



# COVID-19 Guidance

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**THINK. LISTEN. CREATE.®**

Rev 11.11.20

The following guidance is developed as healthcare facilities prepare for COVID patients, and is based on input from ASHE, ASHRAE Technical Committee for Healthcare and ASHRAE/ASHE Standard 170 Committee.

This guidance includes personal opinions. ASHRAE and ASHE are not responsible for the use or application of this information.

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(Chair ASHRAE Standard 170) with questions

ASHE Website for more information – Public Access

<https://www.ashe.org/COVID19resources>



Grateful to the following for their contributions; apologies if we missed anyone:

- Jonathan Flannery, ASHE
- ASHRAE Standard 170 Committee, especially Kevin Scarlett / John Williams (Washington State), Ken Mead, and Richard Hermans
- Traci Hanegan, Coffman Engineering – Chair, ASHRAE Technical Committee for Healthcare
- TLC Engineering Solutions Healthcare Center of Excellence - Aaron Johnson, Mark Costello, Jeff Stone, Ben Roseborough, Bob Danner, as well as COO Jim Ferris



This presentation has evolved since the early Spring of 2020, as has our knowledge of the COVID-19 disease. Here is a partial summary of the changes made from previous versions:

- Statistics in the first 20 or so slides have been updated
- It is highly unlikely that COVID-19 can travel through a code-compliant multi-zone hospital HVAC system (return ductwork, filters, coils, final filters and terminal units). At the time of this publication, there are no known instances of COVID-19 transmission through this pathway
- The use of 100% exhaust (no recirculation via central AHUs) is not justified, EXCEPT for rooms where aerosol generating procedures are performed and in the Emergency Department, where there are significant populations of persons under investigation (PUI). The use of central air systems with MERV 14-16 filters and/or local HEPA filtration has replaced most of the recommendations for 100% exhaust.
- The widespread use of individual room negative pressure relationships, *except for patient and exam rooms equipped with anterooms*, or increasing the amount of exhaust, is not justified. There is limited protection afforded to healthcare workers once the door to an infected patient's room is opened, no matter how negative the pressure relationship. Increased exhaust necessitates increased intake of outside air, resulting in system capacity issues and higher operating costs, and in many cases, failure to maintain pressure relationships and air balance, with loss of temperature and humidity control.
- The current ASHRAE Standard 170 pressure relationships, air change rates and filtration efficiencies have proven to have served us well and there is little evidence that going beyond those requirements yields cost-justified improvements in COVID-19 viral transmission mitigation. There is probably no safer place in the US built environment than a code compliant, well-operated and -maintained hospital.

**1. COVID-19 in Perspective**

**2. Action Plan**

**3. Implementation**

**4. Other Factors**

# 1. Perspective

True number of cases are vastly undercounted due to quantity of undiagnosed and untested patients.

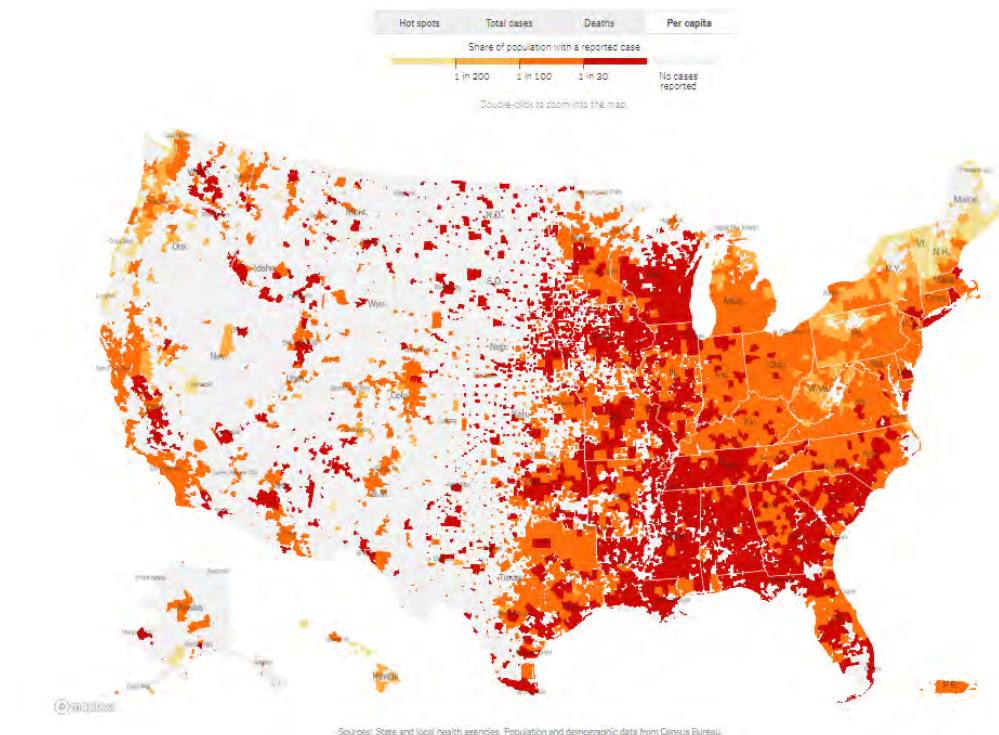
Two ways to estimate “true” number of cases \*:

# of Reported Cases x 10-20

# of COVID Deaths x 400

As of 11.11.2020 –

10,111,077 cases in US; 238,256 deaths



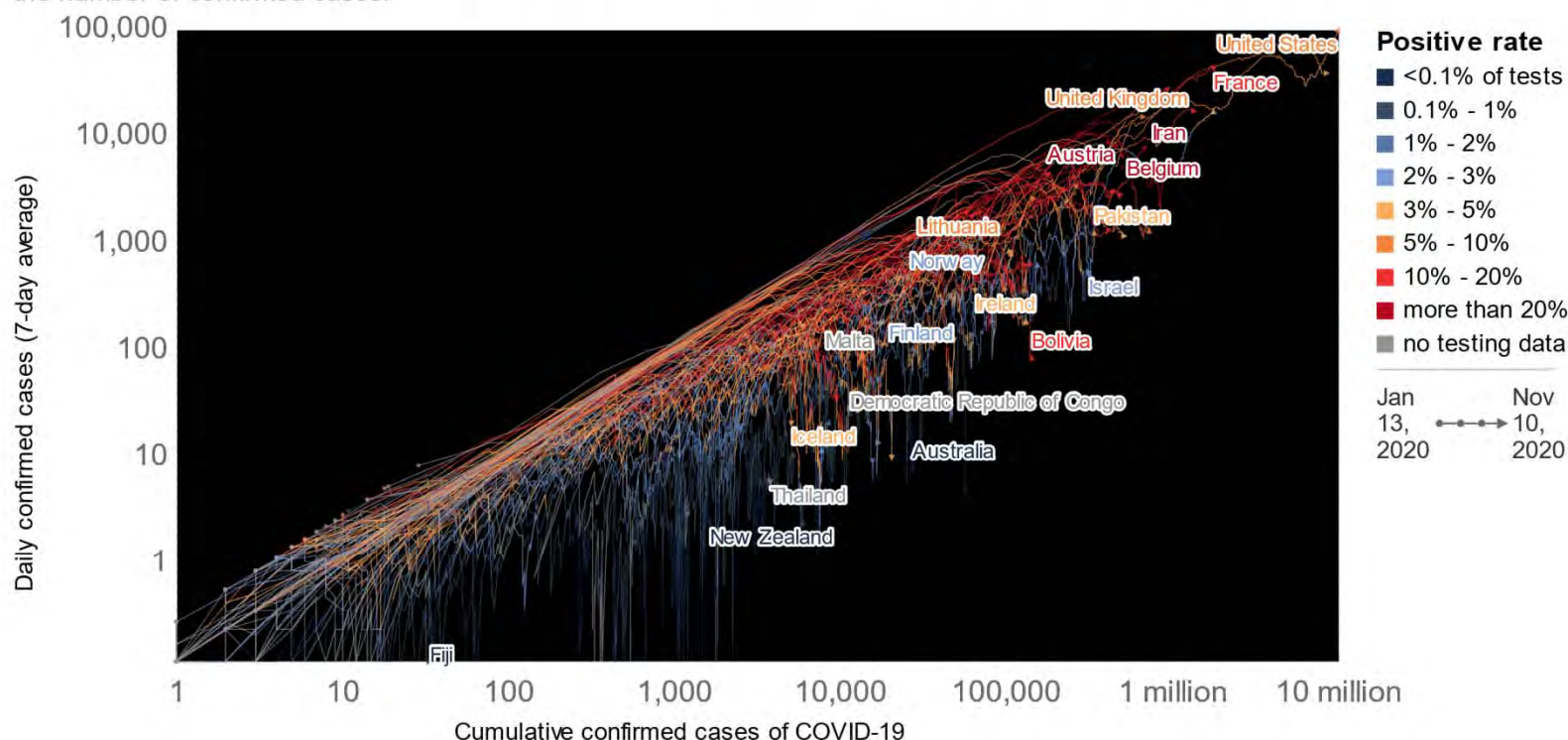


## COVID-19: Daily new confirmed cases vs cumulative cases



The line is blue when the rate of positive tests in a country is low – this means a country performs many tests relative to the size of the outbreak.

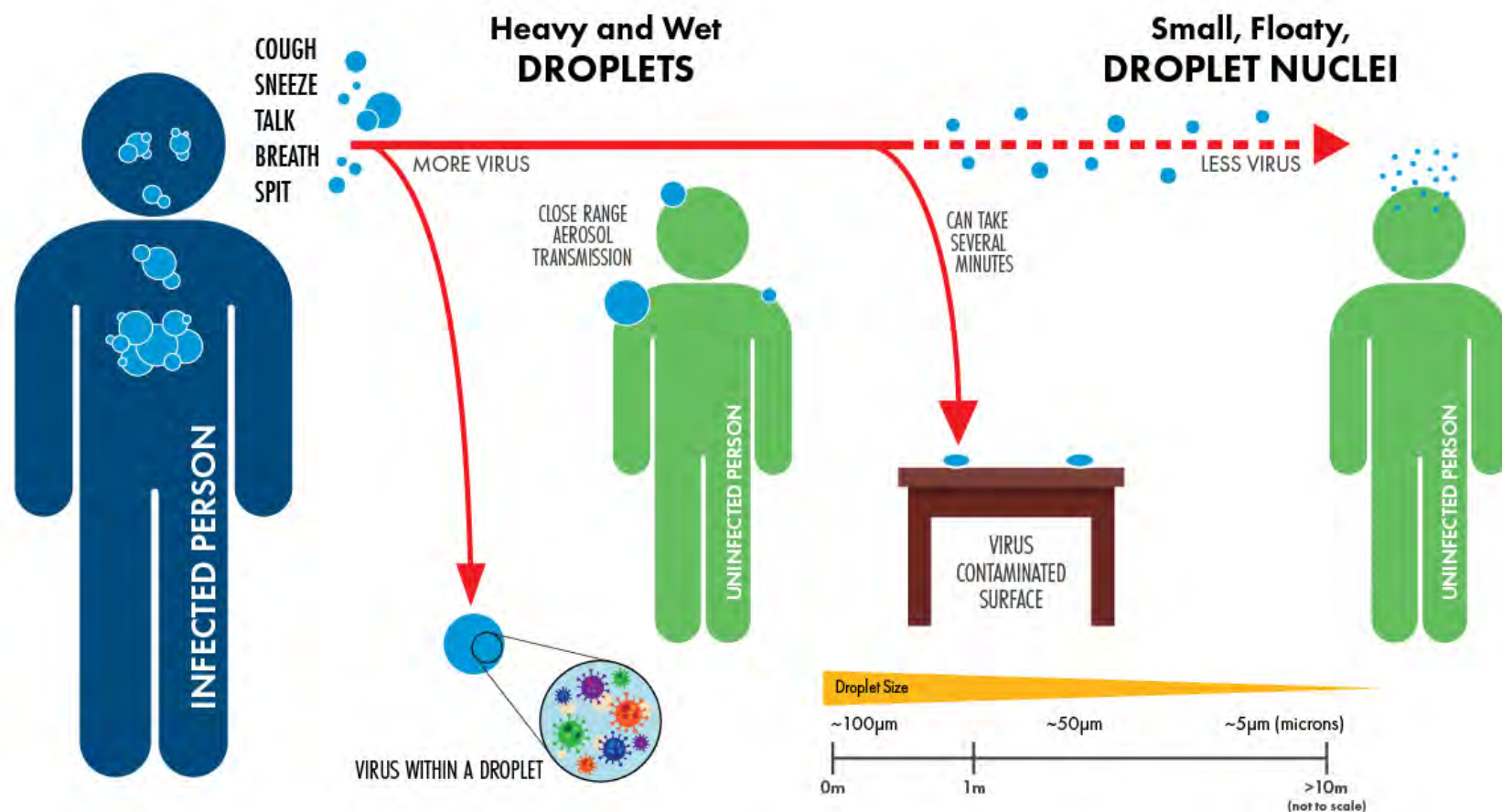
Red indicates a high positive rate of tests. This suggests that the true number of infections may be far higher than the number of confirmed cases.



