

SARS Implementation Plan for COVID-19 (disease), SARS CoV-2 (virus)

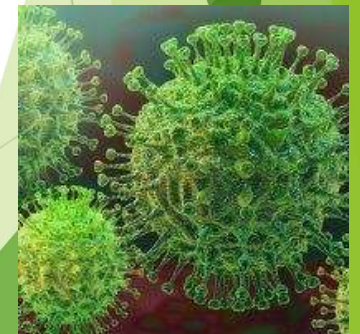
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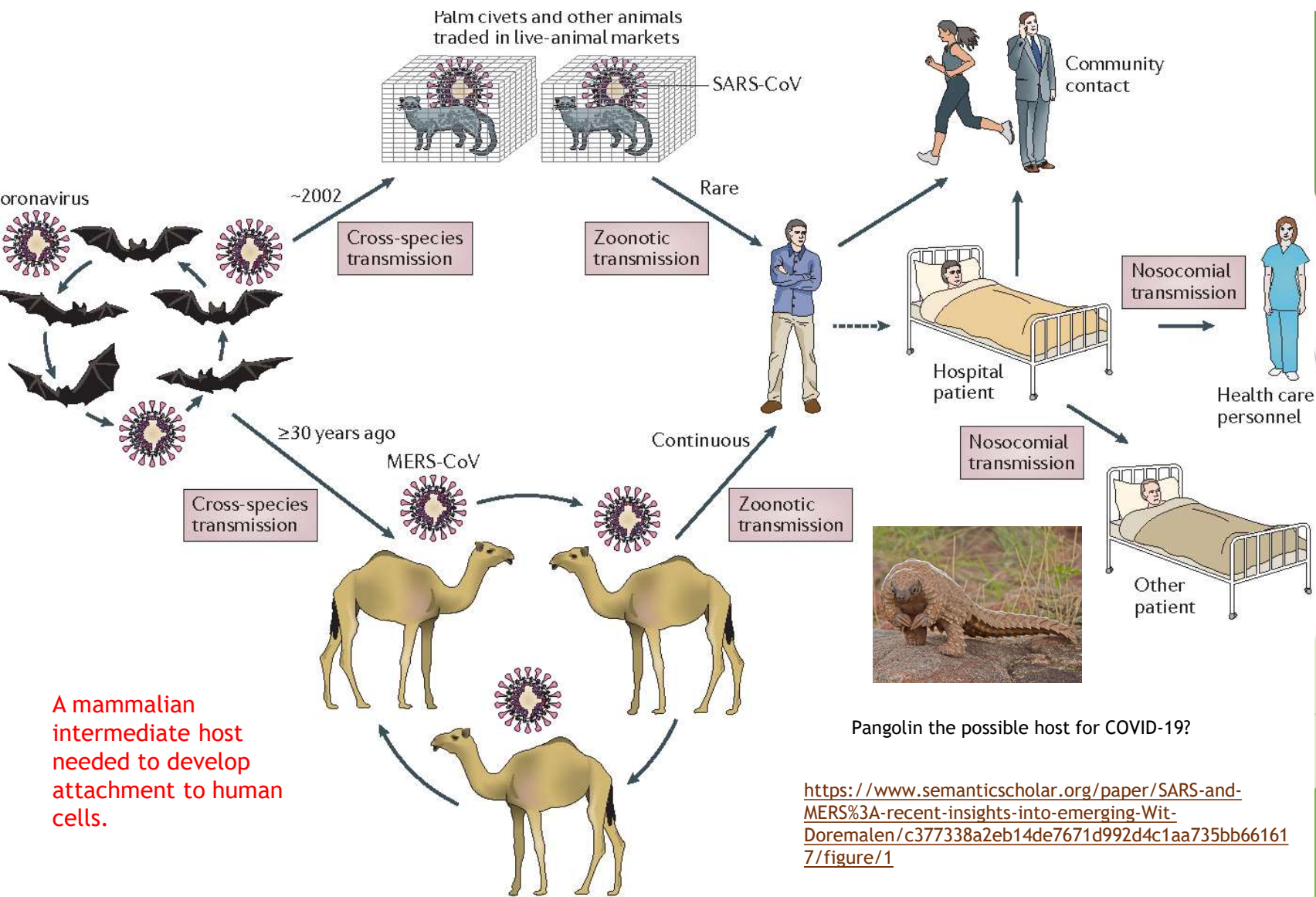
Updated 3/03/20



Where and What?

