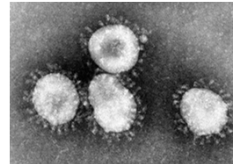


COVID-19 Epidemiology Update

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The Ohio State University Wexner Medical Center

Coronaviruses

- **Hosts: humans, other mammals, birds**
- **Frequent cause of the common cold**
 - **Accounts for 5-10% of adult URIs**
- **Typical symptoms: fever, cough, sore throat**
- **Can cause viral pneumonia or bronchitis**
- **Primarily occur in winter and early spring**
- **Spread by aerosol droplets and contact with secretions**



Coronaviruses

- No vaccines exist
- No *proven* anti-virals
- Treatment is supportive
- Patients should be placed in droplet isolation
- COVID-19 is caused by SARS-CoV-2 virus

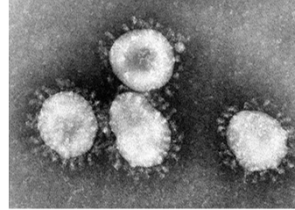


Image courtesy of the CDC

How Is It Transmitted?

Mode of Transmission	Particle Size	Transmissible Distance
Droplet	5-10 μm	< 3 ft
Airborne	< 5 μm	> 3 ft

Lessons from SARS – procedures posing airborne risk*:

- 1. Endotracheal intubation**
- 2. Non-invasive ventilation (CPAP & BiPAP)**
- 3. Amb—bag ventilation**
- 4. Tracheal suctioning before intubation**
- 5. Tracheostomy**

*** PLoS One. 2012; 7(4): e35797**



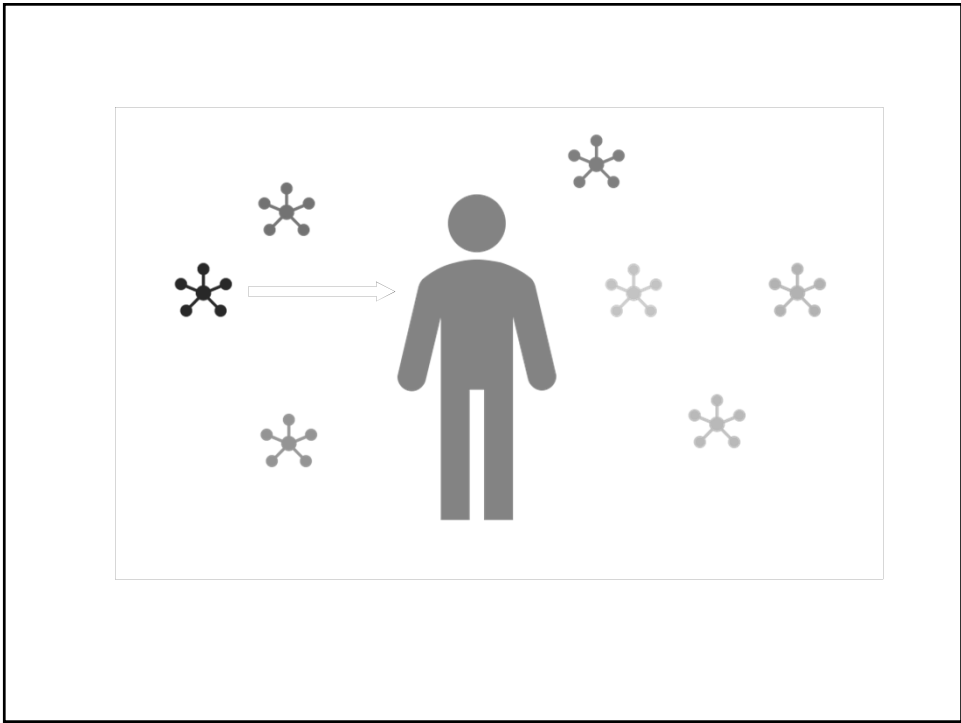
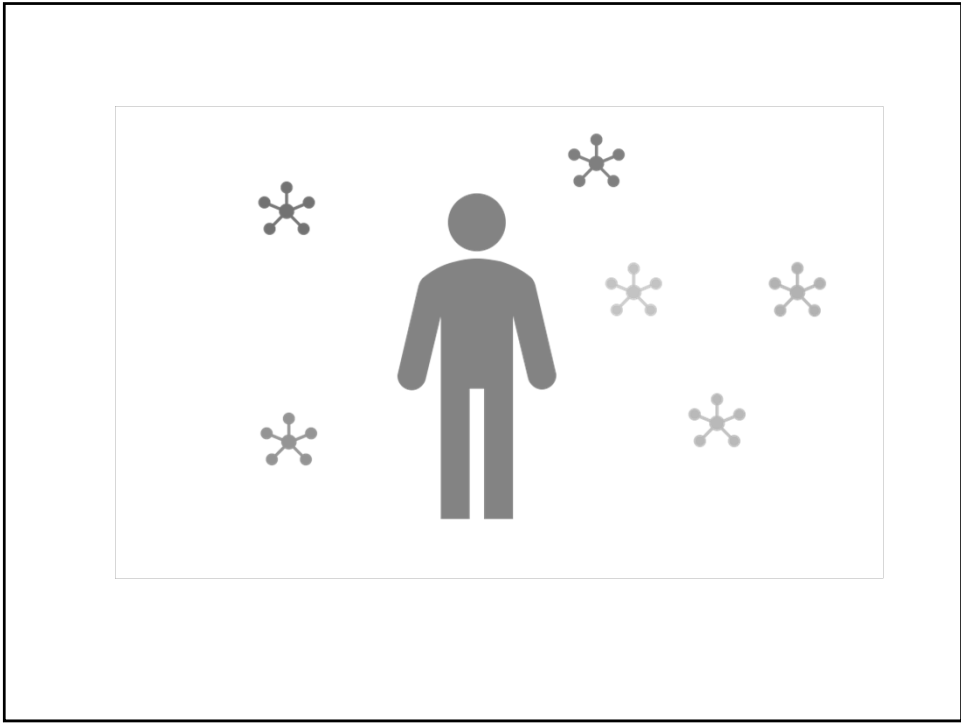
How Long Does SARS-CoV-2 Survive?

