

Ventilation Strategies to Control COVID-19 Transmission in Skilled Nursing Facilities – Part 1

Elon Ullman and Jackie Chan

CDPH Occupational Health Branch

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Agenda

- How is COVID-19 transmitted?
- General ventilation principles to reduce transmission
- Discussion and Q&A



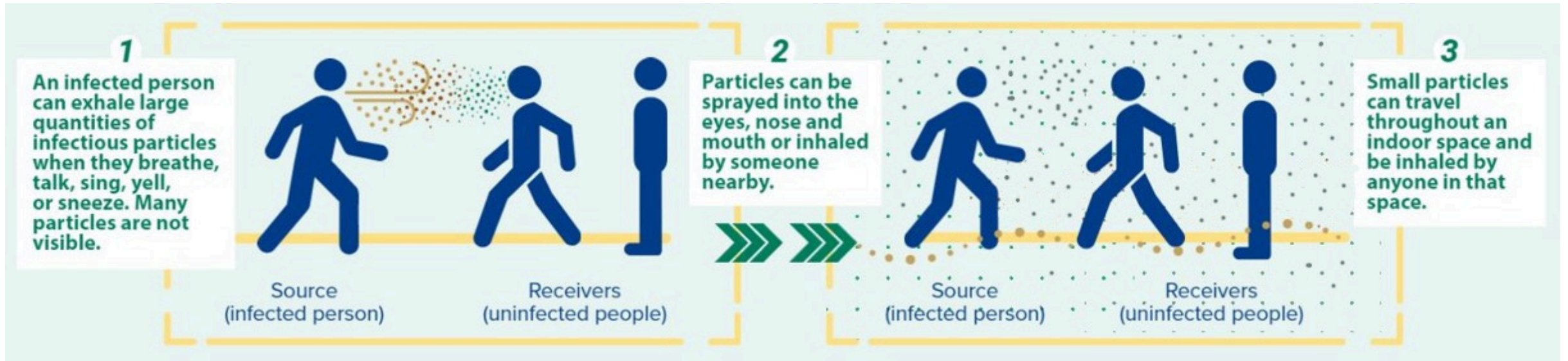
Dominant Transmission Routes of COVID-19

- I. Inhalation of virus particles from close contact
- II. Inhalation of virus particles that have remained suspended in air and "build-up" because of poorly-ventilated indoor environments (not necessarily from close contact)
- III. Direct exposure to virus particles in the eyes, nose, or mouth from "splashes and sprays"

Airborne Transmission of COVID-19

- Droplet and fomite transmission first assumed
- Growing body of research found airborne predominant route of transmission
 - ❑ Difference in rates between outdoor and indoor transmission
 - ❑ Modeling of “superspreading” events
 - ❑ Ineffectiveness of droplet precautions in healthcare
- Airborne transmission acknowledged by:
 - ❑ CDC, WHO, CDPH, Cal/OSHA

Virus Transmission Diagram



What Do We Mean By Ventilation?

- Introduction of fresh air into indoor space by natural or mechanical means
- Other techniques to improve indoor air quality such as improved air filtration

What Will Ventilation Help Most With?

I. Inhalation of virus particles from close contact

II. Inhalation of virus particles that have remained suspended in air and "built-up" because of poorly-ventilated indoor environments (not necessarily from close contact)

III. Direct exposure to virus particles in the eyes, nose, or mouth from "splashes and sprays"

Cigarette Smoke Analogy



Image Credit: Wikimedia Commons

What Would Reduce Smoke Inhalation Risk?