What have we learned in 8 weeks?





A mammalian intermediate host needed to develop attachment to human cells.

Figure 2 | The emergence of SARS-CoV and MERS-CoV. Bats harbour a wide range of coronaviruses, including severe acute respiratory syndrome coronavirus (SARS-CoV)-like and Middle East respiratory syndrome coronavirus (MERS-CoV)-like viruses. SARS-CoV crossed the species barrier into masked palm civets and other animal in live-animal markets in China; genetic analysis suggests that this occurred in late 2002. Several people in close proximity to palm civets became infected with SARS-CoV. A MERS-CoV ancestral virus crossed the species barrier into dromedary camels; serological evidence suggests that this happened more than 30 years ago. Abundant circulation of MERS-CoV in dromedary camels results in frequent zoonotic transmission of this virus. SARS-CoV and MERS-CoV spread between humans mainly through nosocomial transmission, which results in the infection of health care workers and patients at a higher frequency than infection of their relatives.

Figure 2 | The emergence of SARS-CoV and MERS-CoV. Bats harbour a wide range of coronaviruses, including

<https://www.semanticscholar.org/paper/SARS-and-MERS%3A-recent-insights-into-emerging-Wit-Doremalen/c377338a2eb14de7671d992d4c1aa735bb661617/figure/1>

Disease Natural History

- ▶ Infection at time 0 to excreting virus 24-18 hrs. later (10^8 virus per ml)
- ▶ Asymptomatic infection for up to 4 days (or minimal symptoms)
- ▶ Onset of noticeable disease—about day 5.3
- ▶ For the 20% that becomes seriously ill, intubation about day 8

Disease Natural History

- ▶ Ventilator support for about 2 weeks and death occurs in 10% of those admitted about post admission day 21.
- ▶ NOTE: The disease course is 14 to 28 days.
 - ▶ Viral shedding duration unknown
 - ▶ Environmental persistence about 5-6 days
 - ▶ Cleaners work

Fatality

- ▶ Varies for 2019-nCoV from 2.3-11%
- ▶ 2.3% is general population
 - ▶ Presuming USA pop us about 350 mill, that would be 8 million deaths
 - ▶ Extrapolating from influenza infections, that is still 800,000-1.2 million—This death rate does not reality test against China/ South Korea.
- ▶ 10% mortality for those admitted to the hospital
- ▶ 80% have mild disease, approximately 20% develop severe disease; kids appear to tolerate very well
- ▶ Reasons for death are unknown
- ▶ Elderly >80 with underlying cardio-pulmonary disease are at highest risk
- ▶ Children do relatively well; spread infection widely

Spread



The history of SARS

- ▶ Dr. Liu Jianiun was on staff at Sun Yat-Sen Memorial Hospital in Guangdong and cared for SARS patients.
- ▶ Went to Hong Kong Feb 2003 for a family gathering
- ▶ Somewhat ill on 2/21/2003 check in to room 911 on the 9th floor of the Metropole Hotel. Traveled around Hong Kong.
- ▶ 2/22 very ill, died in ICU 3/19/2003
- ▶ 23 other guests became infected from the Metropole hotel, 7 of which were from the same floor. Most never laid eyes on the good doctor.
- ▶ Accounted for 80% of the Hong Kong cases, and exposed guests started epidemics in Toronto Canada, Vietnam, Taiwan, Singapore.

Lessons from SARS 2003

- ▶ Highly infectious—Airborne?
 - ▶ Nebulizers
 - ▶ Bronchoscopy/Aerosol generating procedures
- ▶ Persistence on surfaces
- ▶ WHO-8098 infections with 774 deaths (confirmed and probable)
- ▶ 1 exposure in Toronto lead to 375 cases and 44 deaths, many of them HCW
- ▶ 2 exposures in Vancouver with no HCW infections

Table I. Persistence of coronaviruses on different types of inanimate surfaces.