Surface Material	Half-Life (hours)	Total Time of Detectability (hours)
Copper	1	8
Cardboard	3	48
Stainless Steel	6	48
Plastic	7	72

N Engl J Med March 17, 2020

**Coronaviruses can
go rogue:**

**SARS
MERS**



SARS (Severe Acute Respiratory Syndrome) ❄️

- Onset November 2002
- Last known case 2004
- Total 8,098 cases with 774 deaths (9.6% mortality)
 - 27 cases in the United States
- Caused by a Coronavirus
- Original viral host: Horseshoe Bats in Yunnan Province, China
 - Civet cats were the intermediary





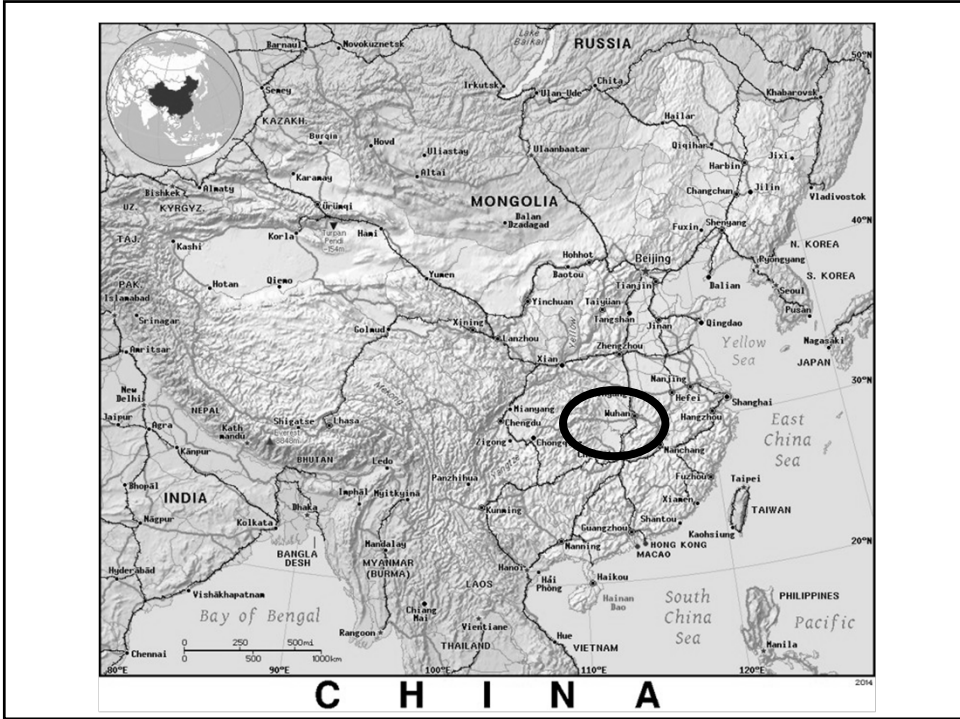
MERS (Middle East Respiratory Syndrome)

- **Onset 2012 in Saudi Arabia**
- **Caused by a Coronavirus**
- **Overall: 1,227 cases, 37% mortality**
- **Saudi Arabia outbreak 2014: 402 cases, 27% mortality**
- **South Korea outbreak 2015: 150 cases, 17% mortality**
- **United States: 2 cases in 2014, both healthcare workers traveling from Saudi Arabia**



COVID-19

- **First case late November 2019**
- **Case mortality rate averaging 5%**
- **Caused by a coronavirus: SARS-CoV-2**
- **Originated in China**

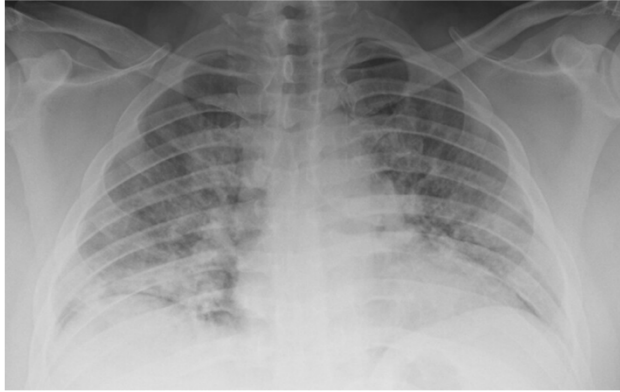




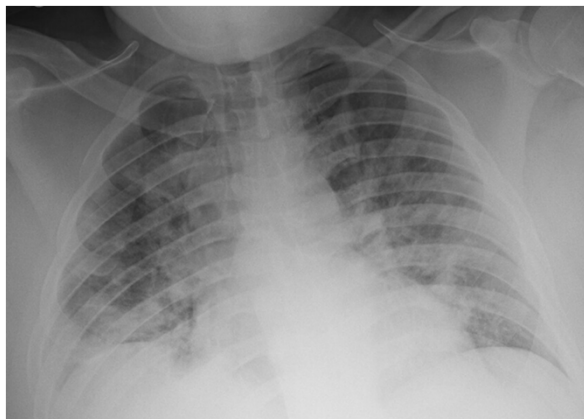
COVID-19 Time Line

- **December 31 – January 3, 2020: 44 cases of pneumonia of unknown cause reported in Wuhan**
- **January 7, 2020: new coronavirus identified**
- **January 13, 2020: Thailand**
- **January 15, 2020: Japan**
- **January 20, 2020: South Korea**
- **January 23, 2020: United States**
- **April 4, 2020: worldwide cases surpass 1 million**