Source: European CDC – Situation Update Worldwide – Last updated 10 November, 10:36 (London time), Official data collated by Our World in Data

Note: Only countries for which testing data is available are included. Details about this data can be found at [OurWorldInData.org/coronavirus-testing](https://OurWorldInData.org/coronavirus-testing).  
[OurWorldInData.org/coronavirus](https://OurWorldInData.org/coronavirus) • CC BY

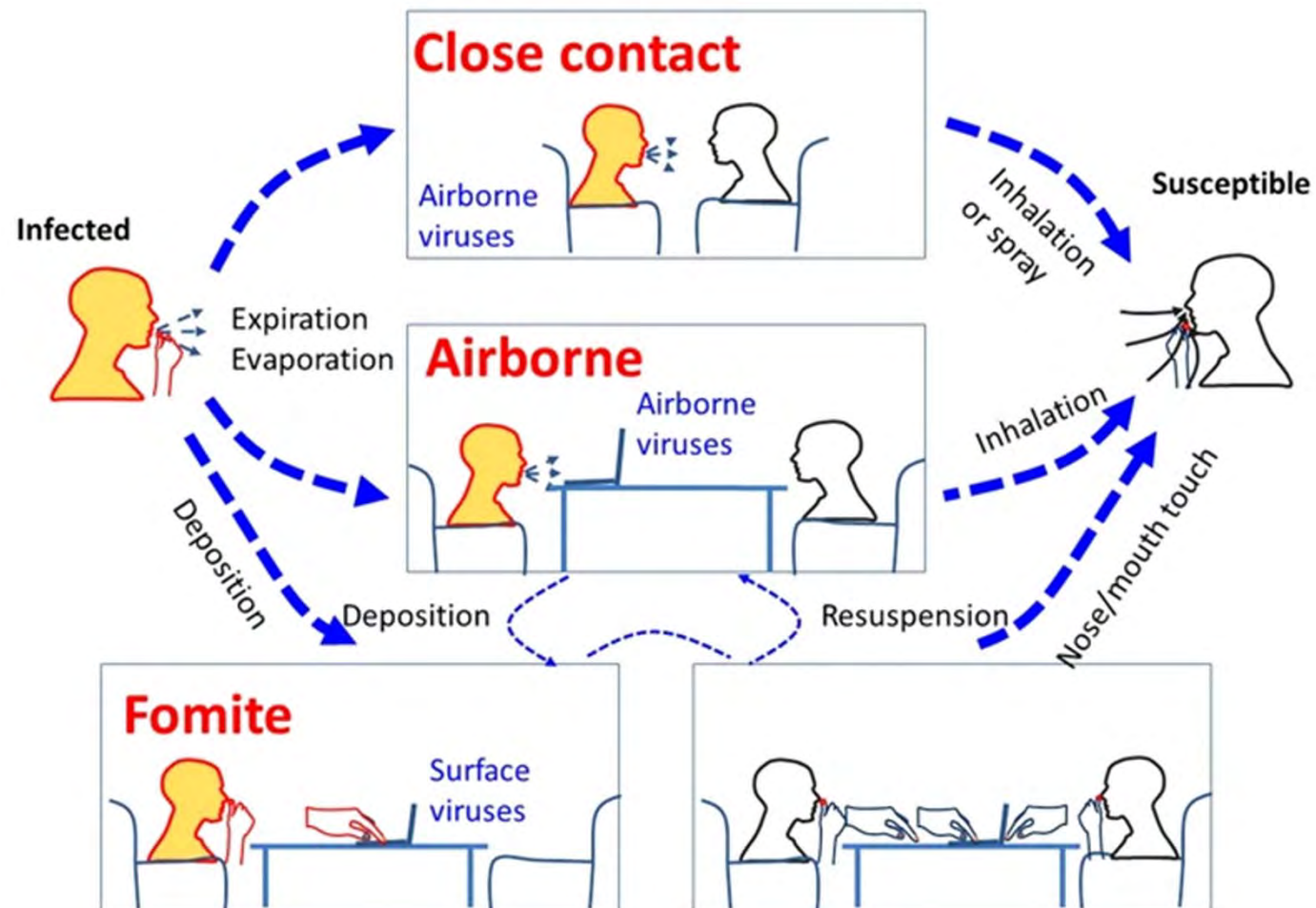
COVID 19 Patients typically have respiratory conditions resulting in coughs, sneezes





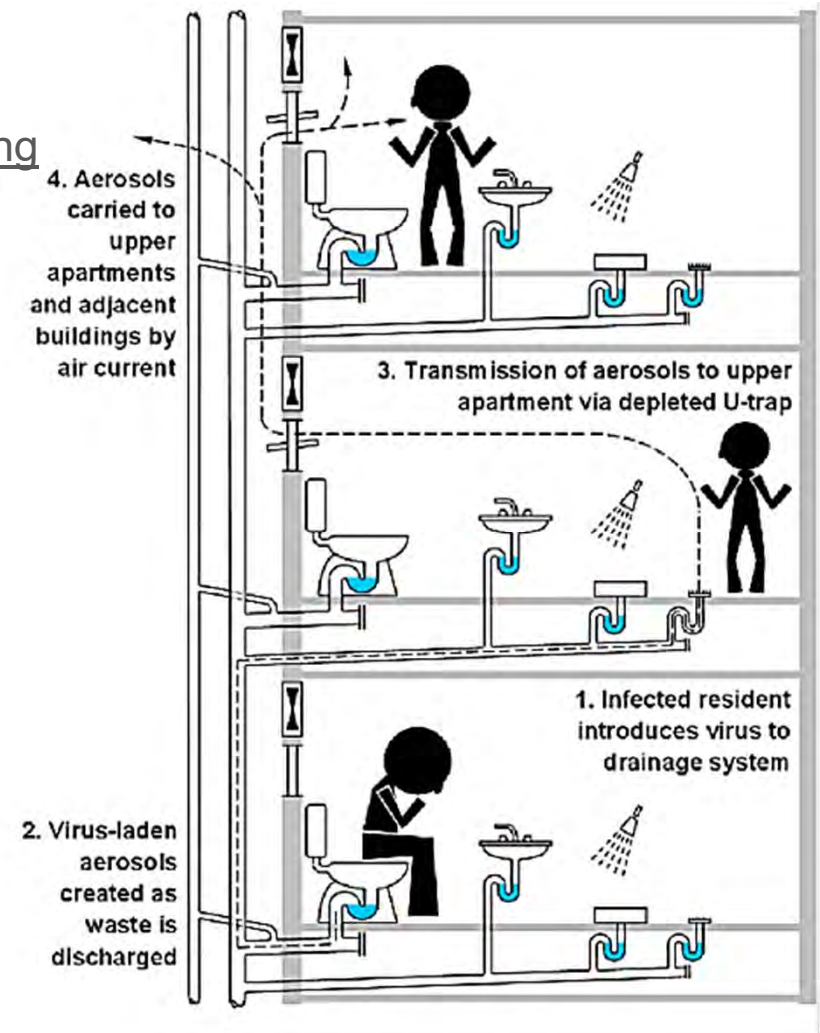
**Viable on surfaces – 3 days**

**Aerosol droplets viable – 3 hours**



## Lessons learned from 2003 SARS Outbreak

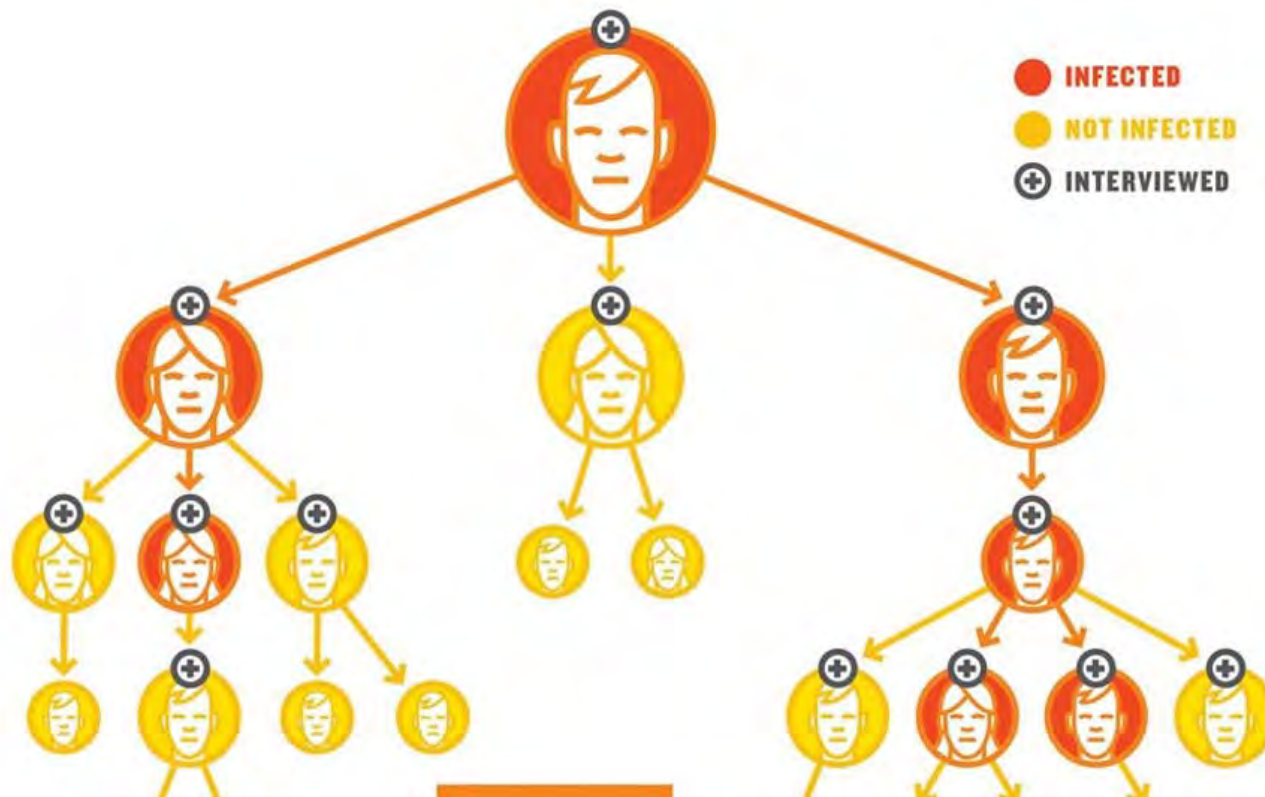
- Recognize that COVID-19 may be aerosolized during toilet flush
- Operate Flush valves; verify trap seals are wet
- Housekeeping consideration



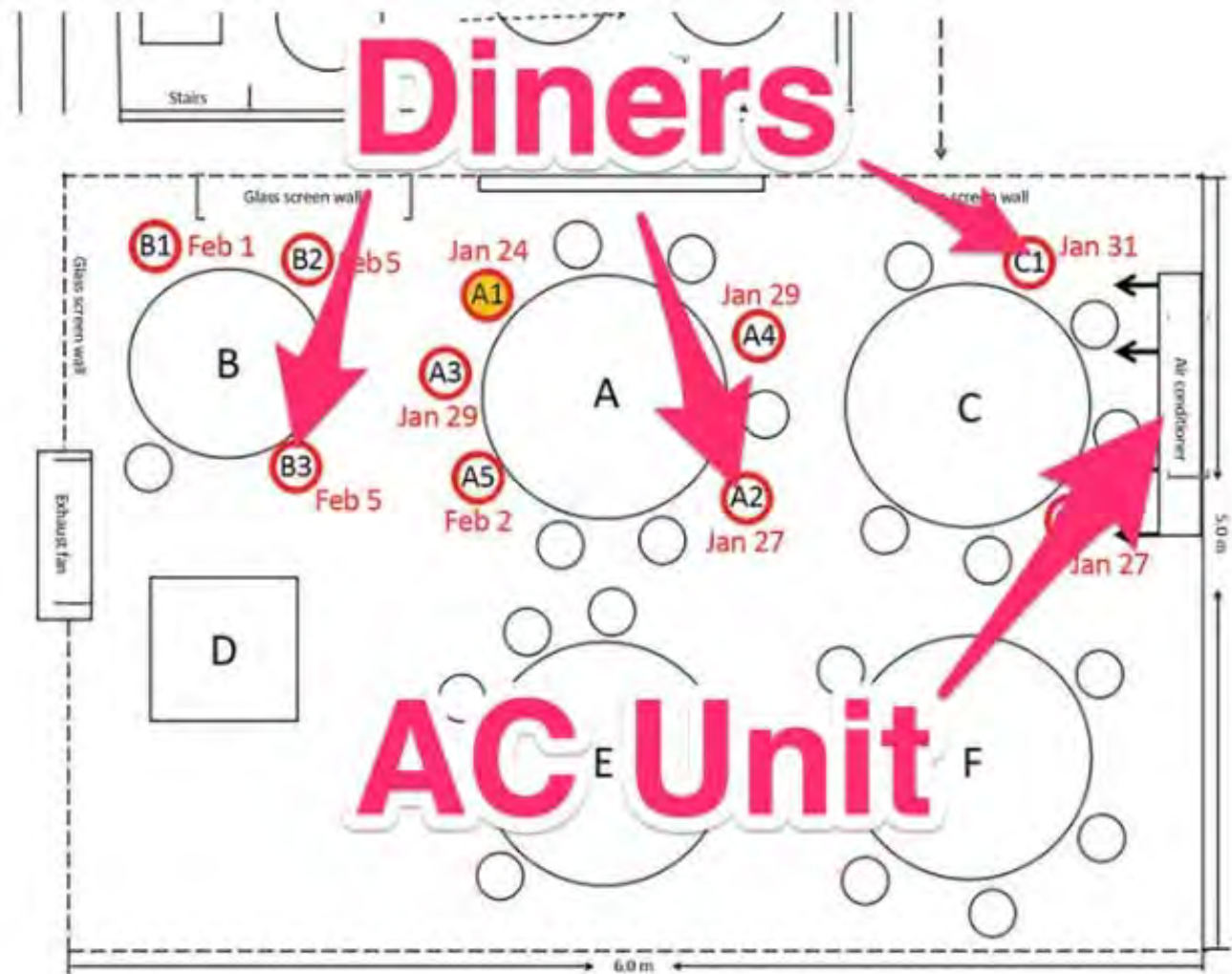
- NEW INFO:  
\*<https://www.medrxiv.org/content/10.1101/2020.03.23.20039446v2>