Type of surface	Virus	Strain / isolate	Inoculum (viral titer)	Temperature	Persistence	Reference
Steel	MERS-CoV	Isolate HCoV-EMC/2012	10^5	20°C	48 h	[21]
				30°C	8 – 24 h	
	TGEV	Unknown	10^6	4°C	≥ 28 d	[22]
				20°C	3 – 28 d	
				40°C	4 – 96 h	
				4°C	≥ 28 d	
MHV	Unknown	10^6	20°C	4 – 28 d	[22]	
			40°C	4 – 96 h		
Aluminium	HCoV	Strain 229E	10^3	21°C	5 d	[23]
	HCoV	Strains 229E and OC43	5×10^3	21°C	2 – 8 h	[24]
Metal	SARS-CoV	Strain P9	10^5	RT	5 d	[25]
Wood	SARS-CoV	Strain P9	10^5	RT	4 d	[25]
	SARS-CoV	Strain P9	10^5	RT	4 – 5 d	[25]
Paper	SARS-CoV	Strain GUV6109	10^6	RT	24 h	[26]
			10^5		3 h	
			10^4		< 5 min	
Glass	SARS-CoV	Strain P9	10^5	RT	4 d	[25]
	HCoV	Strain 229E	10^3	21°C	5 d	[23]
	SARS-CoV	Strain HKU39849	10^5	22°-25°C	≤ 5 d	[27]
Plastic	MERS-CoV	Isolate HCoV-EMC/2012	10^5	20°C	48 h	[21]
				30°C	8 – 24 h	
	SARS-CoV	Strain P9	10^5	RT	4 d	[25]
	SARS-CoV	Strain FFM1	10^7	RT	6 – 9 d	[28]
PVC	HCoV	Strain 229E	10^7	RT	2 – 6 d	[28]
	HCoV	Strain 229E	10^5	21°C	5 d	[23]
Silicon rubber	HCoV	Strain 229E	10^3	21°C	5 d	[23]
Surgical glove (latex)	HCoV	Strains 229E and OC43	5×10^3	21°C	≤ 8 h	[24]
Disposable gown	SARS-CoV	Strain GUV6109	10^6	RT	2 d	[26]
			10^5		24 h	
Ceramic	HCoV	Strain 229E	10^4	21°C	1 h	[23]
			10^3		5 d	
Teflon	HCoV	Strain 229E	10^3	21°C	5 d	[23]

MERS = Middle East Respiratory Syndrome; HCoV = human coronavirus; TGEV = transmissible gastroenteritis virus; MHV = mouse hepatitis virus; SARS = Severe Acute Respiratory Syndrome; RT = room temperature.

What stopped SARS?

- ▶ International travel bans, airport screening
- ▶ Closure of discos, theaters, entertainment venues, closure of shops, restaurants, groceries, markets, bars, universities, schools, banks, and other business closed or had only skeleton staffs.
- ▶ Handwashing
- ▶ Mouth and eye protection