- **Isolate/separate** the "smoker" from others
- **Exhaust/remove** the smoke from the indoor space
- **Dilute** the smoke with outdoor air, open the windows, etc.
- **Filter** out smoke particles in the air with air filter/HEPA filter

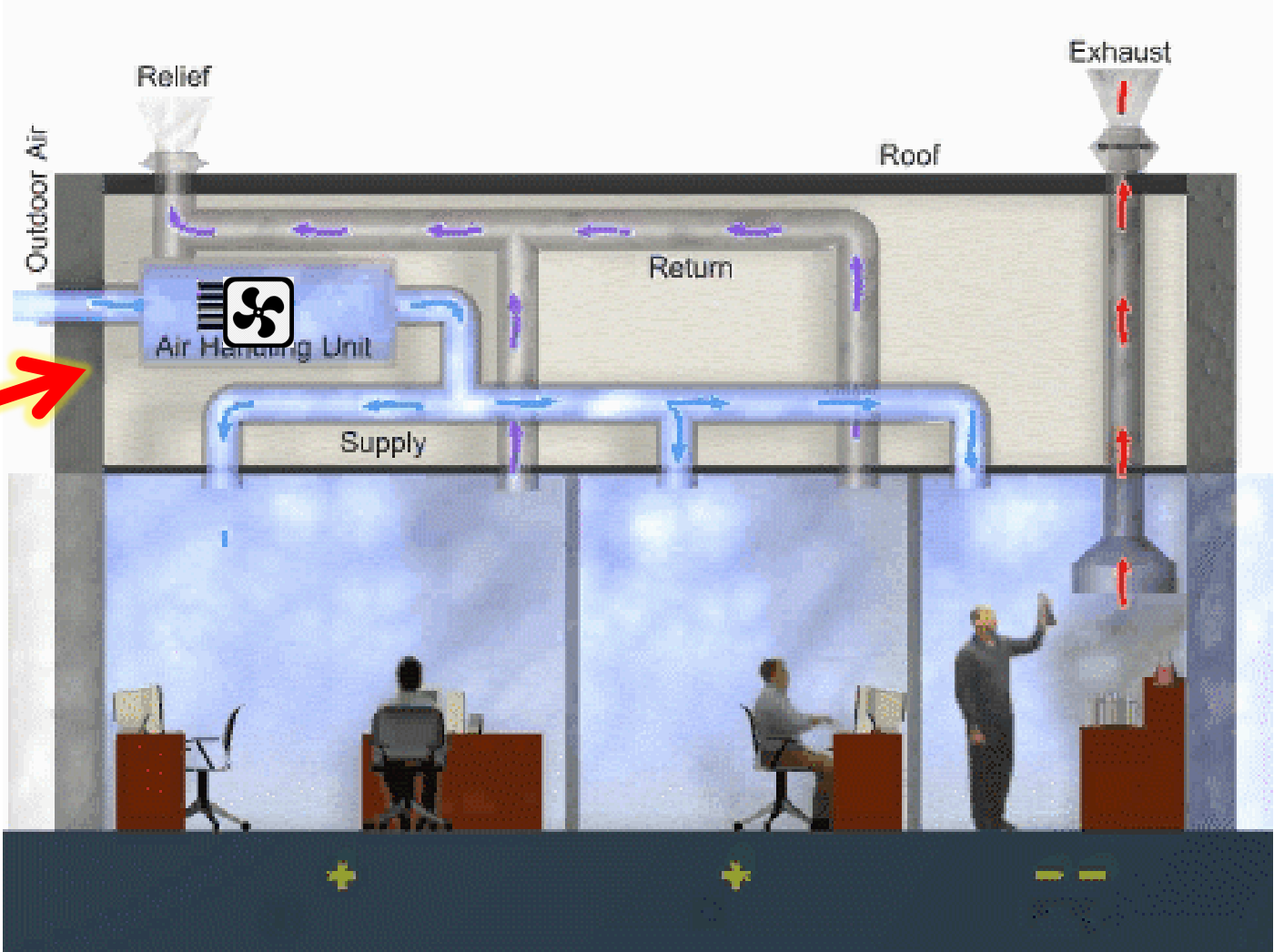
General Ventilation Principles to Reduce Transmission

Strategies to Reduce Risk

Exhaled virus will behave like invisible smoke in the air. Regardless of circumstances in a SNF, the same best practices apply:

- Exhaust “dirty” air directly to the outside if possible
- Dilute indoor air with as much fresh air as possible using natural or mechanical ventilation
- Filter indoor air that is being recirculated and use portable filters to supplement other strategies
- Isolate persons known or suspected to be COVID-19 positive

Mechanical Ventilation System Diagram



* Air Handling Unit houses the fan that moves the air and the MERV filters that clean the air

Air Handling Unit on Roof



Image Credit: Wikimedia Commons

Questions to Ask to Assess Ventilation

- Questions to ask:
 - Do you have mechanical ventilation system or rely only on natural ventilation (opening windows and doors)?
 - Do you have recirculated air? How is it filtered?
 - Do you use portable air cleaners?
- Observations:
 - Can air travel from areas with COVID+ patients to other areas?
 - Are fans or portable air cleaners used, and how?

Exhaust “Dirty” Air to the Outside

- Exhaust (move) “dirty” air directly to the outside whenever possible
 - ❑ Bathrooms fans should move air directly outside (run constantly)
- Use fans in windows to direct “dirty” air outside
 - ❑ Applies to fan use more generally
 - ❑ Clean → Dirty → Outside



Dilution

- Bring in as much fresh air as possible from outside to dilute and reduce the concentration of virus particles suspended in air
- Maximize outdoor air being brought in by mechanical ventilation system
- If no HVAC system, open windows & doors and place fans near windows/doors to promote fresh air entering SNF
- Ceiling fans do not dilute indoor air; they are not bringing fresh air in

Maximizing Outdoor Air Explained

- Ventilation systems supply buildings with a mixture of fresh and recirculated air
- Ventilation outdoor air damper can be adjusted to supply more fresh air
- Systems can also be adjusted to run continuously



Adjustable Ventilation Damper

Maintenance

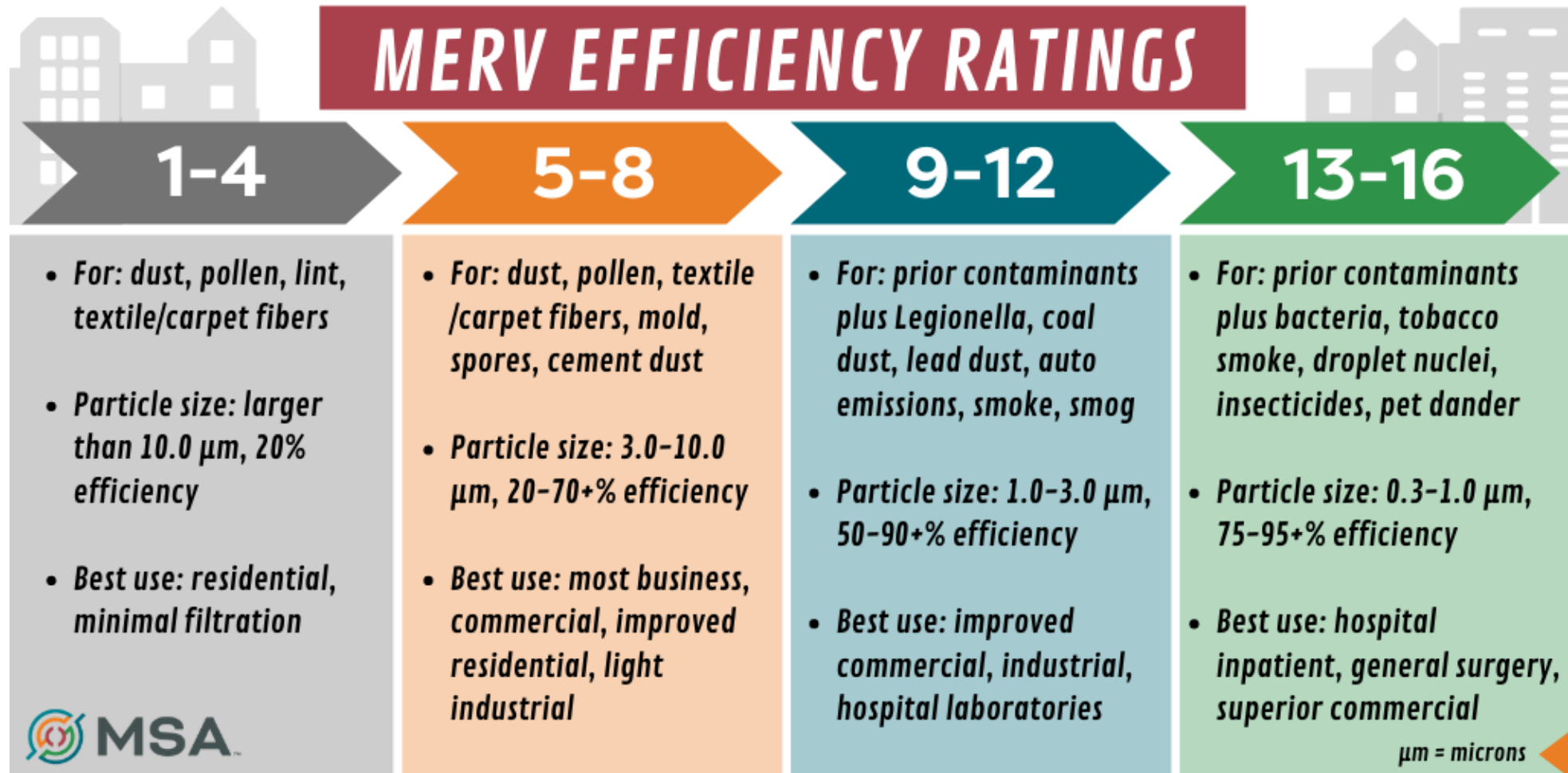
- Important but often overlooked
- Need to maintain regularly like a car
- Change filters, check ducts, inspect system