- \*<https://www.livescience.com/coronavirus-can-spread-as-an-aerosol.html>

Hong Kong Amoy Gardens Apartment Tower



Base Reproductive Rate ( $R_0$ ) for viral infections			
COVID-19	2.5 (2 to 4)	SARS	0.2 to 1.1
Measles	12 to 18	Common Cold	2 to 3
Ebola	1.5 to 1.9	Seasonal flu	0.9 to 2.1
Chicken pox & mumps	10 to 12	1918 Spanish flu	1.4 to 2.8

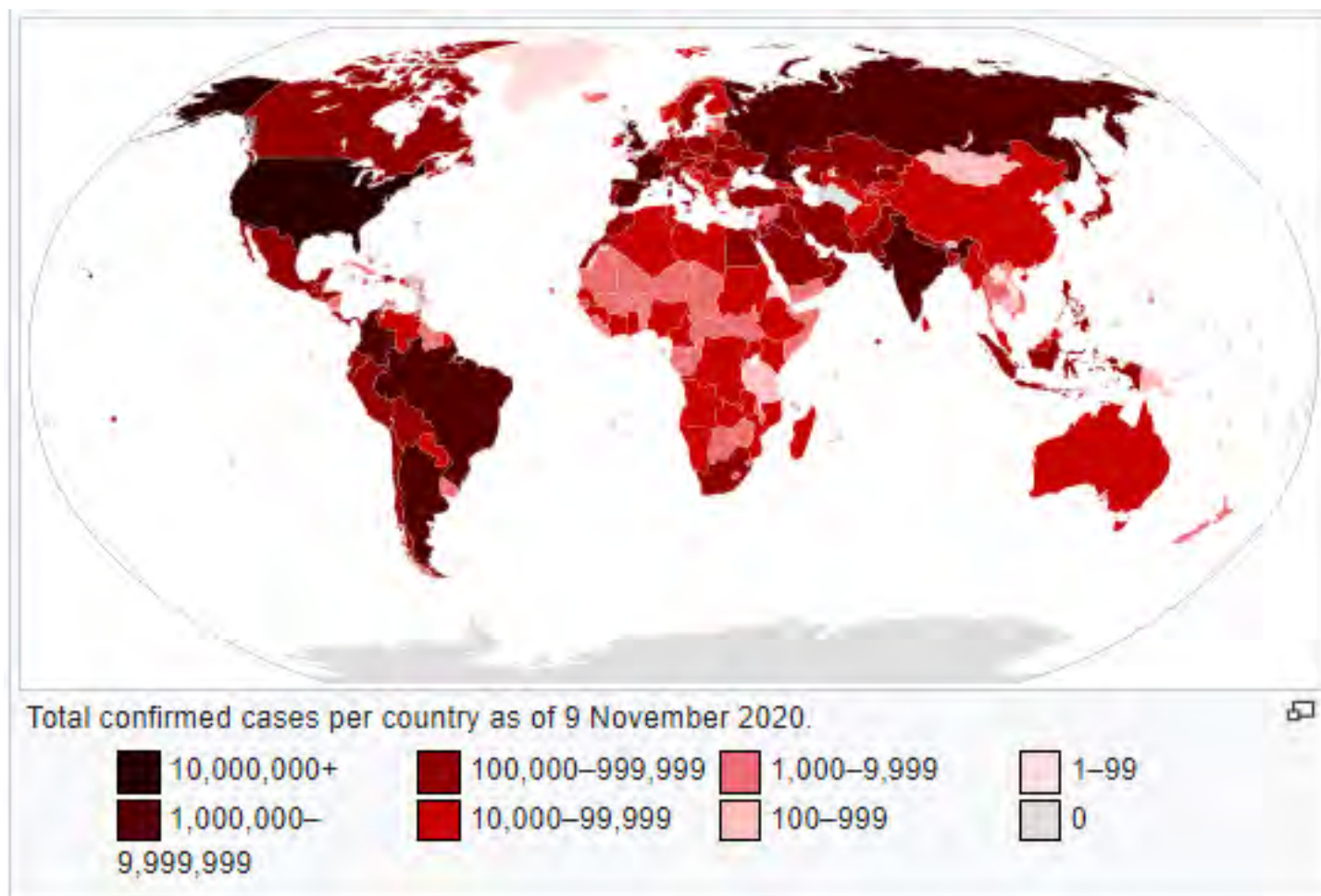


An annotated diagram showing the location of the AC in the restaurant in Guangzhou, China. CDC EID Journal



25% of cases transmitted while asymptomatic (first 24-48 hours)

Most contagious when most symptomatic, typically first nine days (often hospitalized)



At risk populations often become most severe cases

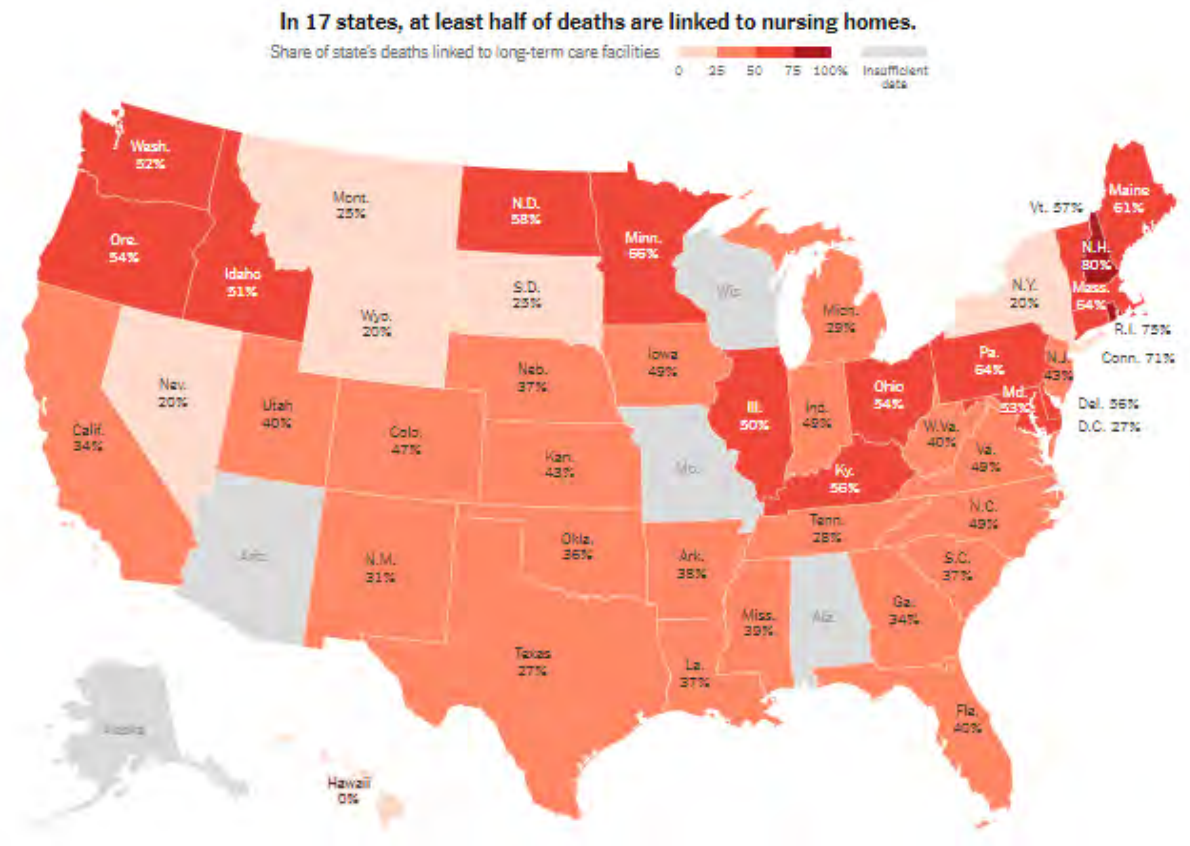
15% of infected require oxygen interventions

3-4% mortality rate\* vs 0.1% for influenza (30x higher)

80+ years mortality rate is near 15% (70 = 8%, 60 = 3%)

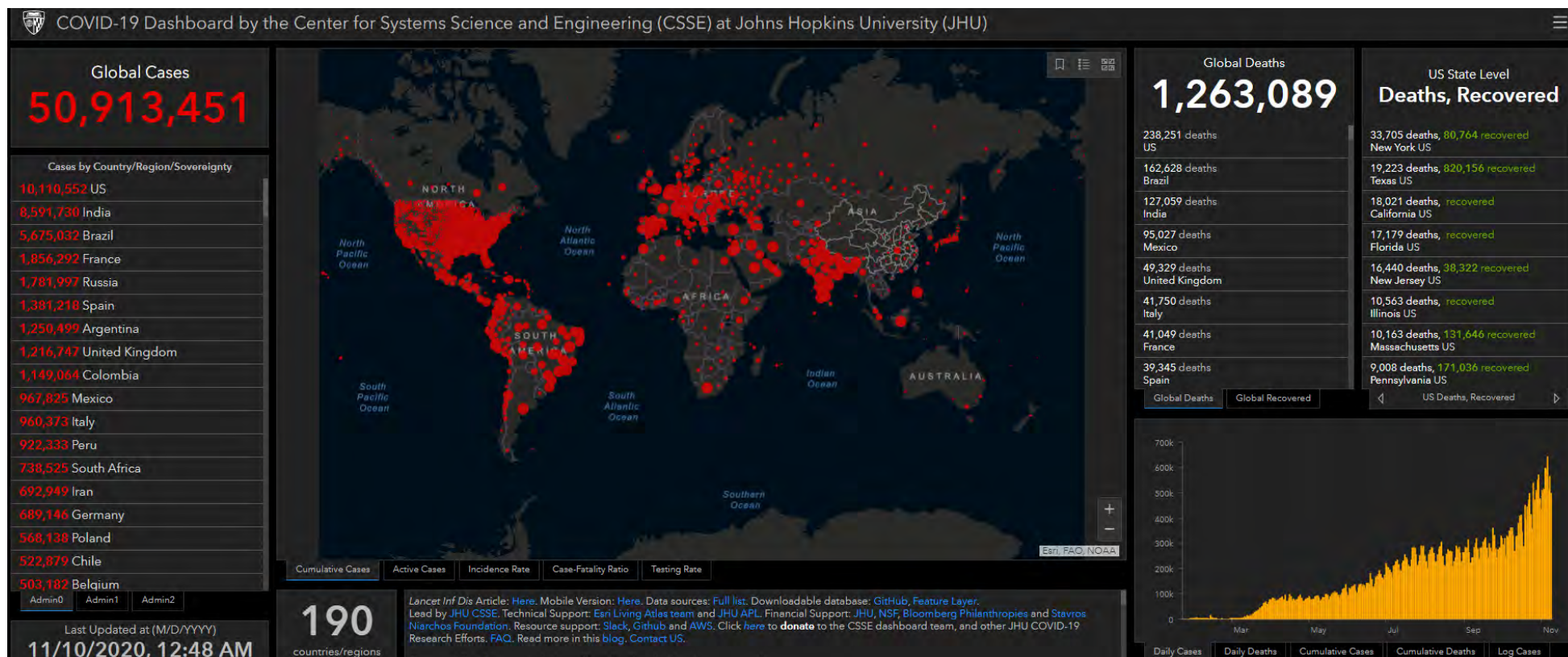
Nearly half of US COVID-19 deaths are nursing home residents or staff

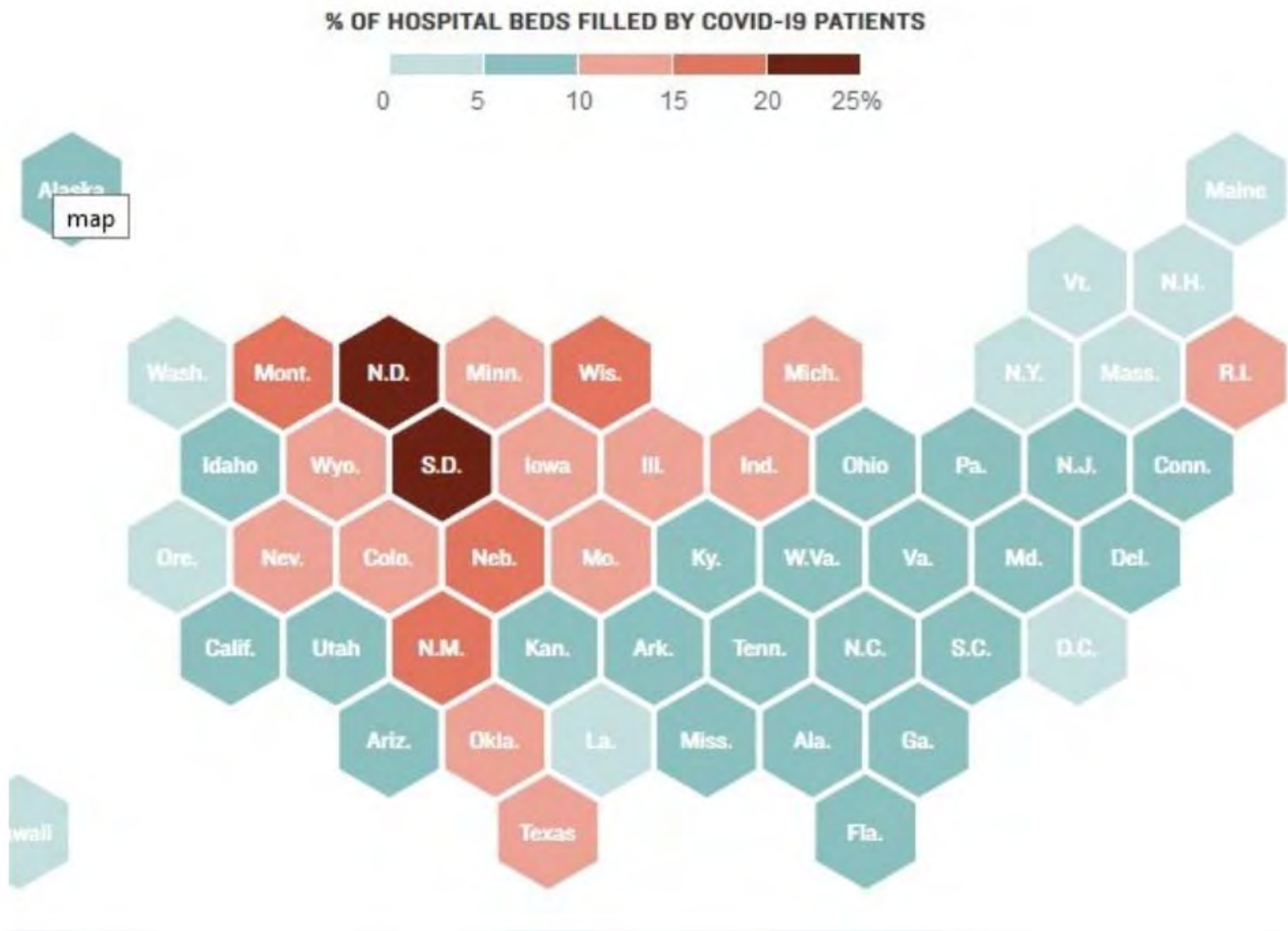
Danger of healthcare system becoming overwhelmed.











