Integrating Infection Prevention and Control Science into POD-based Planning

Module 4: POD Exposure and Safety Module

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Objectives

- Introduce practices to reduce exposure risk and maintain safe environment
  - Transmission-based considerations
  - Hierarchy of Controls

Goal: Continuity of safe POD operations

Bioaerosols and Respiratory Droplets

- Produced when exhaling (speaking, coughing, sneezing, breathing)
- Two general categories:
  - larger droplets fall out of the air (**droplet transmission; direct transmission due to close proximity)**
  - smaller droplets are suspended in the air (generally speaking, **“airborne” transmission)**
- Although the fate of these droplets largely depends on environmental factors such as humidity, temperature, etc., in general, the larger droplets settle due to gravity and do not generally travel distances more than approximately 6 feet. However, due to a litany of factors, it is plausible these larger droplets can travel further due to expulsion rate from the infected person (e.g., cough expulsion is greater than speaking), airflow, and other environmental factors.
- Generally speaking, bioaerosols remain suspended in the air for longer durations due to their smaller size and can play a key role in spreading infection. The smaller particle size does not always indicate smaller amounts of infectious virus.

Source: CDC; American Chemical Society

Bioaerosols and Respiratory Droplets

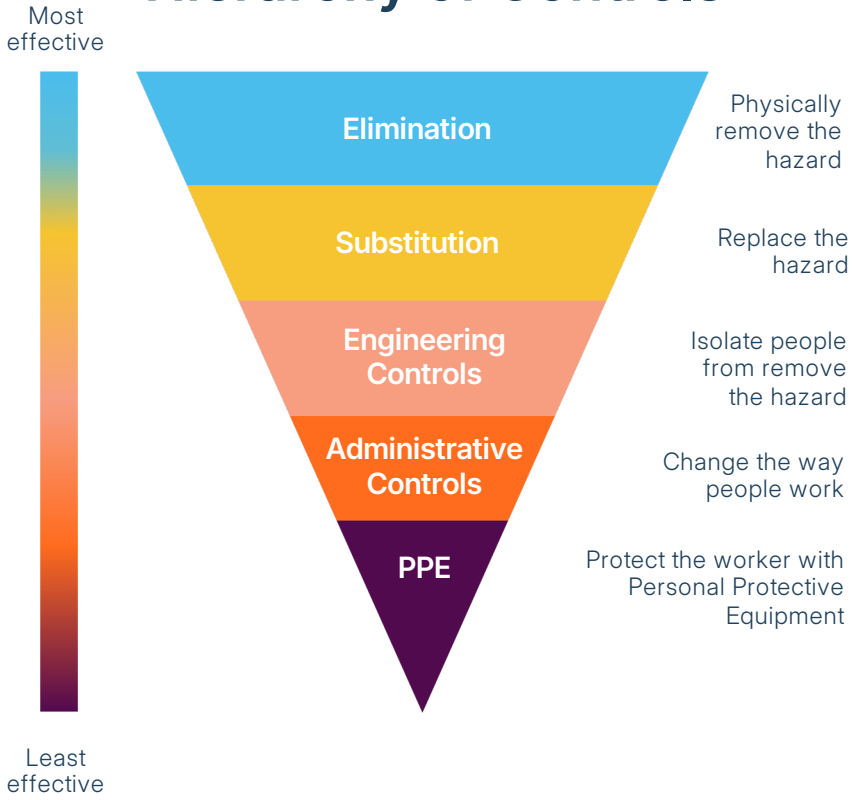
- Enclosed indoor spaces, extended exposure, inadequate ventilation are risk factors amplifying potential exposure and risk of infection.
- Per published reports, factors that increase the risk of SARS-CoV-2 infection under these circumstances include:
    - **Enclosed spaces with inadequate ventilation, air change rates, or air handling** within which the concentration of exhaled respiratory fluids, especially very fine droplets and aerosol particles, can build-up in the air space.
    - **Increased exhalation** of respiratory fluids if the infectious person is engaged in physical exertion or raises their voice (e.g., exercising, shouting, singing).
    - **Prolonged exposure** to these conditions, which is typically more than 15 minutes.