Filtration

- Upgrade filtration in ventilation system to as high as possible if facility recirculates indoor air (goal is to have MERV-14 or higher)
- Filter upgrade may not be possible in some facilities
- Use portable HEPA air cleaner to filter indoor air
 - Particularly useful to supplement other strategies in red/yellow areas with poor ventilation
 - Place in visitation areas or other areas with potential crowding

Filtration



Filtration, cont.

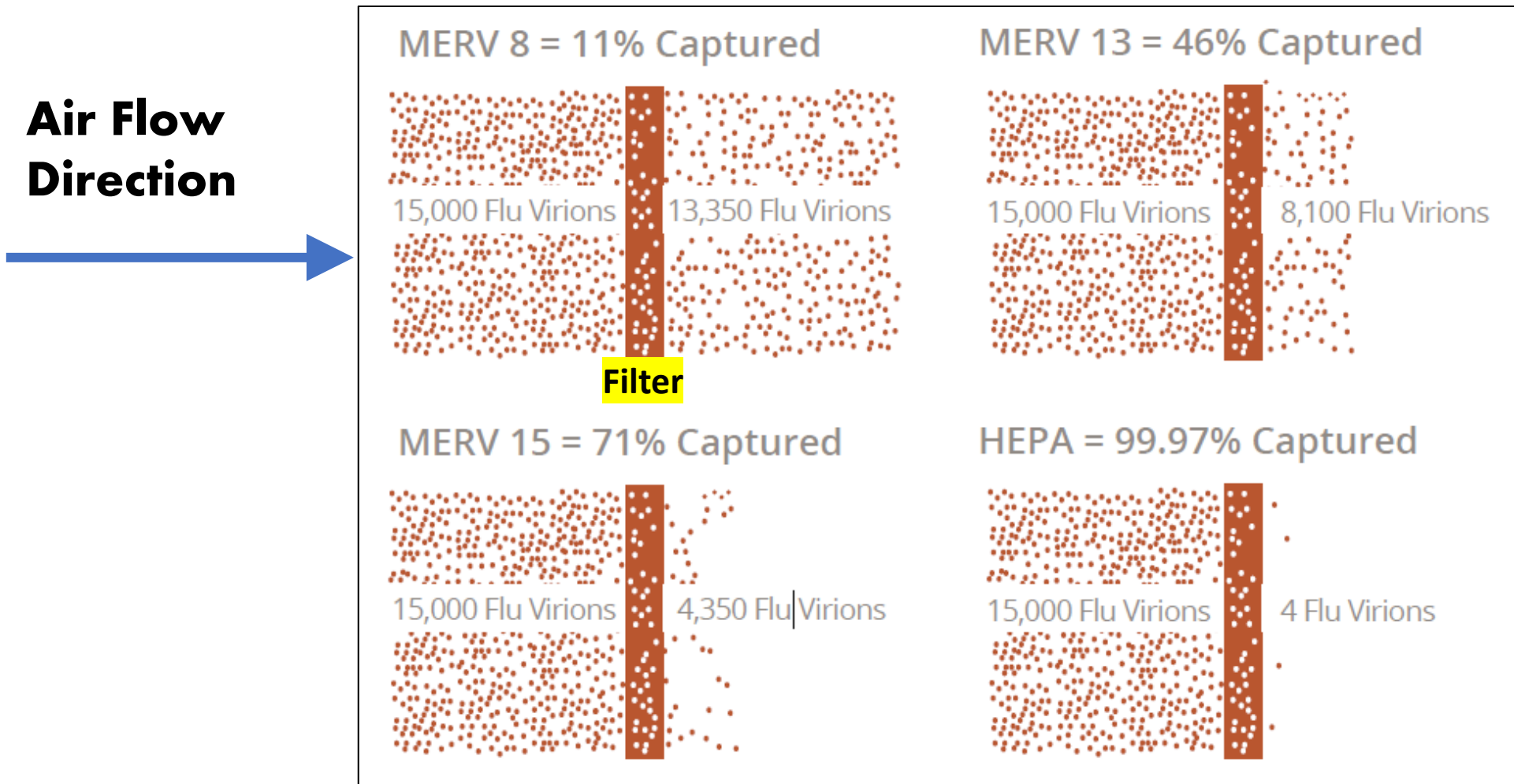


Image Credit: Occupational Health Clinics for Ontario Workers

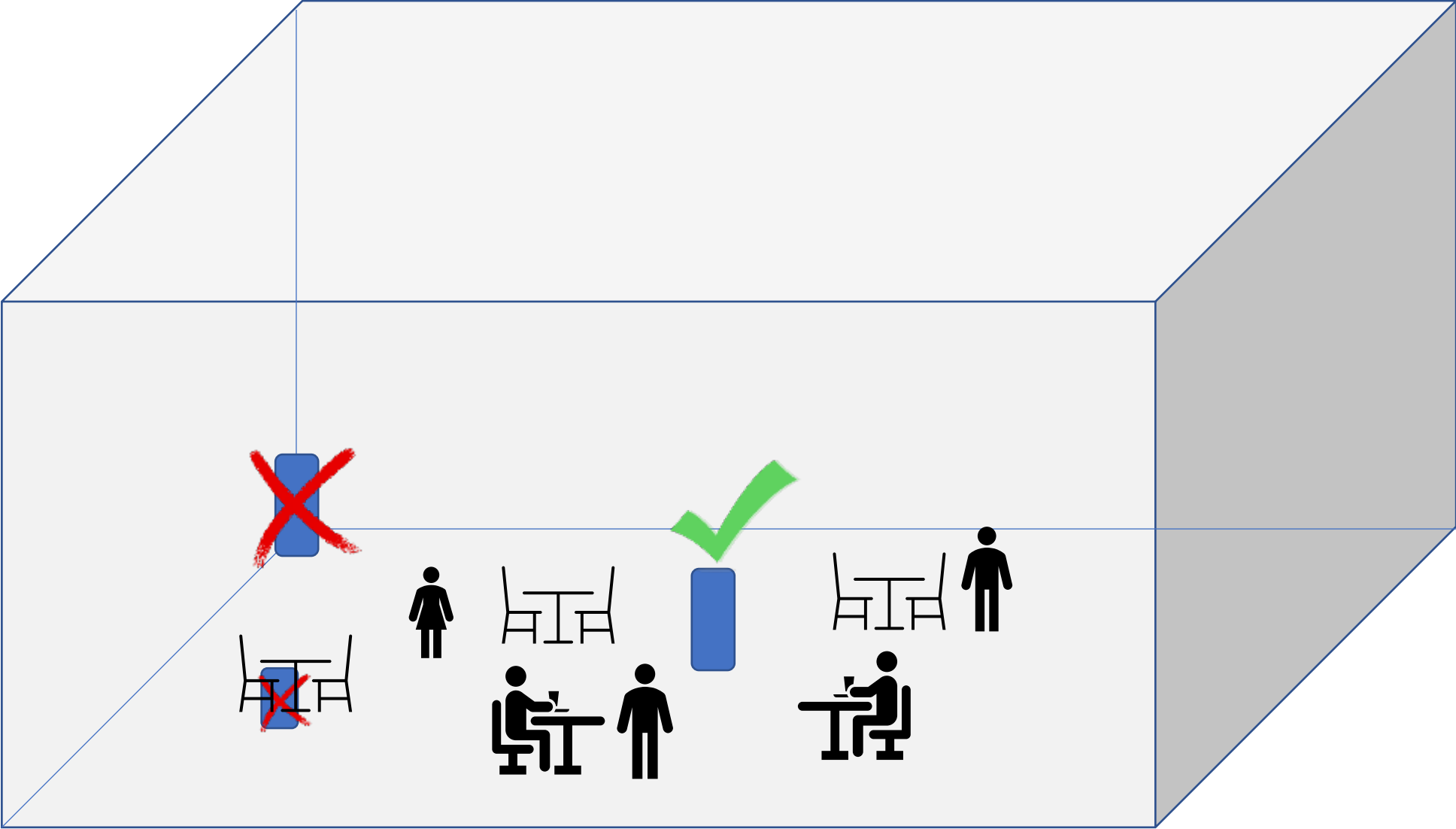
Portable Air Cleaners

- Equipped with HEPA filters (99.97% capture efficiency)
- Designed to take in “dirty air,” filter contaminants, and release fresh air back into the room