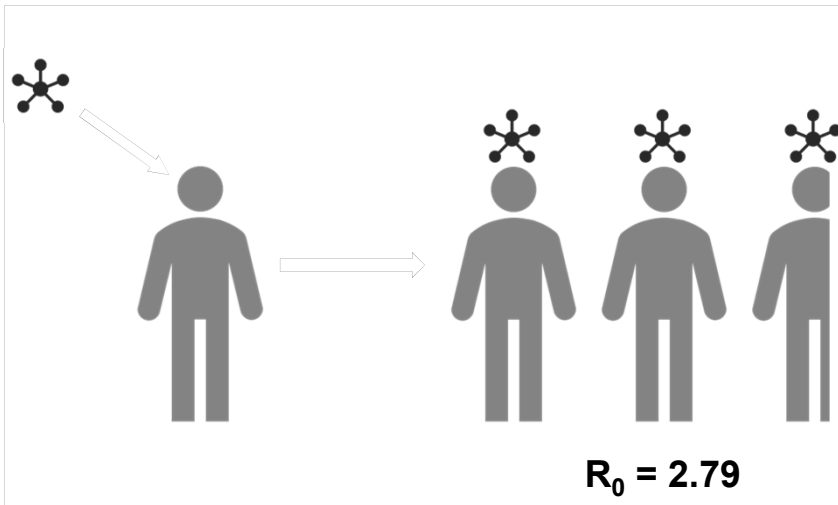
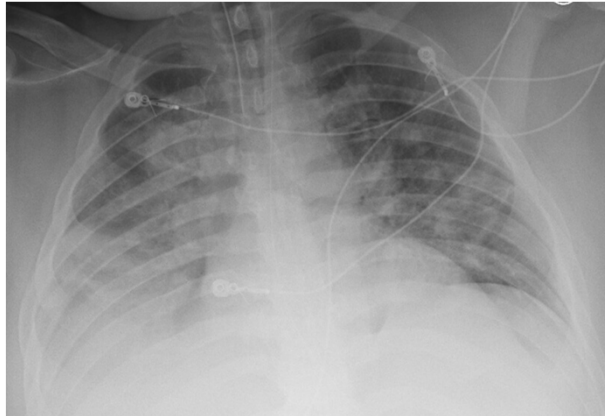
Day #1



Day #2



Day #3

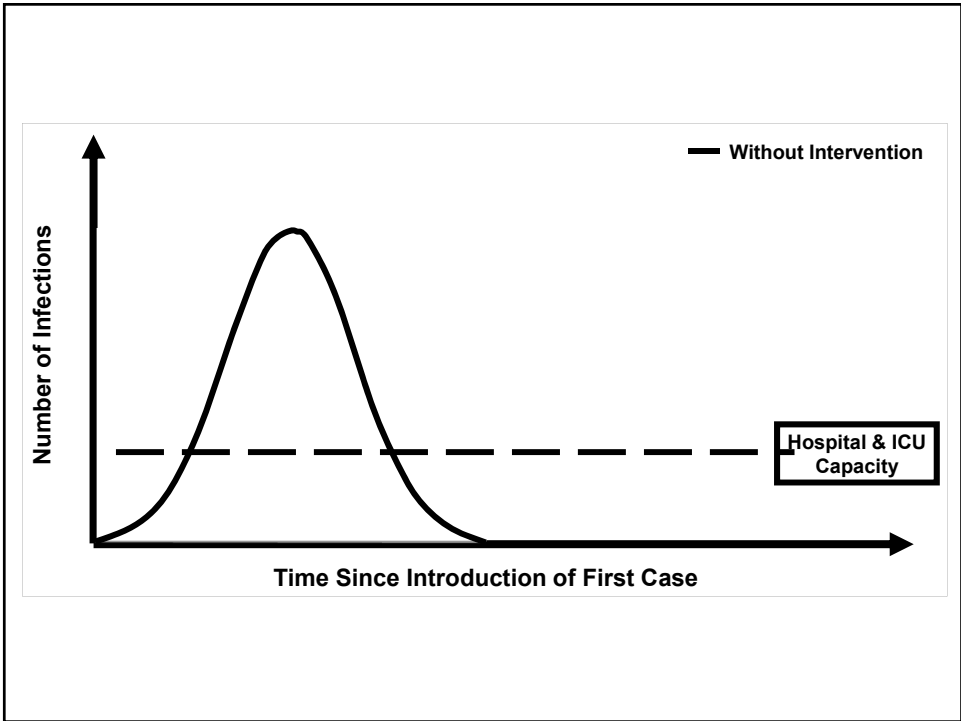
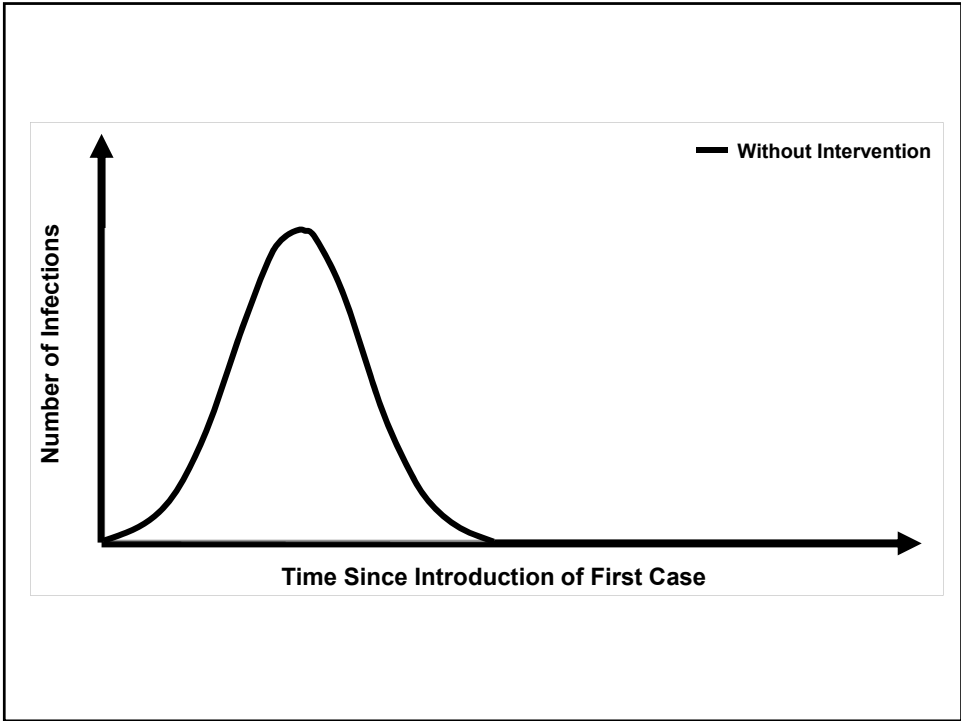