## Patient Processing

- Restricting ED access to ambulatory patients only; designate specific area for respiratory cases
- Persons Under Investigation (PUI) capable of self care, triage outside of ED; advise home care
- Nursing Home / ALF – Protective measures:
  - Limit visitors
  - Screen staff at start of every shift
  - Limit size of resident groups

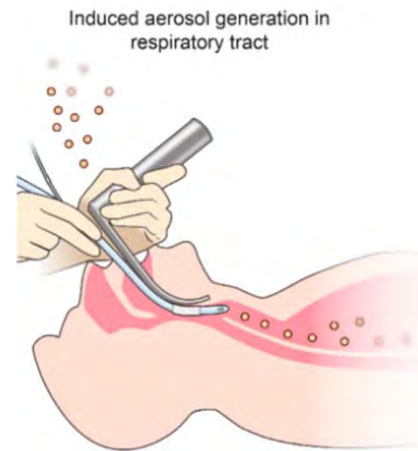


A restricted access sign was outside the entrance to the Tufts Medical Center Friday. CRAIG F. WALKER/GLOBE STAFF/THE BOSTON GLOBE



## Airborne Infectious Isolation Room

- CDC recommends using Airborne Infectious Isolation (AII) rooms for Aerosol Generating Procedures (AGP) only
- Minimum 12 Air Changes / Hour
- Negative Relative Pressure (Clean to Less Clean)
- All Air Exhausted Directly to Outdoors
- Anteroom strongly recommended



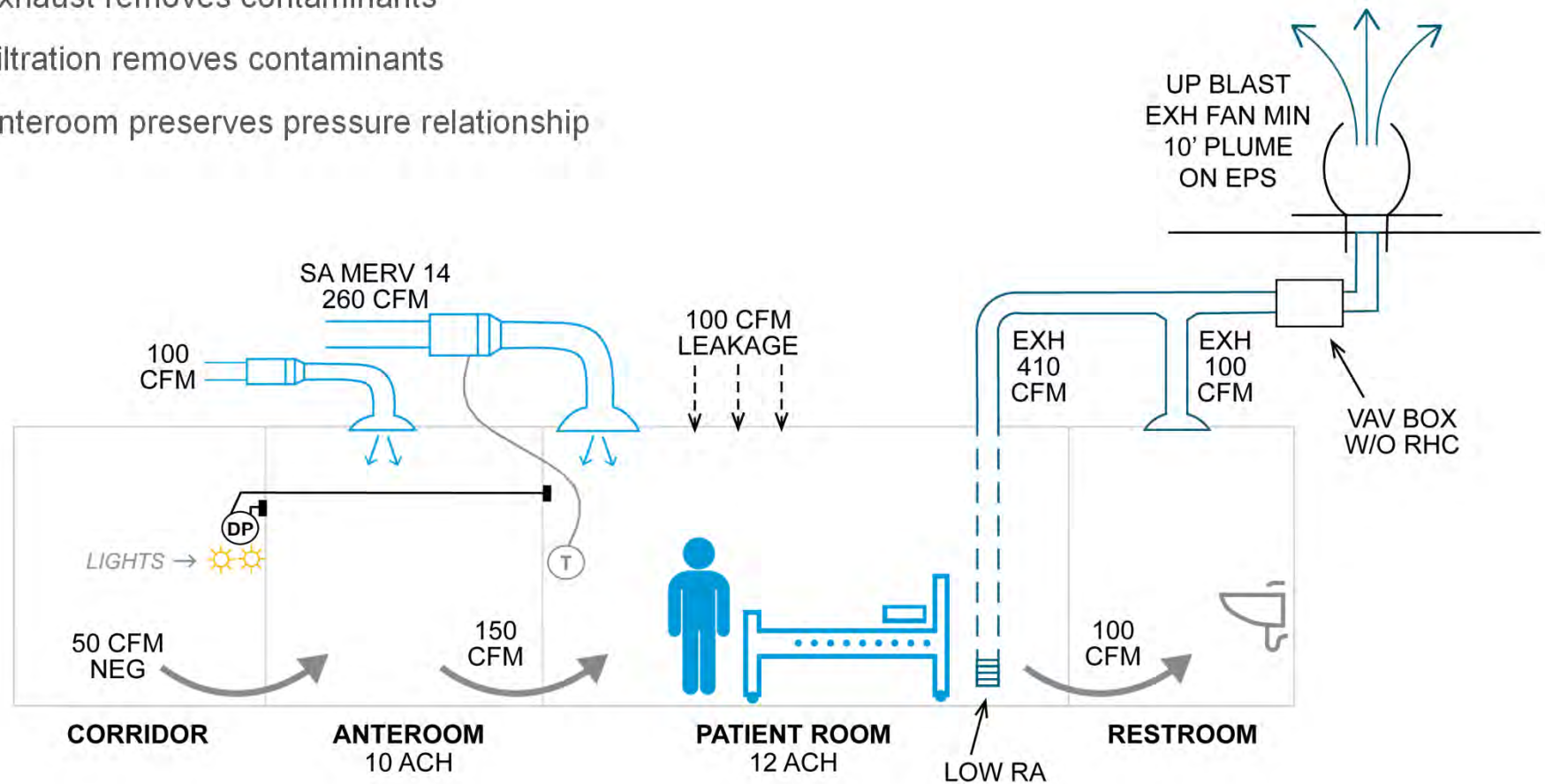
Examples: Intubation, Bronchoscopy, CPR



Examples: Ventilation, Suctioning

## Airborne Infectious Isolation Room

- Air changes dilute contaminant level
- Exhaust removes contaminants
- Filtration removes contaminants
- Anteroom preserves pressure relationship





## Airborne Infection Isolation (A.I.I.) Rooms

Typical 1-2 rooms per floor

Work with clinicians to manage All room use

Staff with dedicated healthcare personnel to limit exposure risk

Designate entire units to care for known / suspected COVID-19 patients, typically requiring AGP procedures

Examples of AGP are positive pressure ventilation (BiPAP and CPAP), endotracheal intubation, airway suction, high frequency oscillatory ventilation, tracheostomy, chest physiotherapy, nebulizer treatment, sputum induction, and bronchoscopy



# Aerobiology & HVAC System

HVAC systems can protect healthcare workers and instill confidence by providing a safe environment for their interactions with COVID patients and reduce exposure when patients discharge contaminants during procedures.

## Basic environmental control strategies:

- A.I.I. rooms require 12 air changes, air exhausted directly (see Standard 170)
- Establish solutions beyond A.I.I. rooms as needed
  - Negative relative pressure helps contain contaminants, *but only while the door is closed, which is the reason for an anteroom*
  - Negative pressure *does not equal* 100% exhaust
  - Air changes dilute contaminant level (See CDC info on Air Cleaning)
  - Exhaust removes contaminants
  - Filtration removes contaminants

Ventilate the room and terminal clean before re-use

Follow CDC air change clearance rates

**Dilution is the Solution  
to Pollution!**

**Table B.1. Air changes/hour (ACH) and time required for airborne-contaminant removal by efficiency \***

ACH § ¶	Time (mins.) required for removal 99% efficiency	Time (mins.) required for removal 99.9% efficiency
2	138	207
4	69	104
6 <sup>+</sup>	46	69
8	35	52
10 <sup>+</sup>	28	41
12 <sup>+</sup>	23	35
15 <sup>+</sup>	18	28
20	14	21
50	6	8

HEPA – developed for safety in nuclear industry; Cleanest air is properly functioning HEPA outlet!  
HEPA filters particles smaller than 0.3 microns!

## HEPA Filters

- Virus particles can be .1 micron or smaller.
- Infectious Patient airborne discharges (cough / sneeze) are typically greater than .1 micron as virus is passed on/in liquid / mucous
- HEPA is at least 99.97% effective for .3 micron particles
- HEPA is an effective tool for contaminant removal

## N95 Masks



- N95 require fit testing and a competent pulmonary efficiency
- N95 are TESTED with .3 micron particles
- N95 is certified to filter at least 95% of airborne particles
- N95 is an effective tool for worker protection



# HEPA UNIT

Portable HEPA Machines



Pre-Assembled System



Ceiling fan filter unit

Ad Hoc Assembly

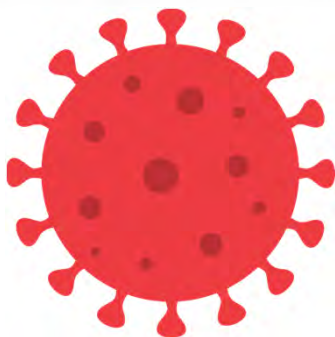
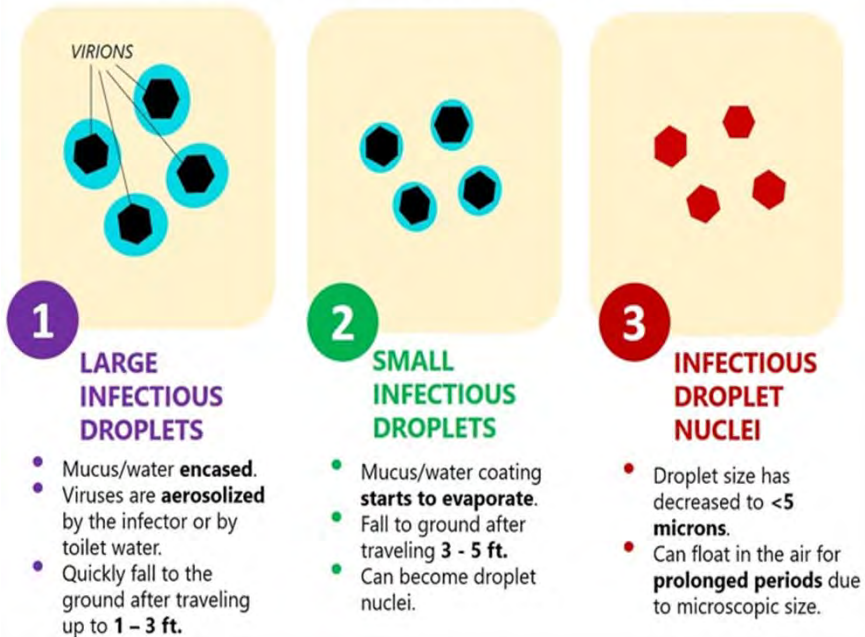
- HEPA filter in frame, preferably bag in/out as needed/available
- Off shelf exhaust fan and associated power
- Sealed connections – rack or wheel mounted