- HEPA filtration is proven; ozone and “ionizers” not recommended

See [CDPH guidance on ventilation](#) for selecting and sizing portable air cleaners.



Placement of Portable Air Cleaners



Isolation/Containment

- Isolation is a crucial component of any ventilation strategy
- Due to its importance and the challenge in explaining it in a short amount of time, next week will be solely dedicated to this topic
- To achieve and test negative pressure, eliminate air recirculation and use localized exhaust

For more information on isolation in healthcare settings to prevent airborne disease transmission, see:

[Aerosol Transmissible Diseases Standard](#) (pg. 16-19)

Conclusions and Next Steps

- Virus behavior and “smoke” analogy
- Fundamental principles: Isolation, Exhaust, Dilution, Filtration
- Consult professionals!
- Next webinar will focus on implementing isolation practices, which are central in reducing transmission, particularly in outbreaks

Resources

- [WHO - Roadmap to improve and ensure good indoor ventilation in the context of COVID-19](#)
- [ASHRAE- HVAC Strategies for LTC Infection Management & Prevention](#)
- [CDPH - Interim guidance for Ventilation, Filtration, and Air Quality in Indoor Environments](#)
- [Cal/OSHA - Aerosol Transmissible Diseases Standard](#)
- [Cal/OSHA - Aerosol Transmissible Diseases Guide](#)
- [ASHRAE Addendum to Increase to MERV 14 Filters in SNFs](#)

Thanks for your participation!

QUESTIONS?

