of pathogens to the hands and clothing of providers.
6) If intubation is needed, consider using rapid sequence intubation with appropriate personal protective equipment (PPE).
7) If possible, avoid procedures which generate aerosols, such as bag-valve mask, nebulizers and non-invasive positive pressure ventilation.
8) Consider proceeding directly to endotracheal intubation in patients with acute respiratory failure. Avoid the use of high-flow nasal oxygenation and mask CPAP or bilevel CPAP due to greater risk of aerosol generation.

- **Among the specific advice for EMS and other first responders:**
  - Emergency medical dispatchers should ask callers about the possibility of COVID-19 in the patient. Emergency medical dispatchers should ask callers about the possibility of COVID-19 in the patient. The query process should not supersede the provision of prearrival instructions to the caller when immediate lifesaving interventions are needed.
  - Prehospital care providers and healthcare facilities should be notified when COVID-19 is suspected in a patient requiring emergency transport.
  - EMS clinician practices should be based on the most up-to-date COVID-19 clinical recommendations and information from appropriate public health authorities and EMS medical direct.

25. Improve body Immunity:

Nutrition as add on - to treatment of COVID-19 infection[48]

1. **Problem: Inadequate nutrition will cause** low body immunity to fight infection and allow excess inflammation and tissue damage caused by the virus that can lead to severe lung injury, prolonged illness, organ failure and even increased risk of death.
2. **Older age,** risk of severe Covid-19 illness and death are highest among people with Cardiovascular disease and diabetes.
   - **About** 45% of all cardiovascular disease and diabetes deaths are directly related to poor diet.
   - **114.4 million Adults** -- nearly half of the US adult population -- have diabetes or prediabetes.
   - **Both cardiovascular disease and diabetes** are linked to chronic, low-grade inflammation throughout the body -- which could predispose Covid-19 patients to the severe excess inflammation that contributes to lung failure and death. These conditions weaken the heart's ability to handle stress, while diabetes also weakens the immune system. Preventing and lessening the severity of existing cardiovascular disease and diabetes should be a key.
3. **Nutritional treatment: (as medicine → add on to all other treatments)**

[48] *How your diet can help flatten the curve. March 27, 2020. Dr. Dariush Mozaffarian, dean of the Friedman School of Nutrition Science & Policy at Tufts University. Dr. Simin Nikbin Meydani is professor at the Friedman School of Nutrition Science and Policy at Tufts University.*

A. **Re-evaluate life style** – prevent and reduce excess inflammation and tissue damage that will be caused by the virus. Stop consuming inflammatory (unhealthy, processed, refined and made in plants) foods and chemicals. **Instead use plant based foods. Consume *Plant based* foods** (deep colored vegetables, fresh and whole fruits - not parts of them and also not canned, dark green leafy and cruciferous vegetables, pomegranate and cranberry juice. These foods boost immunity and fight inflammation better.
   - **Fruits** like papaya, kiwi, and grapefruit (don't take with cholesterol lowering meds)
   - **Garlic.** Chopped raw garlic few cloves leave for few minutes (to activate its main ingredient) put it on the spoon and cover it with little bit of honey, swallow on empty stomach and drink some warm water.
   - **Turmeric** 1/3 teaspoon with pinch of black pepper and couple of cloves (or pinch of powdered form) with and consume every day.
   - **Star anise** is used mainly as a spice. Make tea with grated or mashed ginger, star anise, cinnamon, pinch of ground clove and add little bit of honey.
   - **Anti-viral herbs** such as oregano, cilantro, dried thyme are great for immunity
   - **Yogurt** provides a good source of gut microbiome (friendly bacteria) and healthy immune system, 70 % of the of them live in the GI tract.
   - **Sea food,** wild caught Alaska salmon, and sardines.
   - **Foods to avoid:** Avoid consumption of sugar substitutes, raw foods like raw meat, raw eggs. Avoid sugar, refined flour and processed oods. These cause explosive growth of virus and cancer cells.