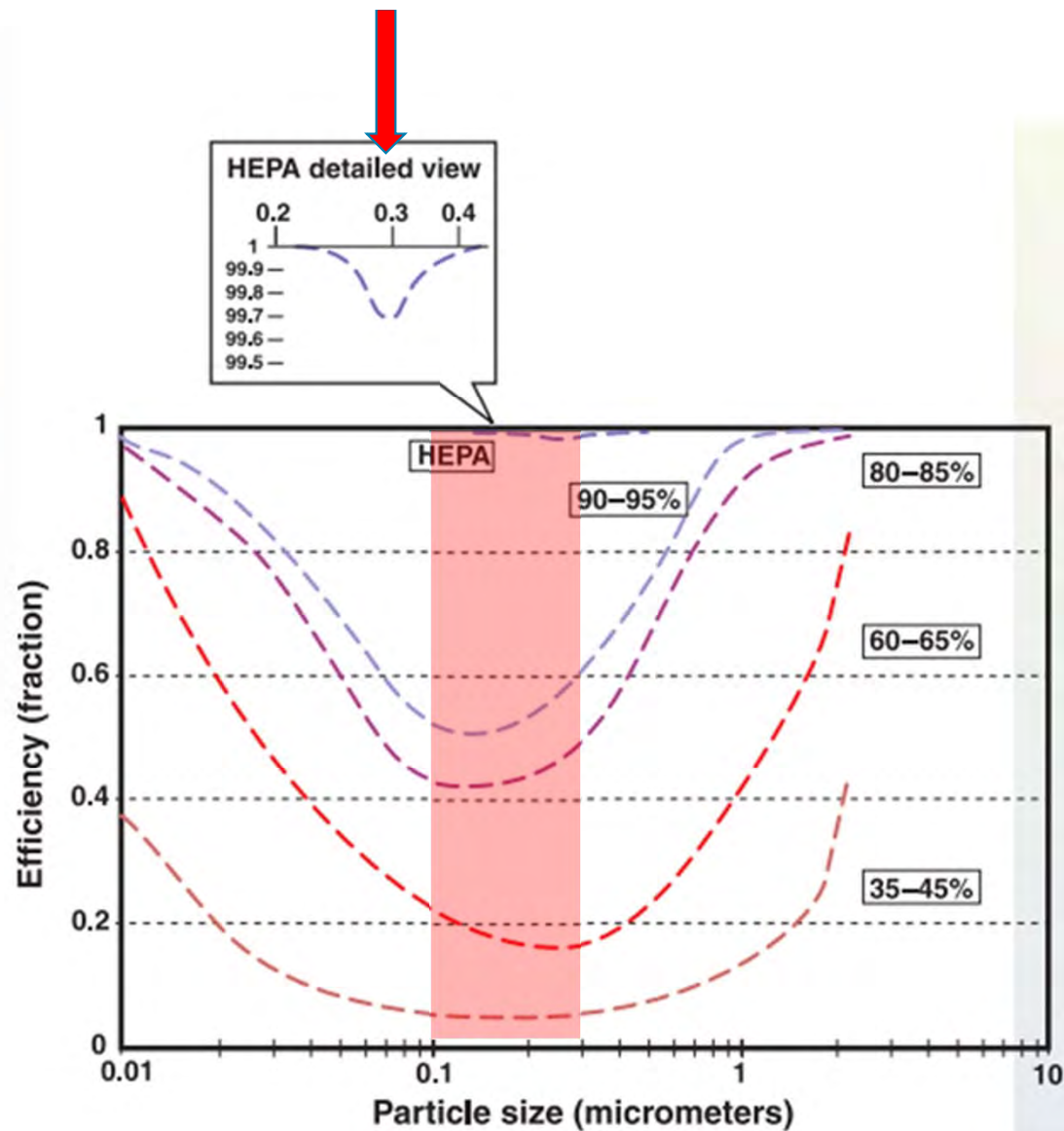
Anteroom assemblies



## Stages Of Infectious Droplets And Droplet Nuclei



0.1 – 0.3 micrometers





## 2. Action Plan

### Health Facility Operators:

- Verify performance of existing A.I.I. rooms
- Verify performance of Emergency Department HVAC system
- Secure all available HEPA (high efficiency particulate air) units
- Understand surge / temporary patient segregation plan & deploy
- Ensure critical equipment is powered on critical or equipment branch



## General Parameters

- Do No Harm
- System Arrangement Should Protect Workers
- System Arrangement Should Protect Other Patients
- Airflow from Clean to Less Clean



## Healthcare Facilities

- Significant time constraints
- Guided by clinicians and infection control team
- Actions to create safe environments and instill confidence
- Expedited work to increase bed count
- Halted other projects to allow for focused effort



# Keep it Simple

## Resource Management

- Focus your efforts
- Do not waste time, mental energy, or dollars without clear goals & plan

## Set Goals

- Work with clinicians
- Establish minimum standards
- Define key areas and designated rooms, suites, floors
- Maintain Life Safety protections
- Make / Distribute a floor plan / map – ensure everyone knows

# Passive Isolation

As prescribed in CDC Guidance\*

## Most Basic Approach

- One patient per room
- Close the door
- Implement related CDC Safety Protocols

Work with Clinicians, anticipate patient load and establish layered approach as needed

These rooms do not justify negative pressure or 100% exhaust, and are not meant for aerosol generating procedures

\* [https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html?CDC\\_AA\\_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhcp%2Finfection-control.html](https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhcp%2Finfection-control.html)

## Layered Approach

### Hospitals Should Be Aware of the Clinical Modes:

Normal mode - Follow CDC Guidelines

- Clinical plan may limit A.I.I. Rooms to patients receiving AGP

Small scale surge capacity mode – may be asked to create additional dedicated A.I.I. or temporary patient observation / segregation rooms with HEPA and negative pressure

Large scale surge capacity mode – may be asked to establish dedicated ward / suite(s) and establish protocols with clinical and environmental action plans

Inform clinicians that patient observation / segregation areas are not true A.I.I. rooms





## HEPA to Hallway

- Single exam or patient room
- Create 'sealed' vestibule to patient room
  - Vestibule should be a minimum 3'x6'
  - Need minimum of 5' egress clearance in the corridor
- Seal off return air grill in patient room
- Place HEPA fan filter unit in hallway ceiling
- Keep door to vestibule closed and door to patient room open
- Verify negative pressure prior to placing room in service and monitor negative pressure while in service
- Limit patient transport and patient transfers
- Terminal cleaning after ACH removes potentially infectious particles

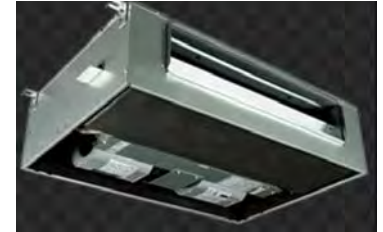


# What are Room Recirculating (RR) Units?

## Variety of In-Room Cooling/Heating Units

- Fan Coil Units
- Heat Pump Units
- Packaged Terminal Air Conditioner (PTAC)
- DX and Mini-Split DX Units
- Special Case: Induction Units (Seek Expert Guidance)
- Special Case: Active Chilled Beam (Seek Expert Guidance)
- RR Unit Typically Has  $\leq 6$  ACH Air Changes, **Minimal Filtration**

Common in nursing homes, older hospital wings



## WARNING- RR Units?

Avoid Use for COVID Patients IF YOU CAN, however IF YOU MUST:



- Consider patient tent or source control as Best Approach
- Consider means of sanitizing RR unit between patients – peroxide fog, other?
- Deep decontamination of RR unit's coil after event is over
- If Infection Control Professionals insist, create Negative Relative Pressure to corridor through use of a HEPA machine, drawing air from patient room, supplying to corridor. Recall, CDC only recommends negative pressure for AGP rooms



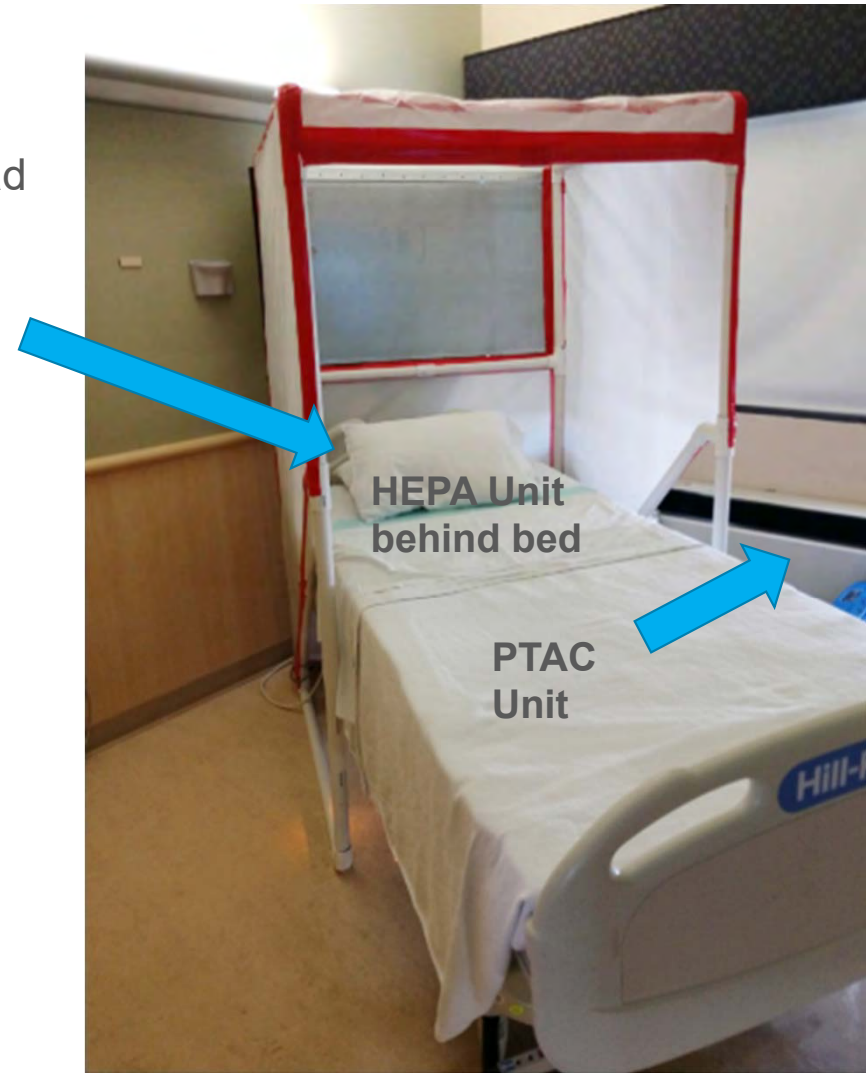
## Alternate Strategy – Source Control

Consider Local Exhaust Source Control at Patient Head for Patients on CPAP, Nebulizer or other AGP

Ventilated Headboard (photo, page 68)

<https://www.cdc.gov/niosh/surveyreports/pdfs/301-05f.pdf>

Can Be Custom Built On Site



Courtesy. Amid the COVID-19 pandemic, B&I Contractors is working with Lee Health on a concept that could help reduce the spread of the disease in hospitals.

## Alternate Strategy – Source Control

- Consider Local Exhaust Source Control at Patient Head for Patients on CPAP, Nebulizer, or other AGP
- Patient Tent w HEPA Headboard (i.e., Demistifier)  
<https://www.peacemedical.com/2000A%202014.pdf>
- Portable Snorkel Exhaust (i.e., SentryAir used for soldering)  
<https://www.sentryair.com/portable-floor-sentry.htm>



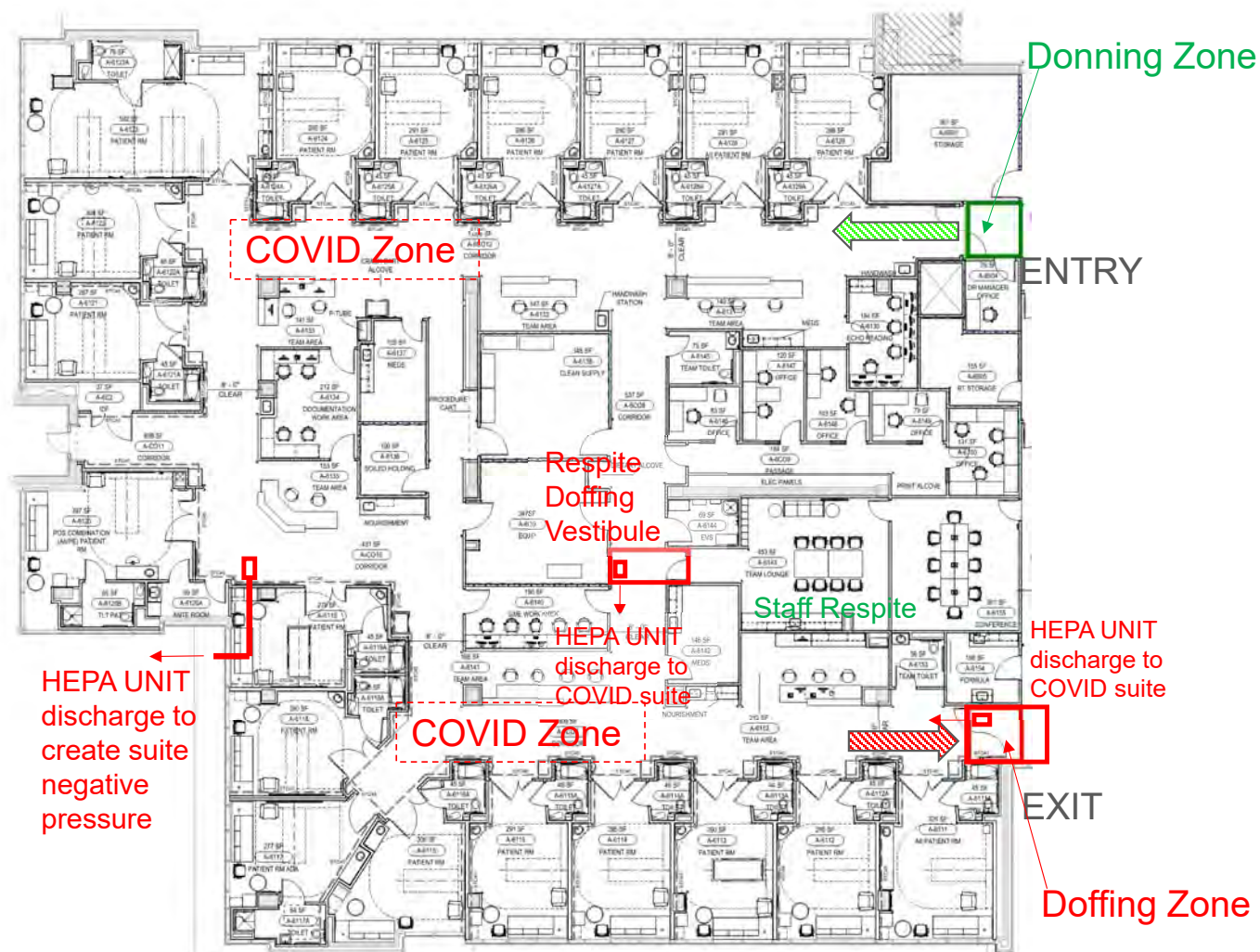
- When patient census grows beyond small scale surge capacity, consider
  - Convert units, wings or floors where all patients in “hot” zone are considered pandemic infected
  - Use anterooms/vestibules to segregate “hot” from “cold” zones
  - Rather than convert individual rooms one-at-a-time, use HEPA machines to create pressure difference at unit hot/cold boundary
  - Create one-way flow if possible, with PPE donning in one anteroom and doffing in another
    - Large enough to accommodate two caregivers, working in “buddy system”
    - Handwash in the anteroom or adjacent
  - If necessary, create positive pressure zones for staff respite inside hot zone, using HEPA machines to establish pressure differences, using anterooms/vestibules if practical
  - This approach conserves PPE
  - 100% exhaust not required – no known case of infection via ducted/filtered return



The benefits of designating COVID patient suites includes the ability to establish the suite as a negative relative pressure zone to adjoining suites.