Mary Mallon September 23, 1869 – November 11, 1938

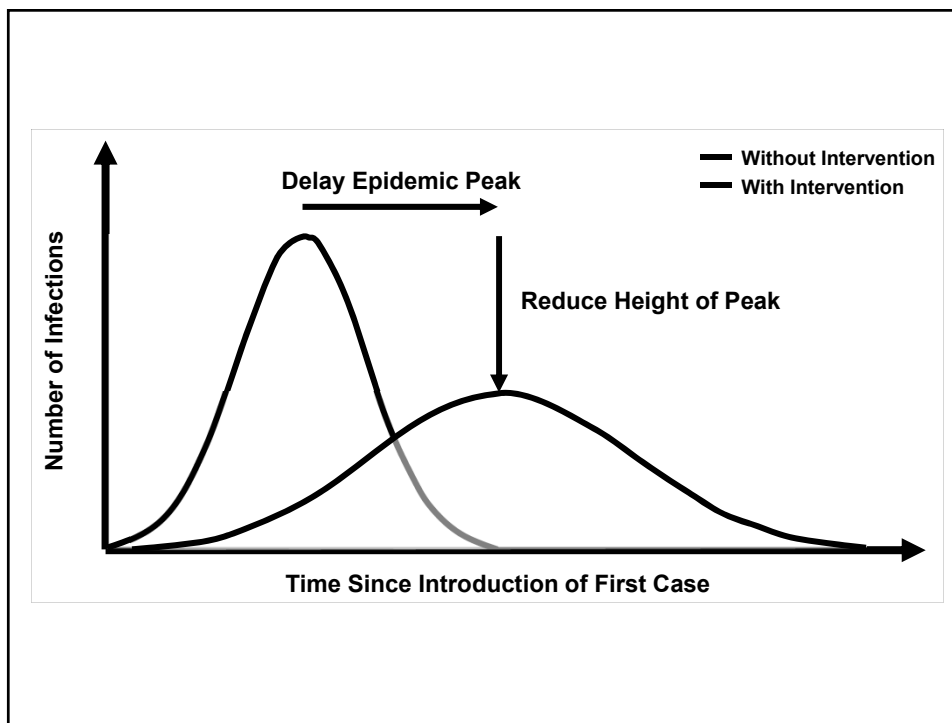
Conditions That Are Ripe For Droplet & Fomite Viral Transmission

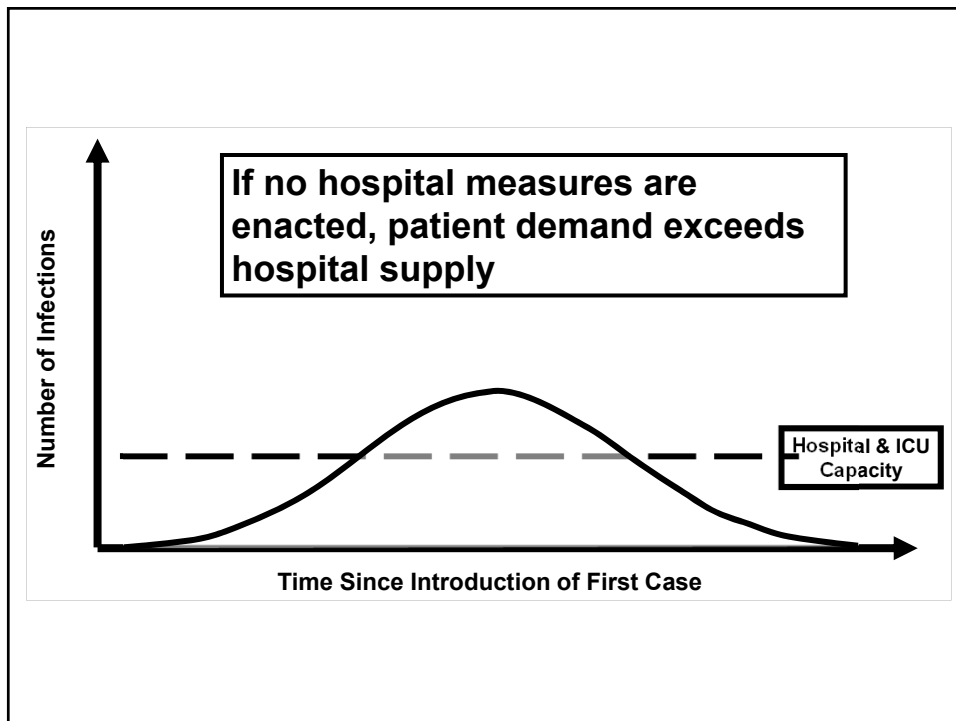
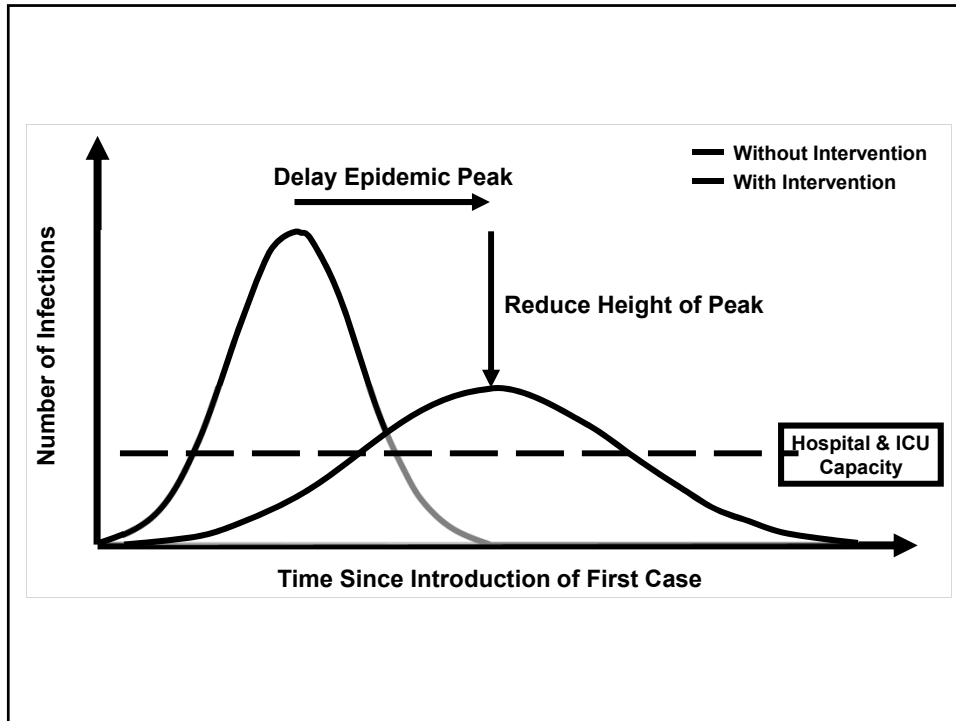
- “Super spreaders” versus “Super Spreader Events”
- Large numbers of people in small indoor areas
- Lots of hand-to-hand contact and hugging
- Passing items with plastic or metal surfaces between multiple people