B. **Imrove and strengthenbody immune response**: Use: micronutrients like **zinc, selenium, iron, and** v**itamins A, C, D, E, B-6,** and folate; whole foods like goji berry, broccoli, and turmeric. citrus fruits, berries, broccoli, spinach, beans, mushrooms, red bell peppers, sweet potatoes, shellfish, almonds, hazelnuts, and green tea. These foods are important for older adults, who often eat less of these nutrients and are at risk of Covid-19 infection.
   - **Resveratrol.** Many foods have Resveratrol which helps at body cell level and boosts body immunity; pistachios, grapes, blueberries, cranberries, strawberries, and even cocoa and dark chocolate, and polyphenols containing fruits,
   - **Powerful antioxidant** Citrus fruits, berries, broccoli, spinach, mushrooms, red bell peppers, shellfish, beans, almonds, hazelnuts, turmeric and green tea.

C. **Other things to do:**
   - **Stop use of toxins: S**moking, **Al**cohol **D**rugs (produce **SAD** results, especially when used with **S**tandard **A**merican **D**iet). Smoking and emphysema attract more infections and with more severity.
   - **Sleep:** Must improve and get 7-9 hours of **restful** sleep to help boost immunity, and physical energy. Brain CSF is cleansed during the sleep; toxins are removed and help memory next day.
   - **Work your best efforts to reduce stress** and it does boost immunity.
   - **Exercise daily** including 5-10 min (or as much possible) of walk every hour, every day.
   - **Normalize *(a must do list)***
     1. body weight
     2. blood pressure
     3. blood sugar: *high sugar attracts viral infections, Diabetic have higher complications*
     4. blood cholesterol

Action	Table: 10 Healthy things to do for strengthening Immune System
STOP	**S**aturated fats, Sugar, Salt (to minimum), Synthetic products for consumption, Stress **T**oxins: **S**moking, **A**lcohol, **D**rugs. **SAD** and **S**tandard **A**merican **D**iet (inflammation) - **SAD** **O**besity, Overeating (stop eating when still hungry), Oil (seed oil) consumption **P**rocessed or refined (flour: cookies, cakes, bread, pizza etc.) and unhealthy foods
REDUCE	**R**ancid foods (oils, nuts, seeds (produce oxidative elements) **E**ggs (2-3/week) **D**ehydration (take 80-100 oz of water, unless medical restriction), Dairy products, Desert **U**nnecessary use of self-medications **C**alories intake, Cakes, Corn products, Canned foods (unless have to) **E**nd snacking in-between meals
ADD	**A**nti-oxidant foods and supplements, Anti-inflammatory foods **D** vitamin (D and D3) from foods and plant based supplements if needed **D**ark chocolate without sugar (100 % Cacao (no sugar) 1 cup 1-2/day
INCREASE	**I**mmune boosting foods (Turmeric (with black pepper – better absorption), Garlic, Red Onion, Ginger, Cherry tomatoes); Cloves, Red pepper **N**uts (Walnuts, almonds, chestnuts, Nitrous oxide foods (beets, relaxes arteries) **C**olorful (deep colors) vegetables, Cilantro, Cucumbers, Cauliflower (all Cruciferous veg **R**ed Peppers (hot chili and bell pepper, both kind) **E**xercise, Energize body physically and with new education (learning) **A**nti-inflammatory foods (dark green leafy veg), Avocados, Activities **S**leep (restful, 7-9 hrs/day), Seeds (Flaxseed, Chia, Sunflower, Hemp), Spices, Salad food **E**nvironmental cleansing, Education about health
FAST	**F**ast periodically each 14-16 hrs long, Fitness, Fruits (like Papaya, Kiwi, Berries, Oranges) o Fasting for: 14-16 hrs – promotes immunity o Fasting for: 16-18 hrs – above + promotes cell Autophagy (removes dead cell debris) o Fasting: for 24 hrs – (eatonce/day above + promotes growth of body stem cells to promote repair and slows down growth of cancer cells (longer fasting better) **A**ctive all day **S**piritual enhancement and Social improvement **T**urn fats into calories and energy with exercise, Tea (green, Nettle)

1. ***Fasting helps → <u>Reduce:</u> 1. body inflammation, 2. viral & cancer cell replication, blood sugar***
2. ***Fasting helps → <u>Increase</u>: Immune system response, growth of body's own stem cells***

26. Travel[49]

Travelling gives a high risk in overcrowded places to exchanging germs. High risks people avoid such places instead of regretting it later. CDC and other organizations have issued guidelines.