Use a HEPA fan filter unit to establish negative relative pressure in the suite. Consider using at least two units for redundancy purposes.

This arrangement avoids the need for HEPA units in each patient room and the necessary HVAC air re-balance and correspondent make-up air issues.



## **Warning: Intensive Care Unit (ICU) or Critical Care Unit (CCU)**

ICU / CCU rooms may be positive pressure\*!

Verify and address



- Designate specific rooms or areas
- Proactively review and modify test & balance as needed
- Consider system level, once through air approach described below
- Recognize that changing the outdoor air amount might impact building pressure balance and also create humidity issues if unmanaged

\*This was Code defined and common practice for many years!

## Operating Room – COVID Patient

Avoid use for COVID patients IF YOU CAN

See resources link for additional information

IF YOU MUST:

- Recommend intubation in operating room
- The high air change rates and filtration in ORs make it highly unlikely that viable virus will make it into the sterile corridor in sufficient quantity to cause a nosocomial infection
- Do not convert an operating room to negative relative pressure. Create a temporary anteroom/vestibule instead.
- The temporary anteroom/vestibule creates buffer zone of negative pressure, but maintains operating room cleanliness

## Operating Room – Alternate use as ICU

Large space that can serve multiple patients

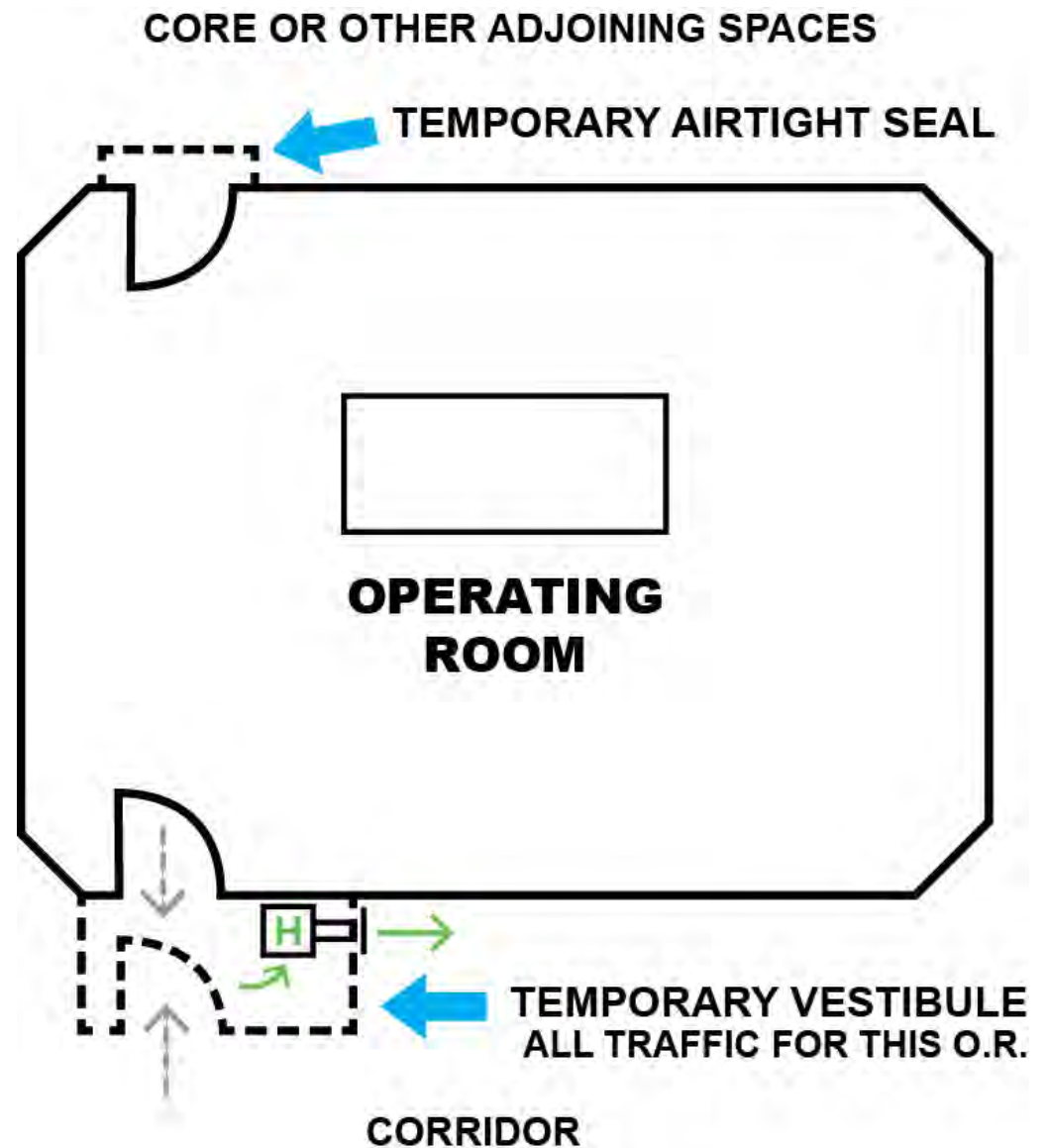
Access to O2 outlets, anesthesia machine as ventilator

IF YOU MUST:

- Segregate this space from remainder of operating suite
- Create controlled air vestibule
- Reduce air changes to 6-12 total air changes, modify outside air balance to match total / exhaust air and capacity for cooling / dehumidification
- All air exhausted from this space; alternate: HEPA filtered and returned
- Establish negative relative pressure

## Operating Room – COVID Patient

- Temporary vestibule
- HEPA unit in vestibule to create negative zone
- Seal other entries



## Emergency Department

- Coordinate with Clinical Team. Many hospitals are implementing Access Management Plans that limit occupancy of patient waiting, including off-site triage protocols. Could contaminate those components.
- Evaluate air system operation and alternative measures
  - Example: convert open bay or trauma room with use of HEPA recirculation unit to multiple patient station
  - Example: Convert AHU temporarily to once through air system; supplement make up air needs with temporary A/C as needed
  - Have a contingency / fall back plan



# 3. Implementation

Our primary function and expertise in preparation for COVID 19 is advising on HVAC systems, configurations, and modifications to support the safe segregation of suspected and confirmed patients within controlled air environments, whether true isolation or modified alternative arrangements, as best suits their needs.



## Alternate Care Sites

Understand the clinical goals as they will dictate the infrastructure needed

- COVID suspected patients?
- Non-COVID patients?
- Acuity level?
- Consider liability issues if diverging from healthcare guidelines
- Consider the temporary use of nearby hotels/motels or dormitory facilities, especially for lower acuity patients.
- The following slides in this section represent possible alternate site approaches. Much depends on the availability of facilities for adaptations as illustrated.

*ASHE Note: During emergencies, it is important that activities be coordinated through the organization's incident command system. Activities outside of an organization's command structure should be coordinated with the local, county and state incident command systems. This enables effective and efficient incident management within common organizational structures.*

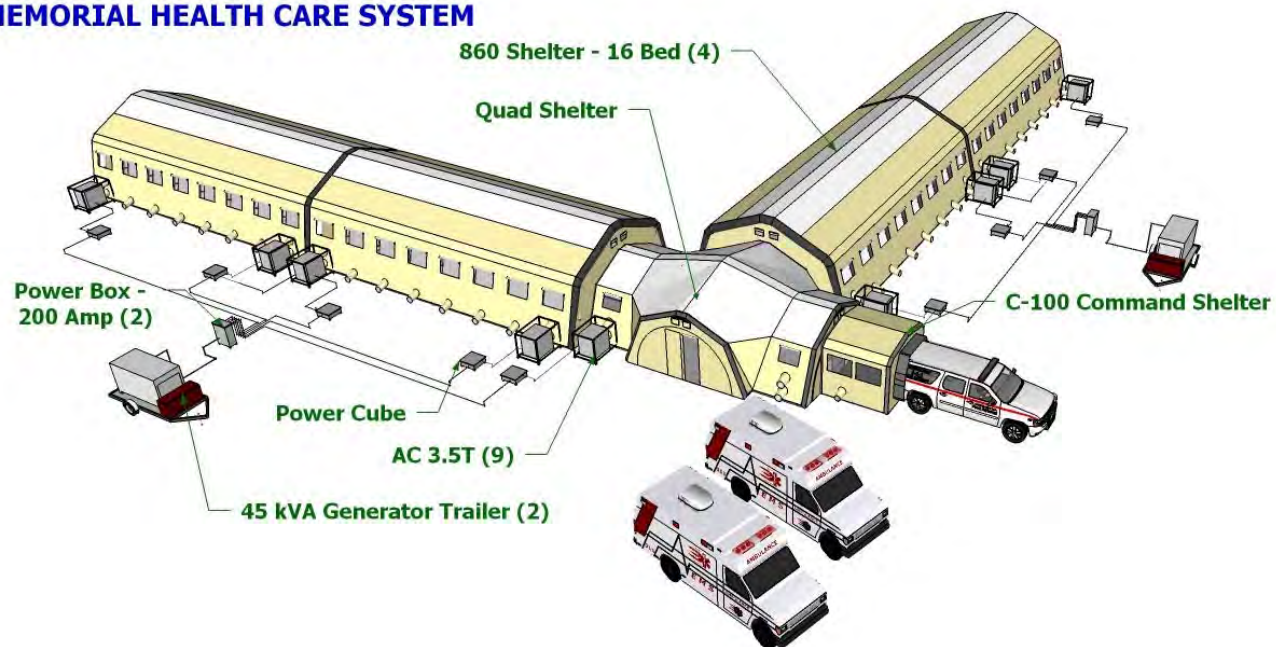


# Screening / Triage area near ED

Pre-emergency department screening area for COVID positive/suspected patients

Consider weather factors

## MEMORIAL HEALTH CARE SYSTEM



- See ASHE Resources <https://www.ashe.org/converting-alternate-care-sites-patient-space-options>
- See CDC Resources <https://www.cdc.gov/coronavirus/2019-ncov/healthcare-facilities/alternative-care-sites.html>

## Alternate Care Sites

Issues to Plan for and Address:

- Staffing – adequate skilled care providers and support staff
- Supplies – PPE, beds, equipment, infrastructure – HVAC, power, wifi
- Space – Site evaluations and proximity to hospital and areas of demand
- Do not ignore access to toilets and hand washing (challenge at large volume spaces like convention centers)