(Source: CDC)

Case Study: SARS-CoV-2 and Bioaerosol Threats

- SARS-CoV-2 has been confirmed to spread through droplet transmission.
- Transmission of SARS-CoV-2 through small bioaerosols suspended in the air is highly plausible (and likely) and remains a topic of research and discussion among experts and policy makers.
- Exposure risk consists of these modalities (per CDC):
  1. Inhalation of fine bioaerosols
  2. Deposition of virus carried in exhaled droplets and particles onto exposed mucous membranes (i.e., “splashes and sprays”, such as being coughed on). Risk of transmission is likewise greatest close to an infectious source where the concentration of these exhaled droplets and particles is greatest
  3. Touching of mucous membranes with hands soiled by fluids containing virus
- How to reduce exposure risks in POD sites?

Hierarchy of Controls



Source: CDC

- Risk and exposure management control strategies
- Engineering controls
  - Ventilation
  - Filtration
  - Isolation
- Administrative controls
  - Personnel management
    - Remain physically distant
- Personal Protective Equipment
  - Respiratory
  - Cutaneous
  - Injury protection

Engineering Controls

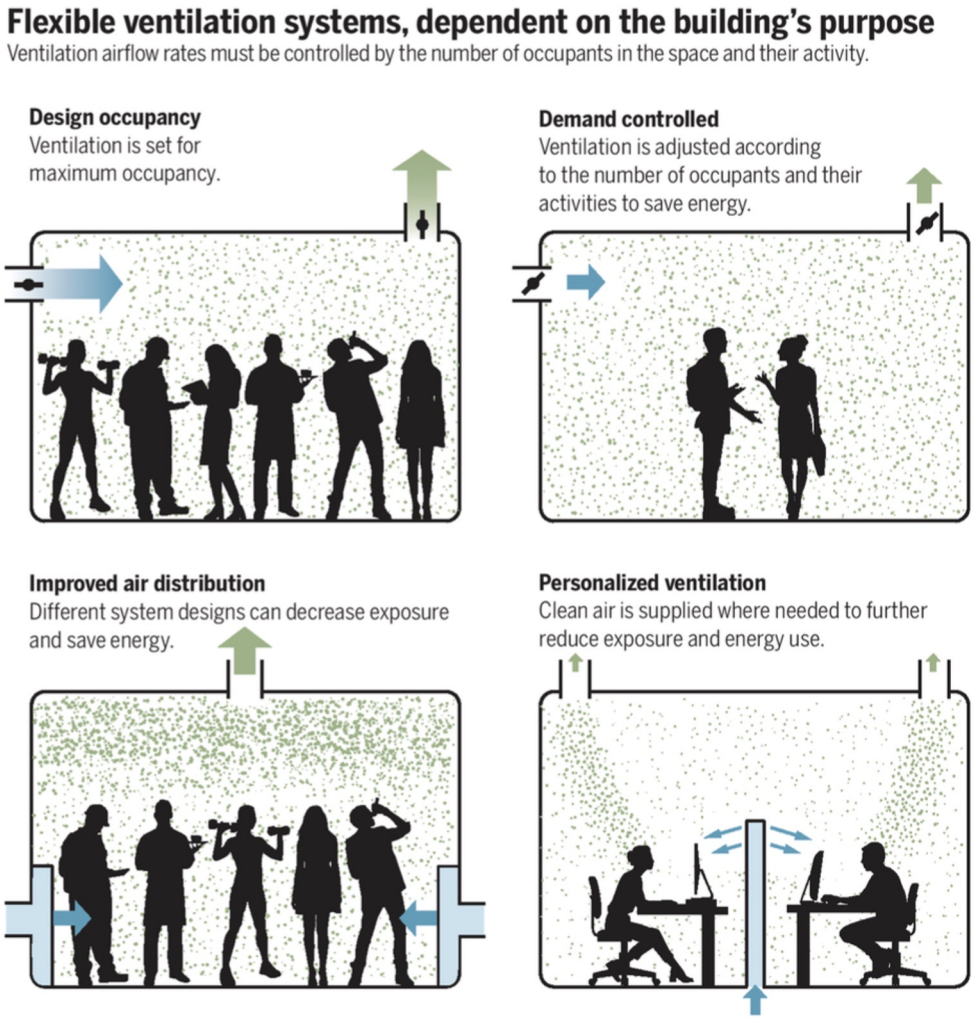
- Ventilation systems
- High-capacity HEPA filtration units (standalone purifiers)
- Ropes, belt barriers/stanchions, or other distancing measures to avoid congregation
- Spacing for dispensing or vaccine administration tables
- Barriers between workers and public (plexiglass) although not as effective as others unless barrier covers 100% of space between the worker and public