- **Level 2 travel:** "Level 2" travel notice globally, which includes the United States. This means the organization recommends that vulnerable groups — including those who are immunocompromised or over the age of 65 — postpone any nonessential travel. If you're sick, you also should not travel.

[49] ***Centers for Disease Control and Prevention guidelines***

- **Level 3 travel:** The CDC recommends that people, particularly those with other health conditions, avoid or defer all cruise ship travel worldwide. People should avoid visiting what are considered "Level 3" areas where there's widespread transmission, such as China, Italy, Korea and Iran, Harry said. The White House has also authorized a travel ban on Europe for 30 days at this time.

27. Recovery from COVID-19 virus infection

- No one can say for certain that the spread of the coronavirus will slow down or be less severe once spring or summer arrives. Nobody knows when will SARS-CoV-2 viral load peak.
- From amongst 721,584 cases across the globe, 34,00066 died, 149,122 people have recovered as of morning of **29 March 2020** 9 pm (case tracker from Johns Hopkins University)[50] See the numners as of today on the last page

28. Death rate from COVID-19 [51]

- **COVID-19** is closely related to the SARS and MERS viruses that have caused past pandemics, however the mortality rate for COVID-19 is higher than the other two viruses, (WHO).
- **Some countries** – like China and Korea have very substantial counter measures in place and new daily confirmed deaths have declined[iii]. Many other countries do not have enough services so the numbers are quickly rising.
- **From the experience in China:** Risk factors for severe illness are not yet clear, although older patients and those with chronic medical conditions may be at higher risk for severe illness.
  - Among more than 44,000 confirmed cases of COVID-19 in China as of Feb 11, 2020, most patients aged 30–69 years (77.8%), and approximately 19% were severely or critically ill.
  - **Case fatality for patients who develope**d respiratory failure, septic shock, or multiple organ dysfunction was almost 50%.
  - **Case-fatality proportion** among cases aged ≥60 years was: 60-69 years: 3.6%; 70-79 years: 8%; ≥80 years: 14.8%. Patients who reported no underlying medical conditions had an overall case fatality of 0.9%, but