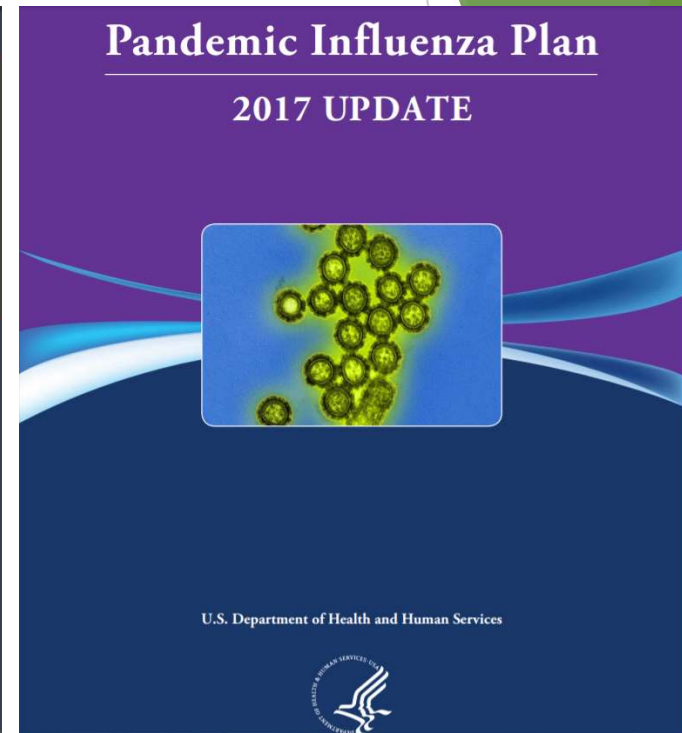
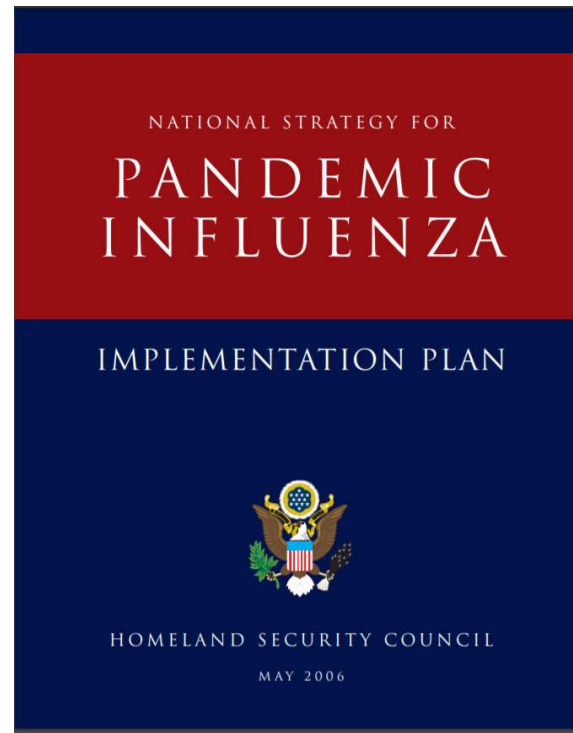
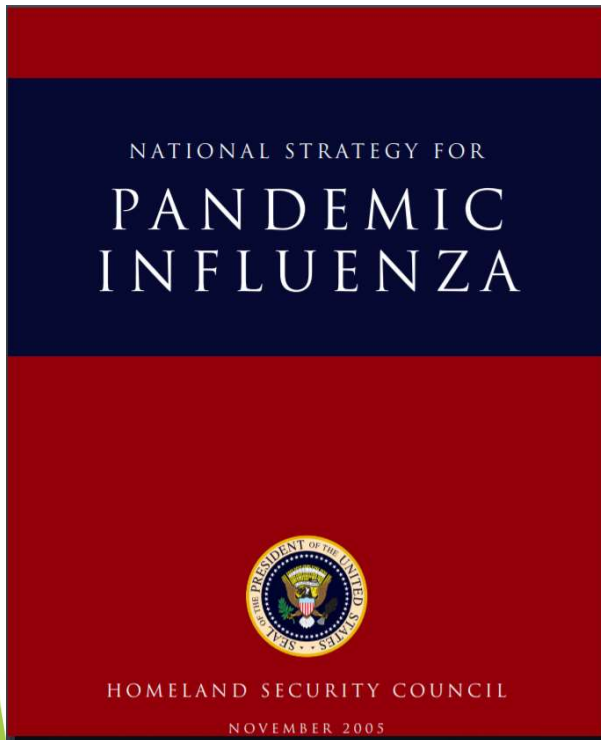
Expectations



New Expectations

- ▶ 100% of the population of the world will, in time, become infected
- ▶ 2.3% will die
- ▶ This will become the 5th human coronavirus
- ▶ The elderly will suffer disproportionately
- ▶ There will NOT be significant seasonality
- ▶ 40% of staff will abandon post—most due to child care issues

Playbook: What's the Plan?