## Treatment Bay

Limited Resources

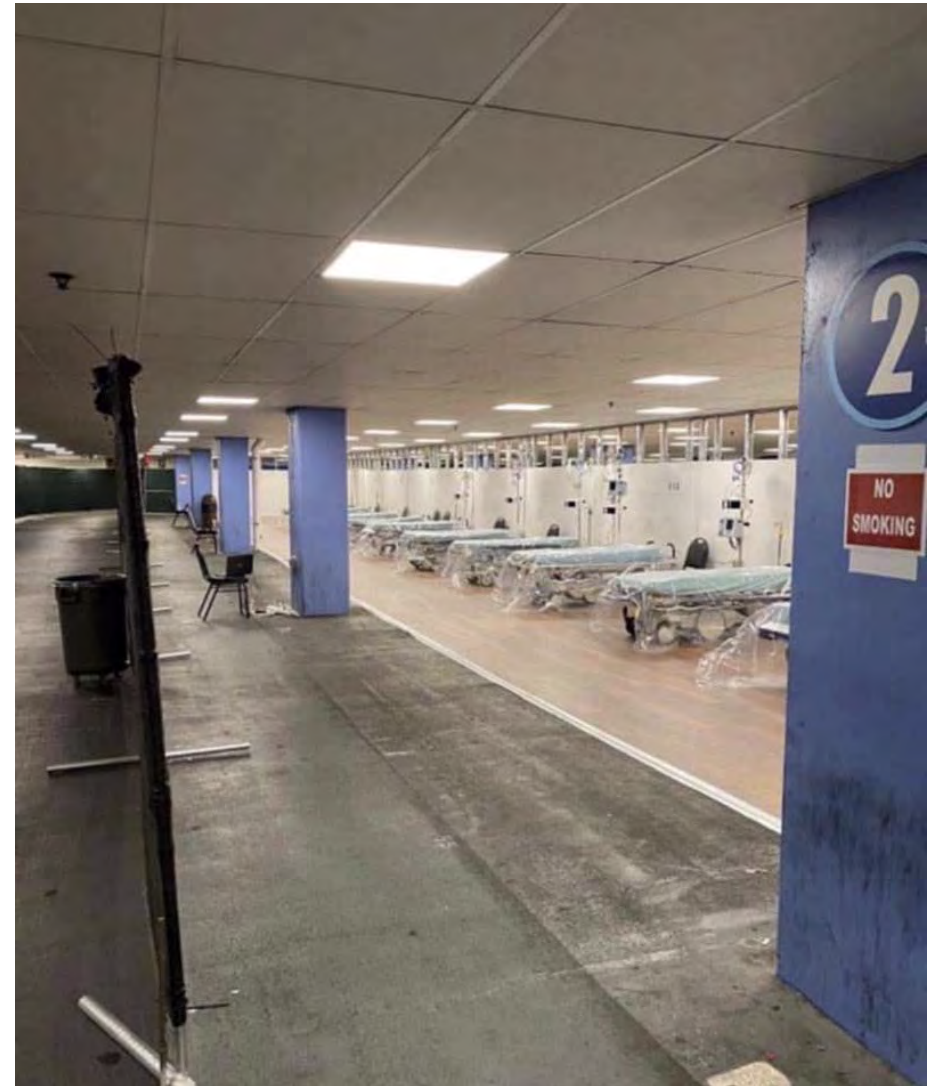
Pressurized / Airflow past patient



## Screening / Triage area near ED (Parking Garage)

Pre-emergency department screening area for positive / suspected cases

Open air

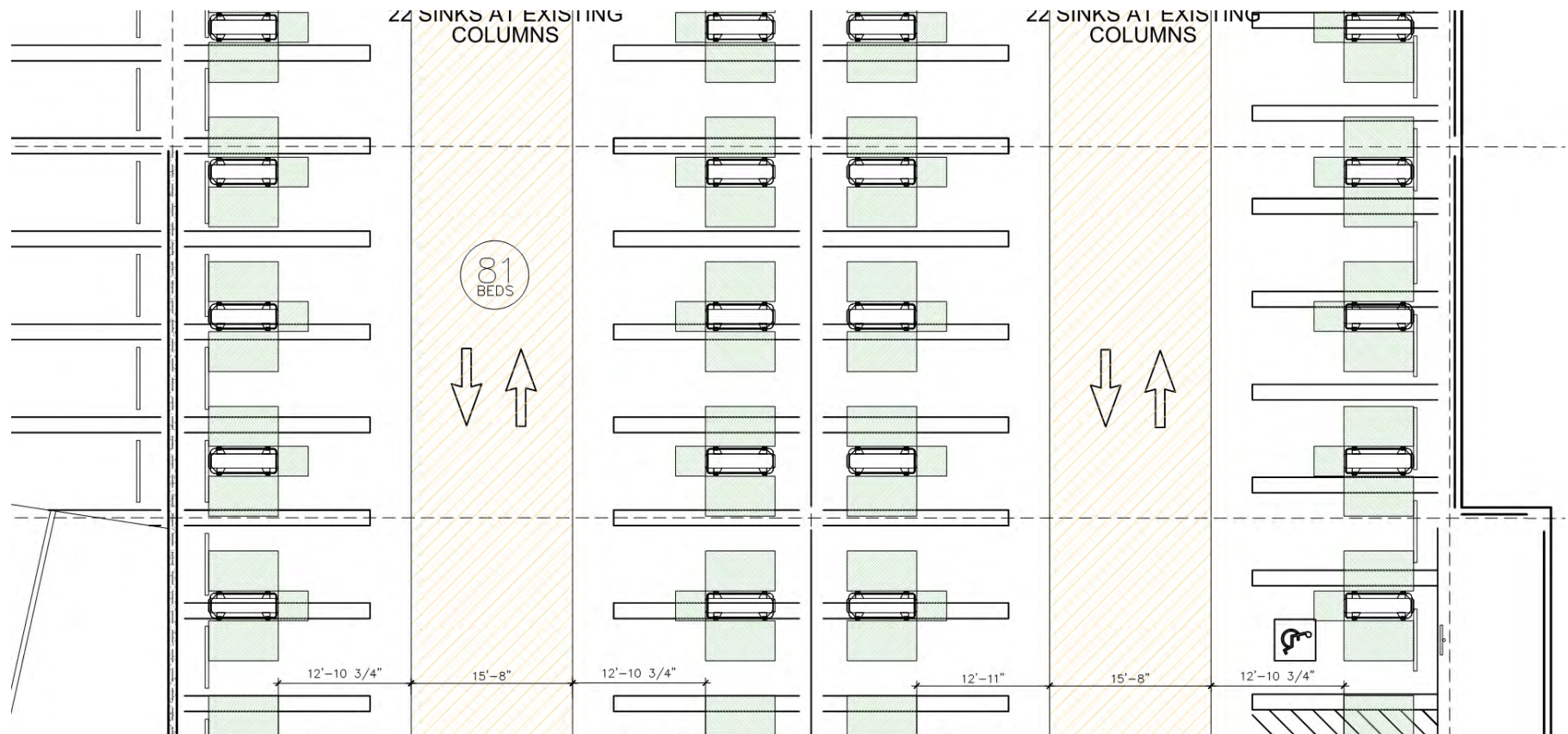


Vanderbilt Medical Center



# Screening / Triage area near ED (Parking Garage)

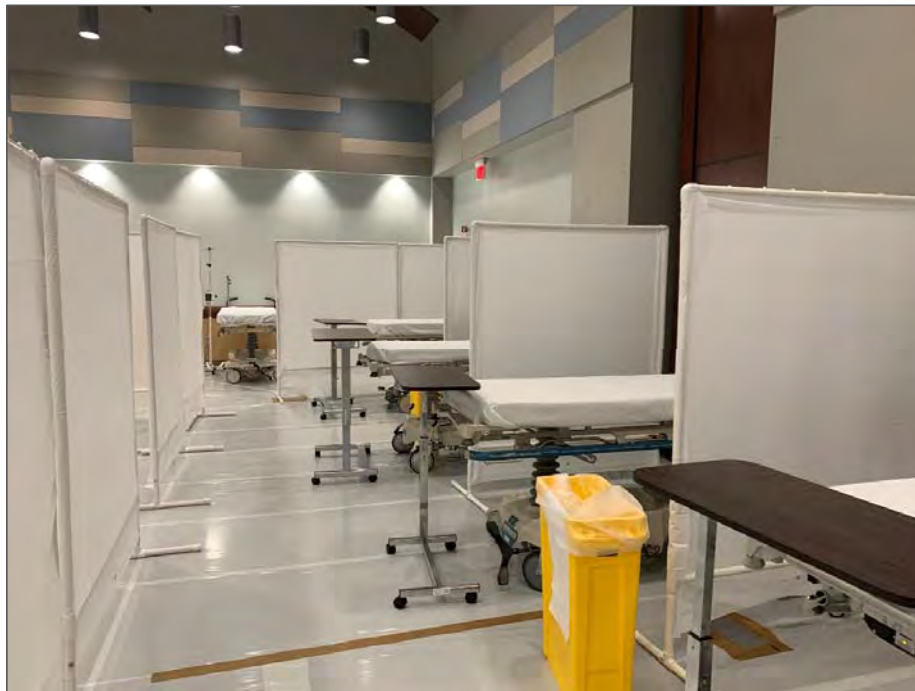
Open air



## Auditorium at Hospital

Post acute care

Limited airflow concerns



## USACE COVID-19 Response Efforts

U.S. ARMY CORPS OF ENGINEERS (AS OF: 29-MAY 0700)

# COVID-19 CORONAVIRUS

COVID-19

RESPONSE DAY



USACE

ENGAGEMENT 50/5

States / Territories

### ADMINISTRATIVE

MISSION ASSIGNMENTS 64 OPEN: 18 CLOSED: 49  
CUMULATIVE FUNDING \$1.8B MA: \$1.8B NEPR FUNDING: \$44M  
ENGAGED PERSONNEL / DEPLOYED: 553 SUPPORTING: 500

### ASSESSMENTS



### ALTERNATE CARE FACILITY TOTAL BED COUNT

15,074

### ALTERNATE CARE FACILITY CONSTRUCTION



#### ARENA TO HEALTHCARE (A2HC)

603 ARENA CONCEPTS 21 (20) ARENAS 12,184 BEDS 0 (0) BEDS 21 CONTRACTS AWARDED



#### HOTEL/DORMS TO HEALTHCARE (H2HC)

552 HOTEL/DORM CONCEPTS 17 (17) HOTELS/DORMS 2,890 BEDS 0 (0) BEDS 17 CONTRACTS AWARDED

### ARENA TO HEALTHCARE (A2HC)

603/603 Assessments Complete  
12,184 Potential Beds

### HOTELS/DORMS TO HEALTHCARE (H2HC)

552/552 Assessments Complete  
2,890 Potential Beds



### ENGINEERED SOLUTION PLANS

Approved site adaptations must be accomplished in as little as 5 days and at most 2 weeks to align with state projected virus infection peaks.

### 4 STANDARD DESIGNS



College Dorm Hotel Sports Arena Convention Center

All 4 designs can be adapted to serve COVID and NON-COVID patients.

### PROJECT COMPLETION



34 OF 38 COMPLETE



U.S. Army Corps of Engineers

## BUILDING STRONG®

### SIMPLE SOLUTIONS FOR A COMPLEX PROBLEM

For more information about what the Corps is doing in response to COVID-19 visit: <https://www.usace.army.mil/coronavirus/>

USACE works in conjunction with the entire federal ecosystem during responses like COVID-19 through FEMA, learn more about their mission here: <https://www.fema.gov/corona>





# USACE TERMINOLOGY FOR COVID-19 PERFORMANCE WORK STATEMENTS (PWS)



6

Patient Diagnosis	Acuity **	Clinical Differentiation Impacting the Facility Design	NFPA 99 Space Category & NFPA 101 Classification	Recommended Facility Solution per PWS's	
				Hotel/Barracks	Arena
COVID Positive	Acute*	Airborne Infectious On Ventilator	Cat 2 Plus* (General/Critical Care) Non-Ambulatory	Single Patient Space Negative Pressure Room Line of Sight to Patient (vision panel / camera)	Single Patient Space Negative Pressure Pod Line of Sight to Patient (Vision panel)
COVID Positive or Presumed Positive (pending test)	Non-Acute	Airborne Infectious Not On Ventilator. May require supplemental oxygen	Cat 3 (Basic Care) Ambulatory	Single Patient Space No negative pressure Isolation by floor/room Line of sight not required (cameras to reduce contact)	Single Patient Space Negative Pressure Pod Line of sight not required
NON-COVID	Non-Acute	Not airborne infectious	Cat 3 (Basic Care) Ambulatory	No Special Requirements – No negative pressure. Multi-patient room permissible Line of sight not required	No Special Requirements – No negative pressure. Multi-patient bays permissible. Line of sight not require
NON-COVID	Acute	Not airborne infectious May require medical support spaces not in ACF.	Cat 2 (General Care) Non-Ambulatory	Typical Med/Surg May not be appropriate for ACF*	Typical Med/Surg May not be appropriate for ACF*
NON-COVID	Critical	Intense medical needs beyond Cat 2 Plus. Multiple Comorbidity	Cat 1 (Critical Care) Non-Ambulatory	Hospital ICU/All/PE ACF not intended for full Category 1 Provisions.	Hospital ICU/All/PE ACF not intended for full Category 1 Provisions
Applicable Performance Work Statement for Alternate Care Facility (ACF)			NOTES		
- H2HC Acute or B2HC Acute			* Category 2 Plus applies NFPA 99 Category 2 considerations (General Care – risk of minor injury) plus additional Category 1 provisions (Critical Care – risk of major injury or death) as relates to the specific needs of a COVID-positive patient on a ventilator.		
- H2HC Non-Acute or B2HC Non-Acute			**This column is not intended to represent true clinically defined patient acuity but represents a general categorization (and terminology) used across the PWS's		
- A2HC Acute					
- A2HC Non-Acute (NON-COVID)					





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## JAVITS CENTER – NEW YORK, NY ARENA TO HEALTHCARE (A2HC)



### Alternate Care Facility Overview

Location: New York, NY
MSC: North Atlantic Division (NAD)
FEMA Region: II
Contractor: NYCC Op. Corp.
Type: Arena (A2HC)
Patient Type: COVID
Facility Size: 470,000 SF
Bed Capacity: 2,106
Address: 655 West 34 <sup>th</sup> St., New York, NY 10014.

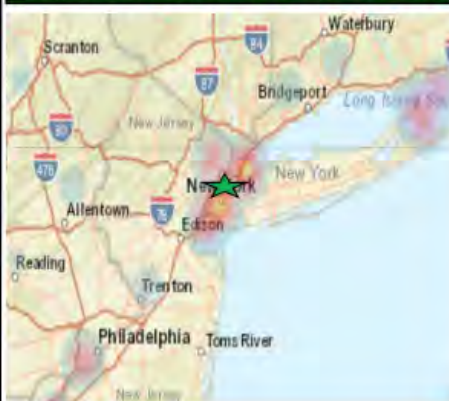


### Timeline

Assessment MA received	22 MAR 20
Construction MA received	23 MAR 20
Contract Awarded	25 MAR 20
Construction Start	30 MAR 20
Contractual Completion	30 APR 20
Estimated Completion	30 APR 20
Actual Completion	24 APR 20
Total Construction Duration	26 Days

Notes: 100% Complete; First patient arrived 11 APR 20.