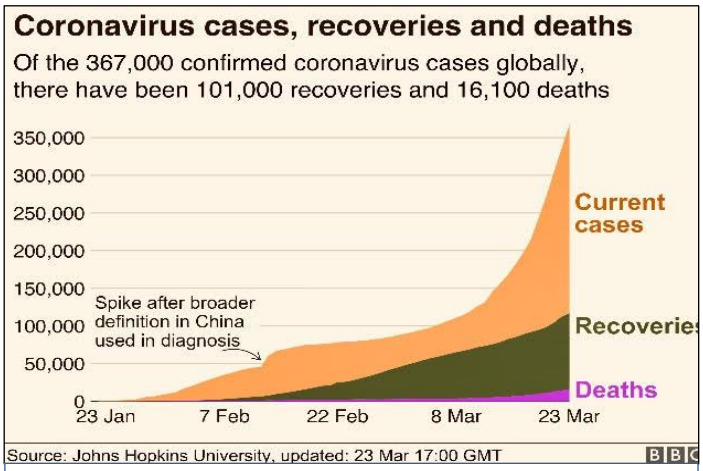


Fig. 14 Recovery and death from COVID-19

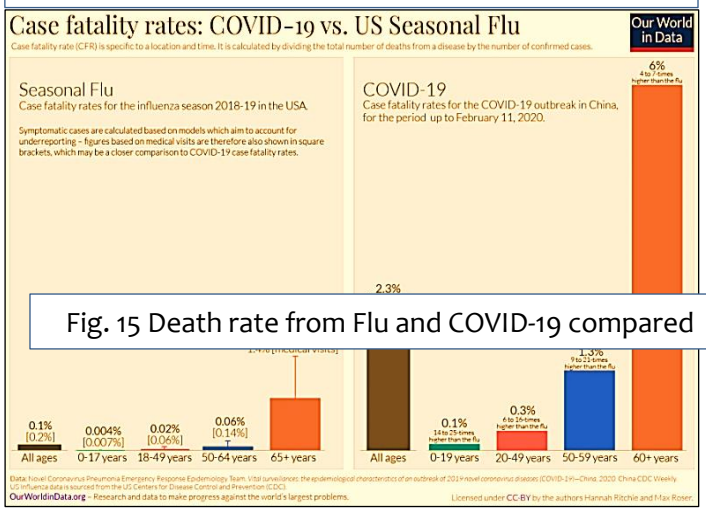


Fig. 15 Death rate from Flu and COVID-19 compared

[50] *https://www.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6*

[51] *Max Roser, Hannah Ritchie and Esteban Ortiz-Ospina (2020) - "Coronavirus Disease (COVID-19) – Statistics and Research". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/coronavirus' [Online Resource]*

case fatality was higher for patients with comorbidities: 10.5% for those with cardiovascular disease, 7% for diabetes, and 6% each for chronic respiratory disease, hypertension, and cancer.

- **In the U.S. A. the death rate (at this time) from:**
  - Seasonal flu kills 1 in a thousand people (0.1%)
  - COVID-19 is currently estimated to kill at least 10 people per thousand infected (1%). "It's about ten times more lethal than the seasonal flu"[52]
  - Lockdown in USA as of today 30 March 2020 has been extended for another 30 days to the end of April.

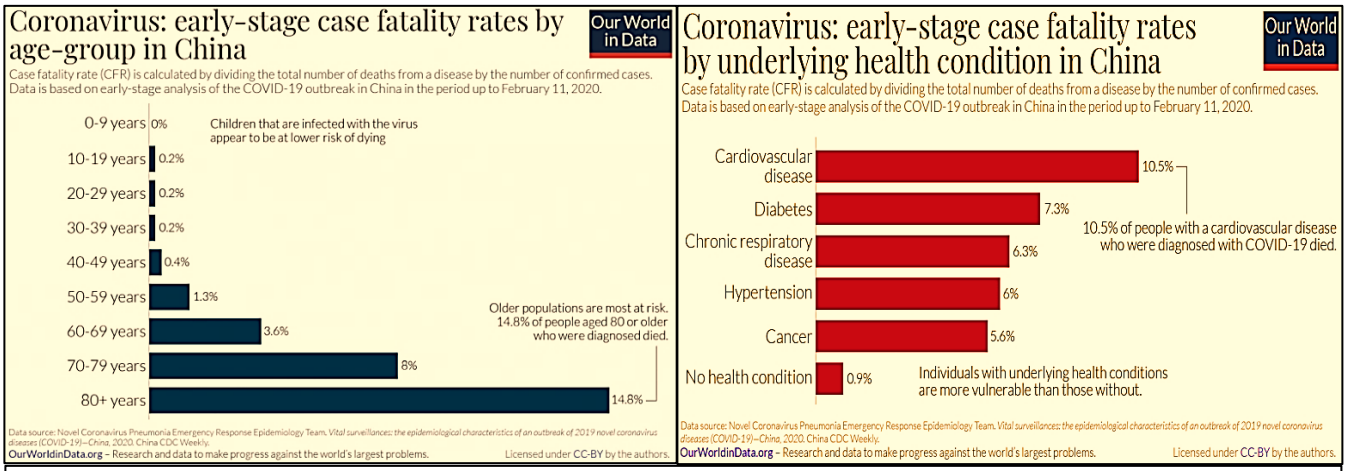


Fig. 16 Fatality rate in COVID-19 Corona virus infection data from China

29. Immunity to Corona virus infection (Vaccines)

Future infections (Re-infection): The virus appears to be mutating slower than the flu, at one to two mutations per month, and we don't know if it will be affected by seasonal weather and behaviors. As of now no one has any vaccine against infection or reinfection.