<https://www.cdc.gov/flu/pandemic-resources/pdf/pan-flu-report-2017v2.pdf>

<https://www.cdc.gov/flu/pandemic-resources/pdf/pandemic-influenza-strategy-2005.pdf>

<https://www.cdc.gov/flu/pandemic-resources/pdf/pandemic-influenza-implementation.pdf>

PANDEMIC INFLUENZA

WHO Global Pandemic Phases and the Stages for Federal Government Response

WHO Phases		Federal Government Response Stages	
INTER-PANDEMIC PERIOD			
1	No new influenza virus subtypes have been detected in humans. An influenza virus subtype that has caused human infection may be present in animals. If present in animals, the risk of human disease is considered to be low.	0	New domestic animal outbreak in at-risk country
2	No new influenza virus subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk of human disease.		
PANDEMIC ALERT PERIOD			
3	Human infection(s) with a new subtype, but no human-to-human spread, or at most rare instances of spread to a close contact.	0	New domestic animal outbreak in at-risk country
		1	Suspected human outbreak overseas
4	Small cluster(s) with limited human-to-human transmission but spread is highly localized, suggesting that the virus is not well adapted to humans.	2	Confirmed human outbreak overseas
5	Larger cluster(s) but human-to-human spread still localized, suggesting that the virus is becoming increasingly better adapted to humans, but may not yet be fully transmissible (substantial pandemic risk).		
PANDEMIC PERIOD			
6	Pandemic phase: increased and sustained transmission in general population.	3	Widespread human outbreaks in multiple locations overseas
		4	First human case in North America
		5	Spread throughout United States
		6	Recovery and preparation for subsequent waves



STAGE 3

Widespread Outbreaks Overseas

GOALS

- Delay emergence in North America
- Ensure earliest warning of first case(s)
- Prepare domestic containment and response mechanisms

ACTIONS

- Activate domestic emergency medical personnel plans
- Maintain layered screening measures at borders
- Deploy pre-pandemic vaccine and antiviral stockpiles; divert to monovalent vaccine production
- Real-time modeling; heighten hospital-based surveillance
- Prepare to implement surge plans at Federal medical facilities

POLICY DECISIONS

- Prioritize efforts for domestic preparedness and response

STAGE 4

First Human Case in North America

GOALS

- Contain first cases in North America
- Mitigate illness, suffering, and death
- Mitigate impact to economy and society

ACTIONS

- Antiviral treatment and prophylaxis
- Implement national response
- Ensure pandemic plans activated across all levels
- Limit non-essential domestic travel
- Deploy diagnostic reagents for pandemic virus to all laboratories
- Continue development of pandemic vaccine
- Antiviral treatment and targeted antiviral prophylaxis

POLICY DECISIONS

- Revision of prioritization and allocation scheme for pandemic vaccine

STAGE 5

Spread throughout United States

GOALS

- Support community response
- Preserve critical infrastructure
- Mitigate illness, suffering, and death
- Mitigate impact to economy and society

ACTIONS

- Maintain overall situational awareness
- Evaluate epidemiology; provide guidance on community measures
- Deploy vaccine if available; prioritization guidance
- Sustain critical infrastructure, support health and medical systems, maintain civil order
- Provide guidance on use of key commodities

POLICY DECISIONS

- Federal support of critical infrastructure and availability of key goods and services
- Lifting of travel restrictions

GOALS

- Support community response
- Preserve critical infrastructure
- Mitigate illness, suffering, and death
- Mitigate impact to economy and society

ACTIONS

- Maintain overall situational awareness
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POLICY DECISIONS

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WHO Phase 6
Pandemic Period



Federal Action Plan

1. Surveillance, epidemiology and laboratory activities (detection)
2. Community Mitigation Measures
3. Medical Countermeasures: Diagnostic Devices, Vaccines, Therapeutics, and Respiratory Devices
4. Health Care System Preparedness and Response Activities
5. Communications and Public Outreach