### Projected Bed Shortfall 07 JUN – 14 JUN



### Plans

Plans Key:  
Blue: Patient rooms / beds  
Pink/Purple: Nurse stations

Notes  
1<sup>st</sup> floor: 652 beds with 1,304 bed surge capacity

3<sup>rd</sup> Floor: 946 bed with 1,892 bed surge capacity

Also includes 508 beds with 1,016 bed surge capacity (FMS area)



### In Progress Photos





# McCormick Center, Chicago







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## MCCORMICK PLACE – CHICAGO, IL ARENA TO HEALTHCARE (A2HC)



### Alternate Care Facility Overview

Location: Chicago, IL
MSC: Great Lakes & Ohio River Div. (LRD)
FEMA Region: V
Contractor: Metro. Pier and Expo. Authority
Type: Arena (A2HC)
Patient Type: COVID
Facility Size: 1.5M SF
Bed Capacity: 3,000
Address: 2301 S King Dr., Chicago, IL 60616



### Timeline

Assessment MA received	22 MAR 20
Construction MA received	26 MAR 20
Contract Awarded	28 MAR 20
Construction Start	29 MAR 20
Contractual Completion	24 APR 20
Estimated Completion	24 APR 20
Actual Completion	23 APR 20
Total Construction Duration	26 Days

**Notes:** 100% Complete; First patient admitted 15 APR 20.

### Projected Bed Shortfall 07 JUN – 14 JUN



### Plans

**Plans Key:**  
Yellow = Patient pods  
Pink = Medical areas  
Orange = Toilets

**Notes:**  
Hall A has 1750 low acuity beds  
Hall B has 750 medium acuity beds  
Hall C has 500 low acuity beds



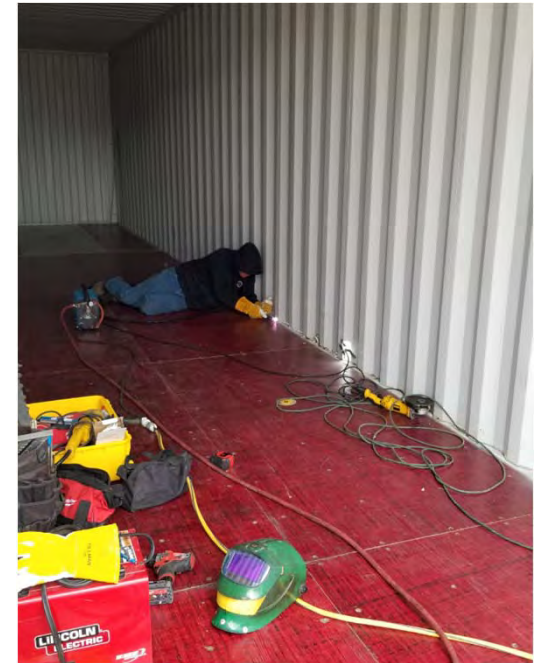
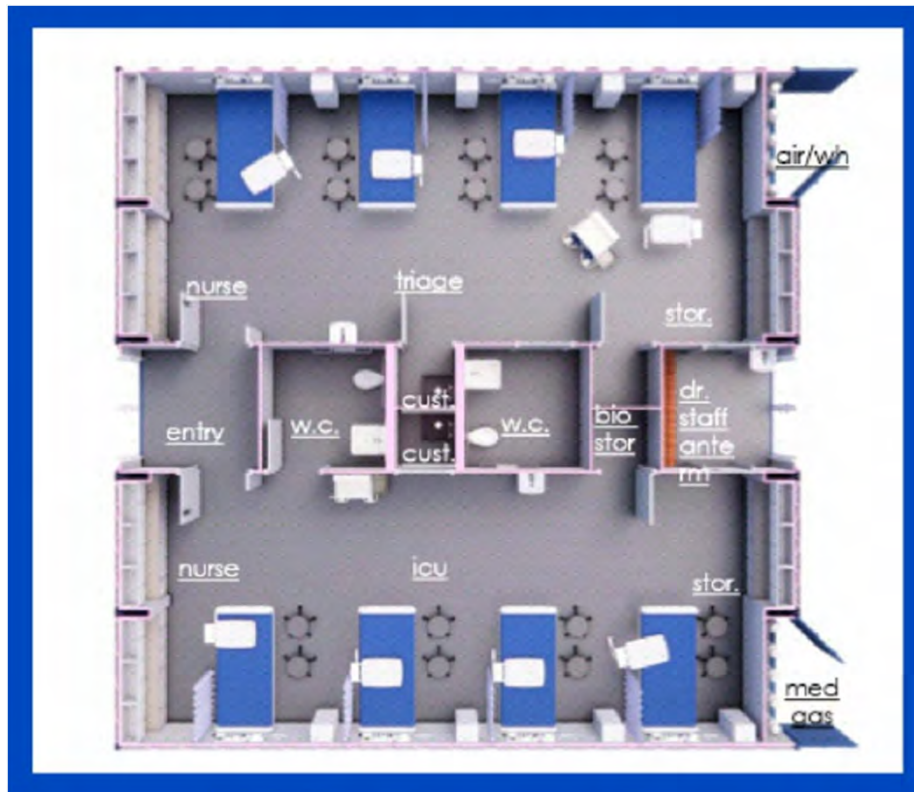
### In Progress Photos



## Mobile Care Sites

Can augment acute care needs

Limited capacity – Lead time and infrastructure



## 4. Recovery Plan

Demobilize

Disinfect

Do maintenance

More info: Epidemic Task Force



## Demobilization

Repair damages wrought by temporary measures

Harden necessary temporary measures

Plan for dedicated / permanent COVID unit(s)

Document and complete AHJ approvals



## Decontamination

Prioritize normal manual cleaning activities for terminal disinfection

UV-C disinfecting lighting

- Line-of-sight vision issues and skin cancer hazard if not applied correctly
- <https://indigo-clean.com/index> 405nm safe for patient applications

Hypochlorous Acid

- May reduce cleaning time
- Electrostatic sprayer, including backpack style  
<https://evaclean.com/products/protexus-cordless-electrostatic-sprayers>

Vaporized Hydrogen Peroxide

- Requires careful application, seal HVAC to room being treated. May have better uses for equipment sterilization. Local Exhaust at Patient Head for Patients on CPAP, Nebulizer, other AGP

- Refer to temporary measures documentation to familiarize with HVAC systems changes made prior to taking any actions.
- Upon release from COVID use, promptly coordinate with EVS for terminal cleaning activity which should include supply/return/exhaust grille wipedown. Do not remove room HEPA machine until EVS service in room is complete. Coordinate removal of return grille covering at that time.
- If Air Balance of an area was modified during temporary COVID use, coordinate and verify by T&B that you are restoring the area to original conditions. Verify suite relative pressure is neutral or positive.
- Recognize the impact of airside economizer (especially if any modifications to outside air damper settings) on suite relative pressure. Verify proper airside economizer operation is restored.
- If VAV boxes were re-programmed to constant volume, restore programming to proper VAV operation.
- Cover and transport any room HEPA machines that are no longer in use to a secured room away from other air handling equipment, preferably an exhausted room, until a cleaning protocol is established and provided.



## Infrastructure

Assume increased demand for oxygen therapy. Assess bulk oxygen capacity and top off. Develop a re-filling plan if already frequent.

Coordinate with biomedical regarding stores of O2 hoses, masks, humidifiers and portable oxygen cylinders. ECMO has been needed for severe cases.

See Kaiser white paper on O2 capacity info and Beacon med gas pipe sizing guidance (contact M. Sheerin)

# Do Maintenance

Repair and prepare  
Use CMS waivers

## **Physical Environment for Multiple Providers/Suppliers *(New since 4/21 Release)***

**Inspection, Testing & Maintenance (ITM) under the Physical Environment Conditions of Participation:** CMS is waiving certain physical environment requirements for Hospitals, CAHs, inpatient hospice, ICF/IIDs, and SNFs/NFs to reduce disruption of patient care and potential exposure/transmission of COVID-19. The physical environment regulations require that facilities and equipment be maintained to ensure an acceptable level of safety and quality.

CMS will permit facilities to adjust scheduled inspection, testing and maintenance (ITM) frequencies and activities for facility and medical equipment.

- **Specific Physical Environment Waiver Information:**

- 42 CFR §482.41(d) for hospitals, §485.623(b) for CAH, §418.110(c)(2)(iv) for inpatient hospice, §483.470(j) for ICF/IID; and §483.90 for SNFs/NFs all require these facilities and their equipment to be maintained to ensure an acceptable level of safety and quality. CMS is temporarily modifying these requirements to the extent necessary to permit these facilities to adjust scheduled inspection, testing and maintenance (ITM) frequencies and activities for facility and medical equipment.

<https://www.ashe.org/covid-19-recovery>

## Code Compliance

Coordinate with state and local authorities

See guidance / reach out for help

Document the action plan and alternations in place

Develop interim life safety measures as applicable

# Resurgence Planning

Define scalable resources needed for future potential pandemic wave(s)

- 'Ready Now' rooms - typically A.I.I. rooms
- 'Ready Tomorrow' rooms – assigned rooms, wings, floors
- 'Not Ready' rooms – further capacity that might require effort

Ensure infrastructure and resources are at the ready

Identify and implement strategic projects

## Medical / Dental Offices

Limited patients – no waiting

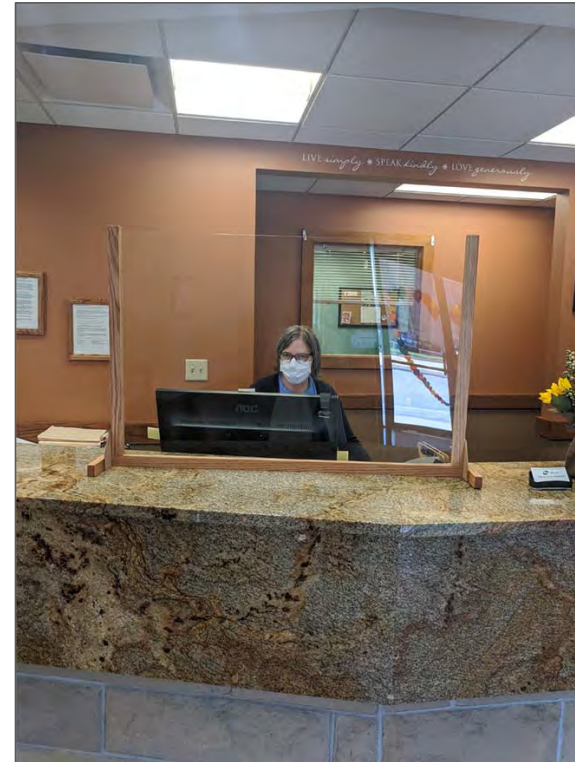
Barriers at administrative desks

Clinical protective measures

Daily staff screenings

Review / modify HVAC airflow path to protect staff

Use source control as appropriate





## Ventilators

Society of Critical Care Medicine (SCCM), American Association for Respiratory Care (AARC), American Society of Anesthesiologists (ASA), Anesthesia Patient Safety Foundation (APSF), American Association of Critical-Care Nurses (AACN), and American College of Chest Physicians (CHEST) Extend Ventilator Use by Splitting Capacity issued statement :

“Advise clinicians that sharing mechanical ventilators should not be attempted because it cannot be done safely with current equipment”

<https://www.asahq.org/about-asa/newsroom/news-releases/2020/03/joint-statement-on-multiple-patients-per-ventilator>







- Epidemic Task Force
  - Chair – Bill Bahnfleth
  - Voting – Jason DeGraw, Max Sherman, Luke Leung, Dr. Stephanie Taylor, Traci Hanegan, Steve Martin, Rick Hermans, Jim Ridenhour
  - Non-Voting – Dennis Knight, Wayne Stopplemoor, Jay Kohler, Wade Conlan
  - Staff Liaison – Steve Hammerling
  - Corresponding Staff – Stephanie Reiniche, Alice Yates, Vanita Gupta
- Creating materials for different occupancies
  - Healthcare
  - Commercial
  - Residential
  - Schools
  - Offices
  - Transportation
- Creating materials for operations and maintenance
  - Shuttering a Building
  - Re-starting a building
  - Commissioning
- Literature Review and Synopsis
- Filtration (Air and Surface Disinfection)
- Frequently Asked Questions ( please submit to [Covid-19@Ashrae.org](mailto:Covid-19@Ashrae.org) )
- Resource Inventory

[www.ashrae.org/Covid-19](http://www.ashrae.org/Covid-19)

ETF Survey Letter to  
Chapters

## NEED INFO - START HERE:

See the ASHRAE COVID page <https://www.ashrae.org/technical-resources/resources>

Also go to the ASHE page for more info <https://www.ashe.org/COVID19resources>

## Supplemental Systems – Decontamination

### UV Air Cleaning

- UV at air handler can halt contaminant build up on coil; not likely to eradicate virus in airstream

### UV-C disinfecting lighting

- Upper air UV light fixture can eradicate airborne virus; wouldn't impact the droplets settling on surfaces, so limited impact on overall virus transmission
- Most direct UV lights harmful to occupants and furnishings so limited applications
- New 405nm is safe for patient applications <https://indigo-clean.com/index>

### Bi-Polar Ionization Air Cleaning

- Charged Ions can attach and aggregate contaminants including virus particles in air, thus enable more effective capture by filtration or during surface cleaning
- Must comply with UL 2998 and ASHRAE 62.1 as ozone build up can be harmful

## Post COVID-19 Planning & Preparation

In the Pre-occupancy / Functional Programming Process – discussions to include:

- Resilience
- Need plan for surging to higher number of beds
- Testing “zones” for all types of healthcare settings
- Alternative care sites because hospitals can no longer have patients step down to nursing homes
- Evaluation of care models within long term care settings – reduced number of residents in groups with consistent staffing to reduce spread of infection, illness, and death
- PPE ‘kits’ and secured supplies available at point of service
- Training and education – cleaning and disinfection of touch points
- HVAC equipment and filtration training for facility staff to accommodate potential patient surge and protect healthcare workers, family/friends, and EMT workers

## Post COVID-19 Planning & Preparation

- In the Pre-occupancy / Functional Programming Process – discussions to include:
- Materials and Surfaces
  - Performance
  - Multiple attributes evaluated for specifications
  - Product service life
  - Match product application to appropriate product use
  - Material Toolkits to include questions for product manufacturers, distributors, and healthcare providers including minimum testing requirements
  - Testing materials for cleaning and disinfection
  - Educating staff on cleaning and disinfection – not only related to touchpoints, but also materials and surface information



# COVID – 19 Guidance

Have questions? Need help?

Contact: [Michael.Sheerin@tlc-eng.com](mailto:Michael.Sheerin@tlc-eng.com)