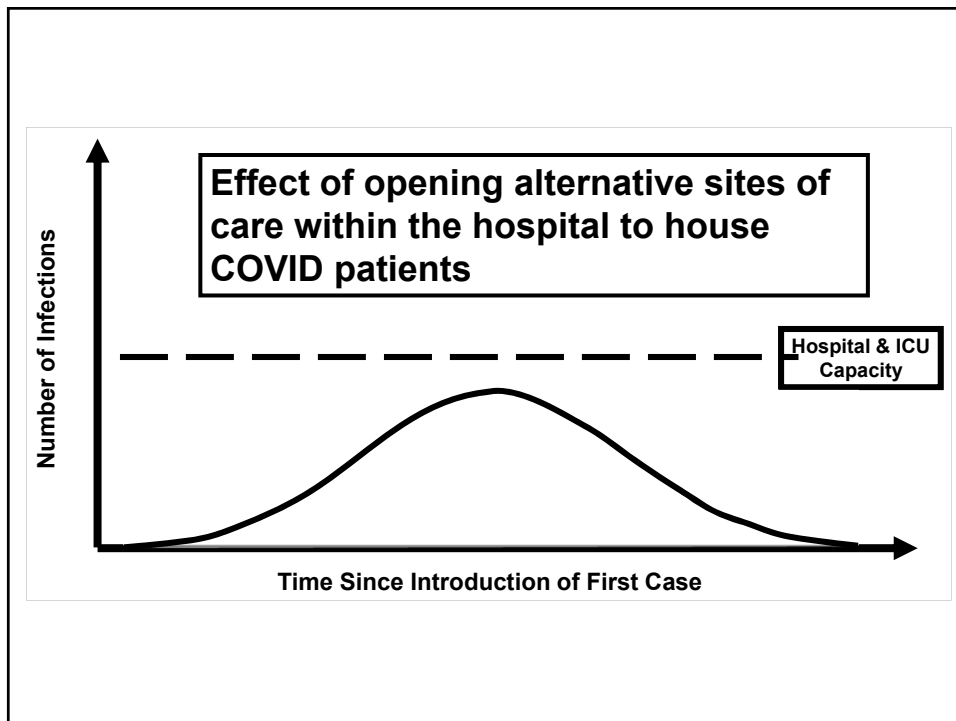
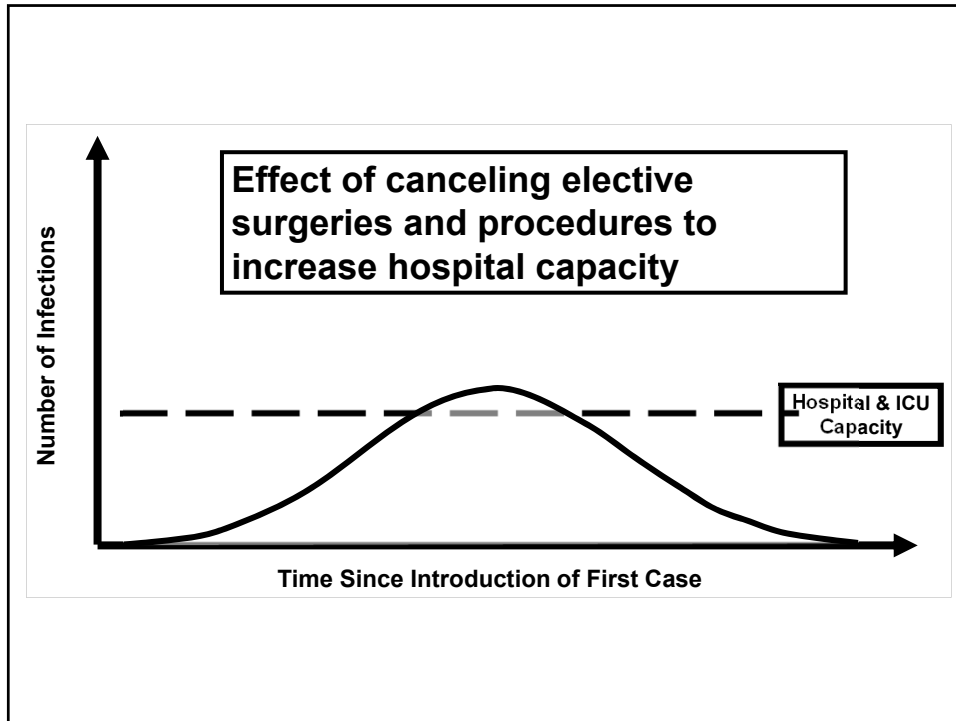


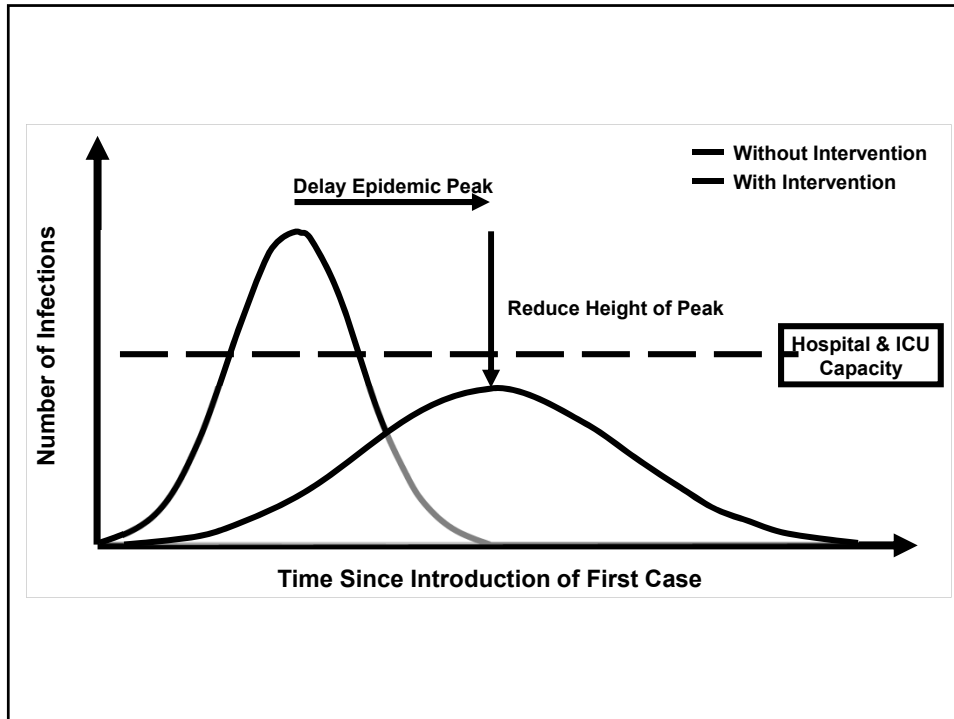
So, How Do You Ensure That You Have Enough Hospital Beds To Handle A Pandemic Surge?