- Recirculated air run through a combination of filters and cleaners or increase outdoor air if systems can handle it
- MERV 13+ filter recommendation for HVAC recirculated air
  - MERV = Minimum Efficiency Reporting Value
  - Describes mechanical filter efficiency
  - HVAC systems designed/installed at MERV 6 - MERV 8
- Ensure current systems are capable of functioning at higher levels
- If directional airflow is not an option, best to mix space air
  - Low levels (avoid strong air currents that could increase transmission by pushing bioaerosols across breathing zones)
- HVAC Systems: maintain temperature and humidity points

Source: OSHA, ASHRAE

Ventilation matters

Source:
Morawska L, et al A paradigm shift to combat indoor respiratory infection. Science. 2021 May 14;372(6543):689-691. doi: 10.1126/science.abg2025. PMID: 33986171.



Vanderbilt MC pre-ED Screening in open air parking garage

Consider exhaust discharge locations – direct away from people and outside air intakes

Bottom opening exhausted to create front to back airflow across patient

Credit: ASHRAE

Administrative Controls

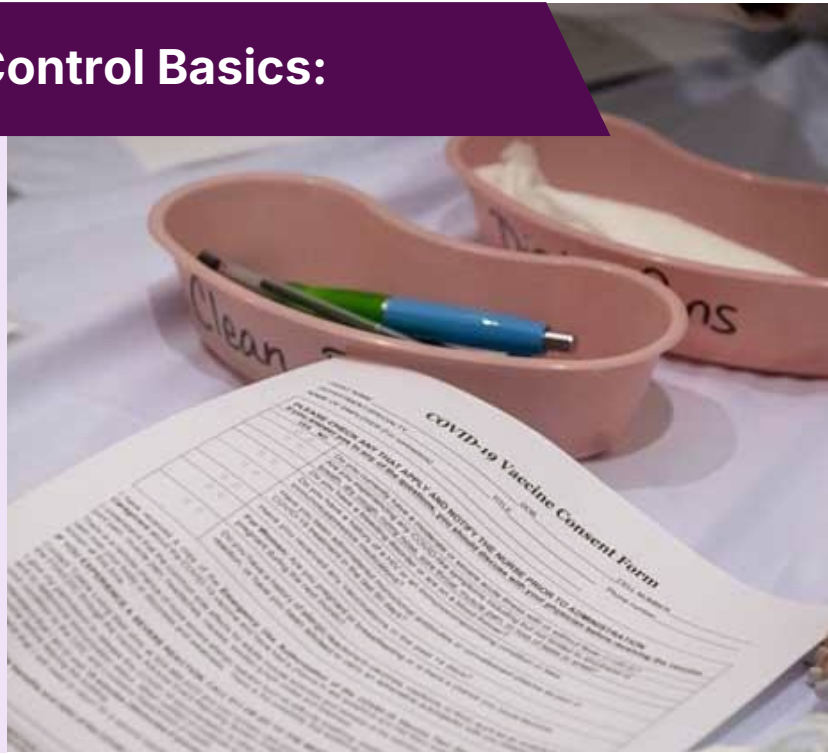
- Behavioral-based solutions
- Spaced arrival of pre-registered individuals
- Safely spaced stations
- Avoid extra workers “hanging around”
- Proper signage
- Trainings & guidance
- Frequent cleaning & sanitizing
- Requiring masks
- Enforcement of protective equipment and protocols

Source: OSHA

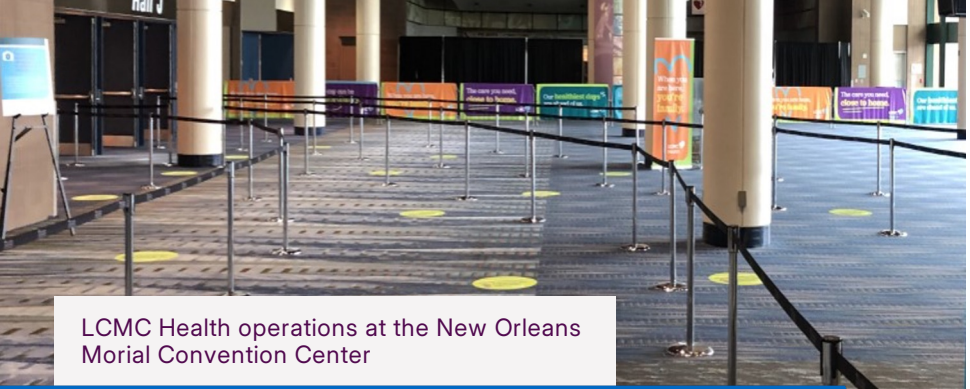
Don’t Overlook Infection Prevention and Control Basics:

Fomite transmission will always be a concern during highly contagious infectious disease pandemics.