COVID-19 infection and built up immunity against it:

- **Detecting antibodies** to the virus offers us another way to diagnose. The Food and Drug Administration (FDA) approved the use of five (5) Rapid Test Kits for COVID-19[53]
- **Vaccines.** There is no vaccine against COVID-19 virus at this time. For vaccines that could prevent COVID-19, Dr. Fauci said it will take at least a year to a year and a half for a vaccine to be available to the public. Vaccine development requires a multi-stage process of human trials. "It will take three or four months to determine if [a vaccine option] is safe," he said, and at least another eight months to gauge whether it's effective.

30. Return of COVID-19

The body's antibody response, triggered by the onset of a virus, means it is unlikely that patients who have recovered from COVID-19 can get re-infected so soon after contracting the virus. Antibodies are normally produced in a patient's body around seven to 10 days after the initial onset of a virus.[54]

---

[52] *Dr. Anthony Fauci, director of the National Institutes of Allergy and Infectious Disease, congressional testimony 11 March 2020*

[53] https://www.fda.gov.ph/fda-approves-rapid-antibody-test-kits-for-covid-19/ . *30 March 30, 2020.*

[54] *Virologist at the University of Texas Medical Branch.*

Possibility of COVID-19 becoming a cyclical disease[55]. Anthony Fauci, MD, "National Institute of Allergy and Infectious Diseases and a member of the White House's coronavirus task force," warned Americans to "be prepared for the possibility that COVID-19 could become a seasonal disease." During a White House briefing, coronavirus task force," warned Americans to "be prepared for the possibility that COVID-19 could become a seasonal disease." During a White House briefing,

- Dr. Fauci "told reporters...that more cases of the disease caused by the novel coronavirus have begun to appear in the southern hemisphere, which is transitioning into colder seasons." Should there be "an outbreak in the southern hemisphere, Fauci said 'it will be inevitable' that the disease will make a comeback even if it is temporarily stopped."
- At the current rate of spread and the current cycle is likely last till next year.
- It has been reported that in China, some

References (Foot Notes):

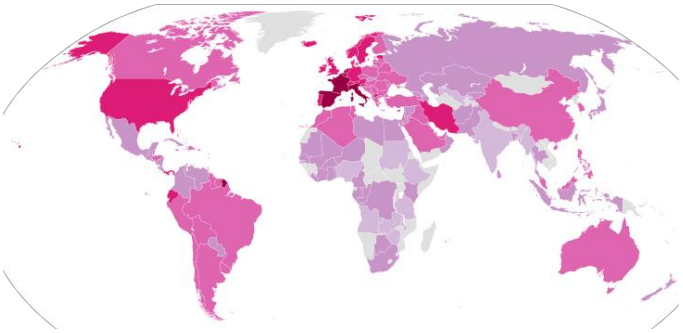
[i] Spanish Flue of 1918. Nickol, M.E., Kindrachuk, J. (2019) – A year of terror and a century of reflection: perspectives on the great influenza pandemic of 1918–1919. BMC Infect Dis 19, 117 (2019).

[ii] Michaelis, M., Doerr, H.W. & Cinatl, J. Novel swine-origin influenza A virus in humans: another pandemic knocking at the door. Med Microbiol Immunol 198, 175–183 (2009).

[iii] Measures in China to control disease. https://en.wikipedia.org/wiki/2019%E2%80%9320_coronavirus_pandemic_in_mainland_China#Early_response_by_Wuhan

Other sources consulted, reviewed

1. **case tracker that Johns Hopkins University**
2. **CDC**
3. **American College of Cardiology**
4. **University of Michigan guidelines for COVID-19**
5. **One World Data**
6. **CCA – ACC joint Sessions**
7. **China data Recommendations: https://www.alibabacloud.com/universal-service/pdf_reader?spm=a3c0i.14138300.8102420620.dreadnow.6df3647f3tEVEv&pdf=Handbook_of_COVID_19_Prevention_en_Mobile.pdf**



Category	March 19, 2020 8:11	1 April 2020 5:20 pm	7 April 2020 8:00 pm
Diagnosed	244,421	932,605	1,345,048
Dead	11,010	46,810	81,200
Recovered		193,177	298,389

[55] *Fauci says US needs to be prepared for coronavirus to be cyclical. By Nathaniel Weixel – T he Hill. 03/25/20 07:26 PM EDT*