1. Flatten the curve
2. Reduce hospital census before the surge
3. Create new patient care areas in the hospital









Stack Effect

- Long duration of mechanical ventilation results in patients getting “stacked up” in the ICU.
- As pandemic progresses, a larger percentage of COVID-19 inpatients are in the ICUs

COVID-19 Interventions in Ohio

March 3: Arnold Sports Festival canceled

March 9: OSU suspends in-person classes

March 9: First Ohio COVID-19 case

March 12: NCAA tournament canceled

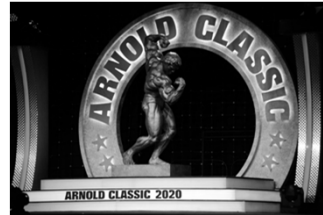
March 14: mass gatherings prohibited

March 14: public schools closed

March 15: restaurant take-out only

March 17: no elective surgeries

March 22: order to stay at home



Preparing your Hospital For A COVID Surge: “Space, Staff, & Stuff”

- 1. Postpone elective surgeries and procedures to create capacity**
- 2. Project ICU needs at maximum hospital capacity**
 - 30-40% of hospital admissions require ICU care at some point**
 - At any given time 20-25% of COVID-19 inpatients are in the ICU**
- 3. Identify what locations in your hospital can become ICUs**
- 4. Train-up nurses and physicians to work in ICUs**
- 5. Identify hospital locations that can be converted to inpatient beds**

Creating Capacity by Postponing Elective Surgeries and Procedures: OSU East Hospital

Tuesday March 3, 2020

- Hospital total occupancy 96%
 - 153 total beds occupied
 - 43 surgical beds occupied
 - 76 medical beds occupied
 - 18 step-down beds occupied
 - 16 ICU beds occupied

• Open beds = 5

Tuesday April 7, 2020

- Hospital total occupancy 42%
 - 68 total beds occupied
 - 29 surgical beds occupied
 - 25 medical beds occupied
 - 6 step-down beds occupied
 - 8 ICU beds occupied

• Open beds = 93

Possible Alternative COVID-19 ICU Sites

What is needed in the room:

- EKG monitors
- Wall suction
- Medical gas outlets
 - Compressed air
 - Oxygen
- Doors

Possible options:

- Step-down nursing units
- Other medical-surgical units
- Operating rooms
- Endoscopy areas
- Cath lab recovery areas
- Pre-op/Post-op recovery areas
- Emergency rooms

Other Possible Alternative Sites of Care

- Sleep labs
- Endoscopy recovery rooms
- Cath lab recovery rooms
- Pre/post-op recovery rooms
- Operating rooms
- Ambulatory clinic areas

Laboratory-Confirmed COVID-19 Associated Hospitalizations

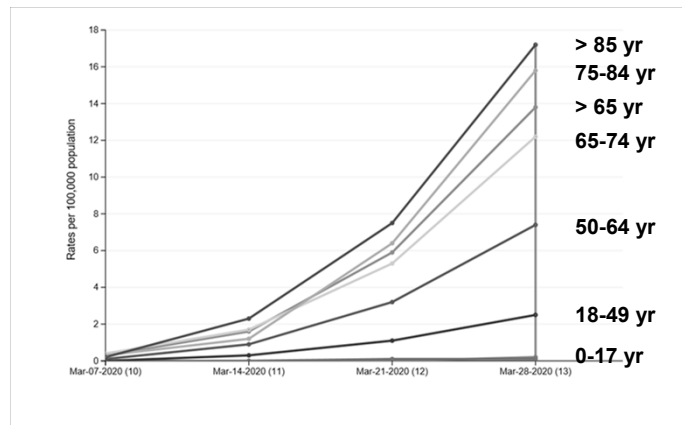


Image: cdc.gov

Other Risk Factors for Hospitalization

- Diabetes
- Hypertension
- COPD
- Coronary artery disease
- Cerebrovascular disease
- Chronic kidney disease
- Smoking

Mortality Rates Vary by Country*

Country	Mortality Rate
China	4.0%
South Korea	1.8%
Italy	12.5%
Spain	9.7%
Iran	6.2%
United States	3.2%
Worldwide	5.6%

*As of first week of April, 2020

Questions For Future Epidemiologists

- **Why do children and young adults have milder disease?**
- **How contagious are patients with mild disease?**
- **Why does the disease cause respiratory failure 10 days after symptom onset?**
- **What causes the “cytokine storm”?**
- **Why is the mortality rate higher in some countries than others?**

For updates:

<https://www.cdc.gov/coronavirus/2019-nCoV/>

<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/>

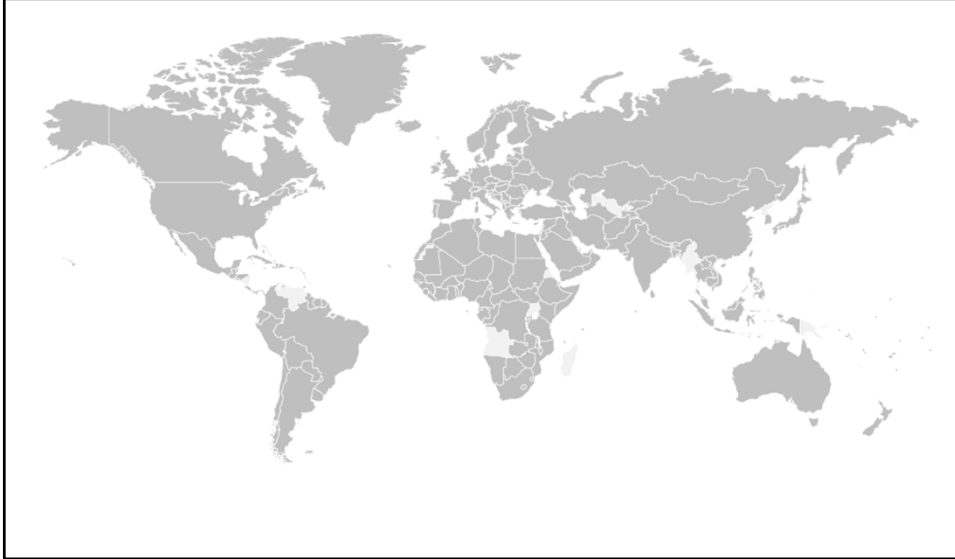
COVID-19 for the Healthcare Provider

Michael Haden, MD
Clinical Instructor in Internal Medicine
Division of Infectious Disease
The Ohio State University Wexner Medical Center