Consider disinfection of high-touch surfaces and any items that will be shared from person to person (e.g., pens at registration). Clearly delineate clean items from dirty items.



Credit: Tulane News | Photo by Paula Burch-Celentano
https://news.tulane.edu/news/photos-tulane-rolls-out-covid-19-vaccine



LCMC Health operations at the New Orleans Morial Convention Center

Stanchions and floor stickers make distancing and queueing easier to follow

Administrative signage to promote safety and compliance (behavioral changes/adoption)

As seen on Tulane University campuses

Make signage for easy-to-follow progression to maintain desired flow and safety

LCMC Health operations at the New Orleans Morial Convention Center

Personal Protective Equipment (PPE)

Do you know the difference between PPE and CPE?

Clothing/equipment that creates a barrier and protects the individual wearing it from becoming at higher risk of exposure from an environmental threat such as a pathogen (e.g., SARS-CoV2).

Typically, potential high-risk contact includes:

- Inhalation of respiratory secretions or aerosols
- Contact with non-respiratory secretions (vomit, feces, urine, blood, etc.)

The type of contact and specific characteristics of the threat will impact the type and amount of PPE worn. These will vary across roles within the vaccination sites.

Personal Protective Equipment (PPE)

- Specialized equipment to prevent exposure
- Users **must** be fit-tested for proper protection
- Users must be trained in donning/doffing
  - Proper use results in user protection from exposure
  - Also serves as source control – protects others
- Examples include filtering facepiece respirators (FFRs), like N95 respirators
- **NOTE:** *Properly worn surgical masks are meant to help block large-particle droplets, splashes, sprays, or splatter that may contain germs (viruses and bacteria), keeping it from reaching the wearer's mouth and nose. Surgical masks also act as source control, just as any other mask. Surgical masks are not designed to filter or block very small particles from the air that the wearer is breathing. Unlike respirators when worn correctly, they do not provide complete protection because they do not form a tight seal against the wearer's face.*

Community Protective Equipment

- No fit-testing requirements
- Not considered PPE, even if using an N95 without proper fit-testing and seal
- Serves as source control – protects others
    - Decreases probability of transmission from the wearer (who could be asymptomatic) to those in proximity
    - Provides minimal exposure aerosol protection for users - NOT A FUNCTIONAL BARRIER
- Most do, however, provide protection at levels that are not insignificant
    - Tighter woven fabrics serve as a good protective barrier – up to 50% filtration across the 10 nm – 6 µm particle size range
    - A four-layer silk (used, for instance, as a scarf) can be surprisingly effective with an average efficiency of >85% across the 10 nm – 6 µm particle size range.

Source: Aerosol Filtration Efficiency of Common Fabrics Used in Respiratory Cloth Masks. Abhiteja Konda, Abhinav Prakash, Gregory A. Moss, Michael Schmoldt, Gregory D. Grant, and Supratik Guha. ACS Nano 2020 14 (5), 6339-6347. DOI: 10.1021/acsnano.0c03252

COVID-19 Case Study: Workers Need Respirators

Infected individual (source) is wearing	Susceptible individual is wearing					
		Nothing	Cloth Mask	Surgical Mask	N95 FFR (10%)	N95 FFR (1%)
	Nothing	15 min	20 min	30 min	2.5 HR	25 HR
	Cloth Mask	20 min	27 min	40 min	3.3 HR	33 HR
	Surgical Mask	30 min	40 min	60 min	5 HR	50 HR
	N95 FFR (10%)	2.5 HR	3.3 HR	5 HR	25 HR	250 HR
	N95 FFR (1%)	25 HR	33 HR	50 HR	250 HR	2,500 HR

Source: American Conference of Governmental Industrial Hygienists (ACGIH)
https://www.acgih.org/covid-19-fact-sheet-worker-resp/

For more information and training on Infection and Prevention Control, visit *ipc.nnphi.org*.

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