6. Scientific Infrastructure and Preparedness
7. Domestic and International Response Policy, Incident Management, and Global Partnerships and Capacity Building

<https://www.cdc.gov/flu/pandemic-resources/pdf/pan-flu-report-2017v2.pdf>

Local Action Plan—Goals

- ▶ Preserve critical infrastructure
 - ▶ Transportation of critical goods
 - ▶ Medical System support
- ▶ Slow spread to prevent overwhelming hospital resources
 - ▶ Let medication approvals and vaccine(s) catch up
- ▶ Maximize detection strategies
- ▶ Quarantine (if implemented) will last 2-4 incubation periods (14 days per period—i.e. 4-8 weeks)

Detection and Treatment

▶ Detection:

- ▶ ISDH will be validated, now active as of 3/3/20. Ohio hasn't started.
- ▶ Several companies racing for commercial tests that will be available to hospital labs.

▶ Treatment:

- ▶ Currently, only supportive treatment
- ▶ Favilavir (favipiravir) approved in China, commercially available in Japan as Avigan
- ▶ Gilead Sciences announced investigation of the safety and efficacy of an investigational antiviral compound, Remdesivir (GS-5734) on 2/5/20
- ▶ Emergency use will be allowed in the US for a small number of US patients [per Gilead Spokesman]
- ▶ Other drugs with promise: Chloroquine, Kaletra, Xofluza, alpha-interferon
- ▶ Baylor/Sanofi announced trials have restarted on their SARS vaccine

Recommended strategies for employers to use now:

- ▶ Actively encourage sick employees to stay home
- ▶ Separate sick employees
- ▶ Emphasize staying home when sick, respiratory etiquette and hand hygiene by all employees
- ▶ Perform routine environmental cleaning
- ▶ Advise employees before traveling to take certain steps: Check the [CDC's Traveler's Health Notices](#) for the latest guidance
- ▶ Employees who are well but who have a sick family member at home with COVID-19 should notify their supervisor

<https://www.cdc.gov/coronavirus/2019-ncov/specific-groups/guidance-business-response.html>

Action Plans-Phase 6, Stage 5

- ▶ Initially, identify and contain—case tracking and contact tracing
- ▶ **Social Distancing**
 - ▶ Eliminate face to face meetings
 - ▶ > 3 feet
 - ▶ No bodily contact
- ▶ **“Snow Day”**
 - ▶ Work and School from home
- ▶ **Geographic Quarantine**
 - ▶ Travel
 - ▶ Entertainment
 - ▶ Shopping
- ▶ **Failure of Quarantine—Expand medical surg capacity**

Supply Management

▶ Immediate steps:

- ▶ 1. Assure that masks at entrances and other public places are monitored so that inappropriate quantities of masks are not removed, but are used.
- ▶ 2. Fit test key healthcare providers and staff
- ▶ 3. Key providers include: Anesthesia, ED, ID, Pulm/CC and clinical staff
- ▶ 4. Continued Occ health fit testing of first responders
- ▶ 5. Good Handwashing
- ▶ 6. Make sure all providers are up to date on vaccines
- ▶ 7. Wear PPE when examining patients with unexplained respiratory infections. There are other bad bugs circulating.
- ▶ Educate staff that Human Coronavirus is circulating, and is NOT COVID-19.

Questions:

- ▶ **What is critical infrastructure?**
 - ▶ Medical Facilities
 - ▶ Transportation of goods, supply chain
 - ▶ Police
 - ▶ Fire
 - ▶ EMS
 - ▶ Government—emergency response, allocation of resources, enforcement of restrictions
 - ▶ Food
 - ▶ Gas, electric, sanitation
- ▶ **What is not?**
 - ▶ School, banking, shopping, travel, entertainment

Summary

- ▶ SARS CoV-2 is highly contagious with an overall mortality about 2.3%--may drop as denominator is better defined.
- ▶ Goals of the community are:
 - ▶ Preserve critical infrastructure
 - ▶ Delay (stretch out) presentation so as not to overwhelm hospitals/staff, and allow medicines and vaccines to come onboard
- ▶ Control Panic and absenteeism