Countries with SARS-CoV-2 as of January 30, 2020



Countries with SARS-CoV-2 as of April 7, 2020



Risk Assessment

- **Initially declared a Public Health Emergency of International Concern on January 30, 2020**
- **On March 11, 2020, COVID-19 was officially characterized as a pandemic by the WHO**

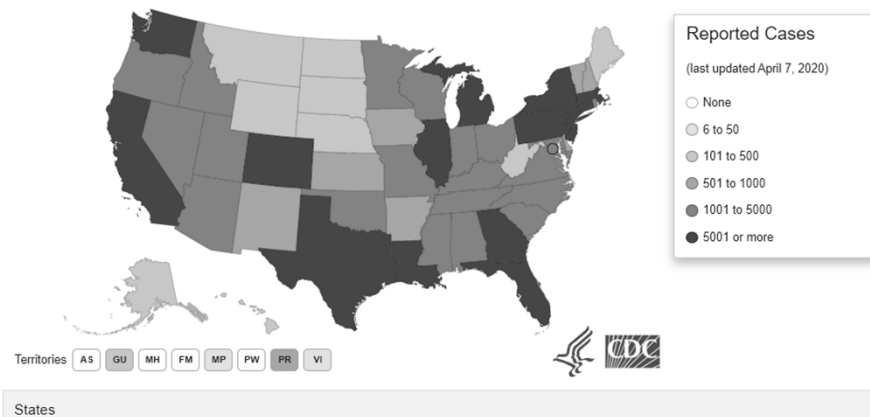
COVID-19 Pandemic

As of April 7th, 2020:

- 1,353,361 confirmed cases world wide
- 79,235 confirmed deaths
- 212 countries, areas or territories with cases

Situation in United States

States Reporting Cases of COVID-19 to CDC*



COVID-19: U.S. at a Glance

As of April 7, 2020

- **Total cases: 395,011**
- **Deaths: 12,754**
- **Cases documented in all 50 states, in addition to U.S territories such as Puerto Rico, U.S Virgin Islands and others**

COVID-19 Symptoms

- **Fever**
- **Myalgias**
- **Cough**
- **Shortness of breath**

Isolation

- **Patients with known or suspected COVID-19 should be placed in a single-person room with the door closed**
- **Airborne isolation rooms should be reserved for patients undergoing aerosolizing procedures**

Testing

- **Initially testing was only available through the CDC**
- **Now there are several commercial COVID-19 tests available, as well as through the state health department**
- **Some institutions have developed their own in house testing**
- **Most common modality is via RT-PCR of nasopharyngeal samples**

Specimen collection

- **Nasopharyngeal swab preferred**
- **Other specimens can be tested as well**
 - **Sputum, though induction of sputum is not recommended**
 - **Lower respiratory tract aspirate or BAL on intubated patients**
- **This can be done in a normal examination room with the door closed, negative airflow is not necessary**

Priorities for Patient Testing

- **Priority 1: Hospitalized patients and symptomatic healthcare workers**
- **Priority 2: Symptomatic patients who:**
 - **Are greater than 65, those in long-term care facilities, or those with underlying conditions**
 - **Symptomatic first responders**
- **Priority 3: Individuals in community who do not meet above categories or those with mild symptoms only**
- **Non-priority: Asymptomatic individuals**

Coronavirus COVID-19		PRIORITIES FOR TESTING PATIENTS WITH SUSPECTED COVID-19 INFECTION	
COVID-19 Symptoms: Fever, Cough, and Shortness of Breath			
PRIORITY 1 Ensures optimal care options for all hospitalized patients, lessen the risk of healthcare-associated infections, and maintain the integrity of the U.S. healthcare system		1	
<ul style="list-style-type: none"> Hospitalized patients Healthcare facility workers with symptoms 			
2		PRIORITY 2 Ensures those at highest risk of complication of infection are rapidly identified and appropriately triaged	
		<ul style="list-style-type: none"> Patients in long-term care facilities with symptoms Patients 65 years of age and older with symptoms Patients with underlying conditions with symptoms First responders with symptoms 	
PRIORITY 3 As resources allow, test individuals in the surrounding community of rapidly increasing hospital cases to decrease community spread, and ensure health of essential workers		3	
<ul style="list-style-type: none"> Critical infrastructure workers with symptoms Individuals who do not meet any of the above categories with symptoms Healthcare facility workers and first responders Individuals with mild symptoms in communities experiencing high numbers of COVID-19 hospitalizations 			
NON-PRIORITY	NON-PRIORITY <ul style="list-style-type: none"> Individuals without symptoms 		
For more information visit: coronavirus.gov			

Healthcare personnel

- **Testing of healthcare personnel with even mild symptoms should be considered if potential exposure to COVID-19**

Infection Prevention and Control

- **Limit potential facility exposure:**
 - **Cancel elective procedures**
 - **Use telemedicine when possible**
 - **Limit points of entry**
 - **Manage visitors and screen all patients for respiratory symptoms**
- **Isolate symptomatic patients**
- **Protect healthcare personnel**

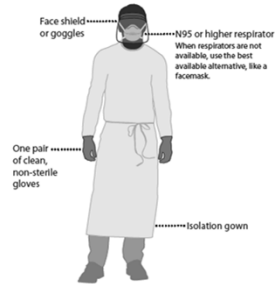
Personal Protective Equipment (PPE)

For general patient care:

- **Gown**
- **Gloves**
- **Droplet mask or mask with separate goggles or face shield**
 - **Glasses are not sufficient for eye protection**

COVID-19 Personal Protective Equipment (PPE) for Healthcare Personnel

Preferred PPE – Use N95 or Higher Respirator



Acceptable Alternative PPE – Use Facemask



[cdc.gov/COVID19](https://www.cdc.gov/COVID19)

PPE

- **N95 respirators or PAPRs should be reserved for aerosol-generating procedures**

Aerosol generating procedures

- **Procedures:**
 - Intubation / Extubation
 - Endoscopy (EGD, Bronchoscopy, TEE)
 - CPR
 - Tracheostomy placement
- **Bedside Care:**
 - Nasopharyngeal swab (testing for COVID)
 - NG / OG tube placement
 - Suctioning, sputum induction or tracheal aspiration

PPE

- **Follow the recommended sequence for safely donning and doffing PPE to avoid self contamination**
- **Hand hygiene should be performed before and after all patient contact, before putting on and after removing PPE**
 - **Alcohol based hand sanitizer or soap and water**

Donning (putting on the gear):

More than one donning method may be acceptable. Training and practice using your healthcare facility's procedure is critical. Below is one example of donning.

1. **Identify and gather the proper PPE to don.** Ensure choice of gown size is correct (based on training).
2. **Perform hand hygiene using hand sanitizer.**
3. **Put on isolation gown.** Tie all of the ties on the gown. Assistance may be needed by another HCP.
4. **Put on NIOSH-approved N95 filtering facepiece respirator or higher (use a facemask if a respirator is not available).** If the respirator has a nosepiece, it should be fitted to the nose with both hands, not bent or tented. Do not pinch the nosepiece with one hand. Respirator/facemask should be extended under chin. Both your mouth and nose should be protected. Do not wear respirator/facemask under your chin or store in scrubs pocket between patients.*
 - » **Respirator:** Respirator straps should be placed on crown of head (top strap) and base of neck (bottom strap). Perform a user seal check each time you put on the respirator.
 - » **Facemask:** Mask ties should be secured on crown of head (top tie) and base of neck (bottom tie). If mask has loops, hook them appropriately around your ears.
5. **Put on face shield or goggles.** Face shields provide full face coverage. Goggles also provide excellent protection for eyes, but fogging is common.
6. **Perform hand hygiene before putting on gloves.** Gloves should cover the cuff (wrist) of gown.
7. **HCP may now enter patient room.**

Doffing (taking off the gear):

More than one doffing method may be acceptable. Training and practice using your healthcare facility's procedure is critical. Below is one example of doffing.

1. **Remove gloves.** Ensure glove removal does not cause additional contamination of hands. Gloves can be removed using more than one technique (e.g., glove-in-glove or bird beak).
2. **Remove gown.** Untie all ties (or unsnap all buttons). Some gown ties can be broken rather than untied. Do so in gentle manner, avoiding a forceful movement. Reach up to the shoulders and carefully pull gown down and away from the body. Rolling the gown down is an acceptable approach. Dispose in trash receptacle.*
3. **HCP may now exit patient room.**
4. **Perform hand hygiene.**
5. **Remove face shield or goggles.** Carefully remove face shield or goggles by grabbing the strap and pulling upwards and away from head. Do not touch the front of face shield or goggles.
6. **Remove and discard respirator (or facemask if used instead of respirator).*** Do not touch the front of the respirator or facemask.
 - » **Respirator:** Remove the bottom strap by touching only the strap and bring it carefully over the head. Grasp the top strap and bring it carefully over the head, and then pull the respirator away from the face without touching the front of the respirator.
 - » **Facemask:** Carefully untie (or unhook from the ears) and pull away from face without touching the front.
7. **Perform hand hygiene after removing the respirator/facemask** and before putting it on again if your workplace is practicing reuse.

**Facilities implementing reuse or extended use of PPE will need to adjust their donning and doffing procedures to accommodate those practices.*

Optimizing PPE supply

- **Cancel elective and non-urgent procedures / appointments**
- **Reserve PPE for healthcare workers**
- **Use re-usable PPE that can be reprocessed if able**
- **Consider extending use of respirators, facemasks and eye protection beyond a single patient contact**

Treatment

- **There are no drugs or other therapeutics approved by the FDA to prevent or treat COVID-19**
- **Clinical management includes infection prevention measures and supportive care**

Experimental therapies

Hydroxychloroquine and Chloroquine

- **Under investigation in clinical trials for pre-exposure / post-exposure prophylaxis of SARS-CoV2 exposure and treatment of patients with COVID-19**
- **FDA issued Emergency Use Authorization (EUA) for treatment of hospitalized patients with COVID-19, for whom a clinical trial is not available**
- **EUA does NOT include use for pre or post-exposure prophylaxis**
- **Combination with Azithromycin not advised due to QTc prolongation**

Experimental therapies

Remdesivir

- **Investigational antiviral therapy currently being explored in clinical trials and through an expanded access program from the manufacturer, Gilead Sciences**

Experimental therapies

Lopinavir / ritonavir

- **Protease inhibitor used as component of some HIV regimens**
- **Patients must be screened for HIV prior to use**
- **Multiple drug-drug interactions, diarrhea is common**

Experimental therapies

Immune modulators, such as tocilizumab

Corticosteroids are NOT recommended for treatment of COVID-19 unless necessary for other clinical indications (COPD, asthma, etc).

- **Corticosteroid use has been shown to prolong viral replication**

Experimental therapies

Convalescent plasma from individuals who have recovered from COVID-19

Experimental therapies

These therapies are all experimental and have various risks and toxicities associated with them.

Use should be determined on individual case by case basis and discussed with Infectious Disease team if available.

Vaccine

- **Efforts to create a vaccine against COVID-19 are underway**
- **Currently only in phase 1 clinical trials**
- **If found to be effective, will not be available any time in foreseeable future**

Prevention

- **Wash your hands**
- **Avoid touching your face**
- **Cover your cough**
- **Stay away from others if you are ill**

Social distancing

- **Stay at least 6 feet from other people**
- **Do not gather in groups (large or small)**
- **Stay out of crowded places and avoid mass gatherings**

Discontinuing Isolation Precautions

- **Test based strategy:**
 - **Resolution of fever (without anti-pyretics) and improvement in respiratory symptoms AND**
 - **Two negative nasopharyngeal swabs for SARS-CoV2 collected at least 24 hours apart**
- **Non-test based strategy:**
 - **At least 3 days (72 hours) since recovery (resolution of fever and improvement of respiratory symptoms) AND**
 - **At least 7 days since symptoms first appeared**