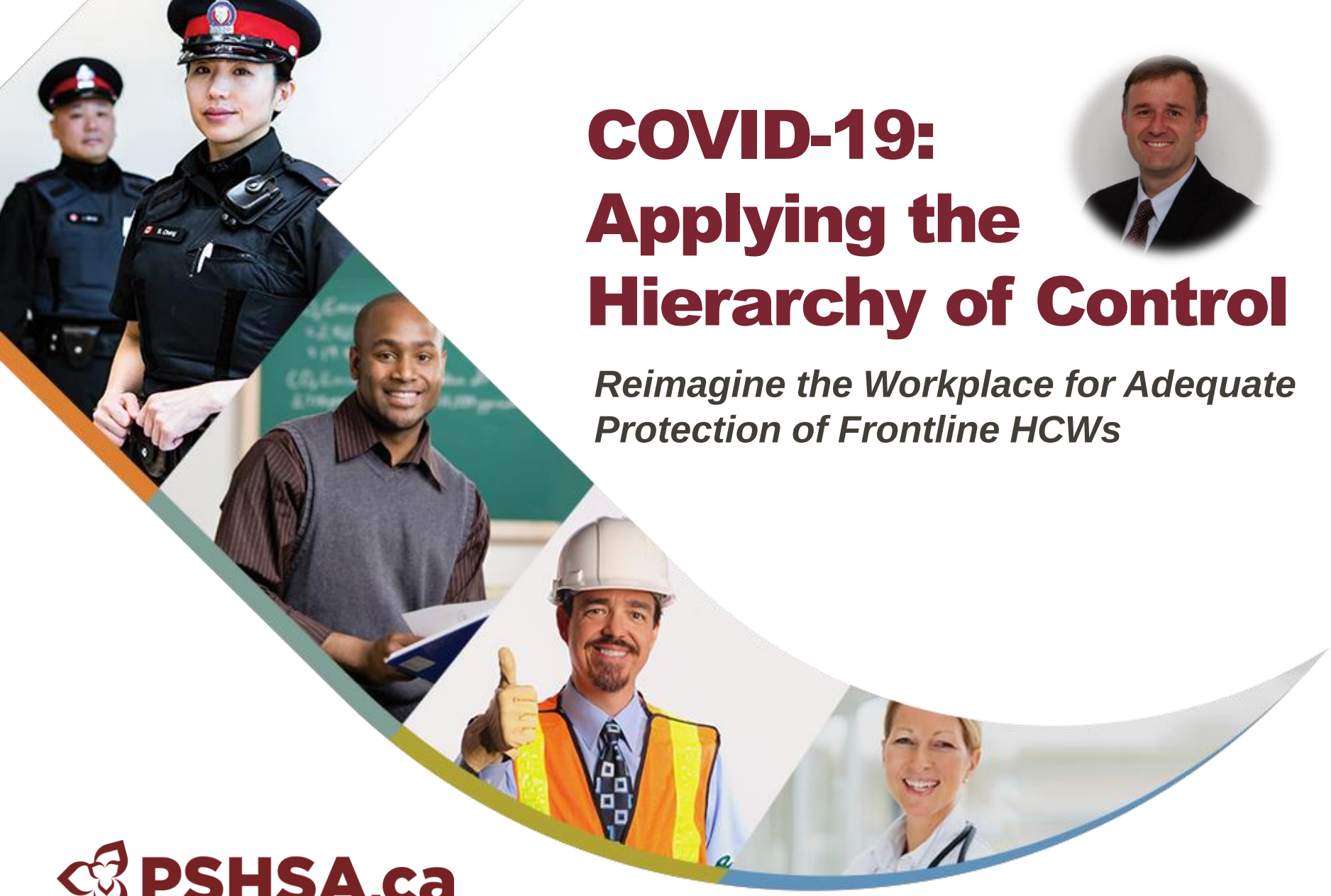


COVID-19: Applying the Hierarchy of Control

Reimagine the Workplace for Adequate Protection of Frontline HCWs

PSHSA.ca

Neil McDermott, M.Sc., CRSP, CIH

June 26th, 2020

Who We Are

ESTABLISHED IN

2009

NON-PROFIT ASSOCIATION

FUNDED PARTNER OF THE Ministry of Labour

WE PROVIDE OCCUPATIONAL

HEALTH

& SAFETY

Training
Resources
Consulting

WE WORK WITH

1.67+ MILLION WORKERS

10,000+ ORGANIZATIONS

ONTARIO'S PUBLIC & BROADER PUBLIC SECTORS:

Education
Healthcare
Emergency Services
Government
First Nations

Disclaimer: The views in this presentation are the professional judgment of Neil McDermott and not necessarily the views of PSHSA.

Due Diligence

- OHSA provides a legal framework to ensure that Ontario's workplaces are safe & healthy
- OHSA s.2.(2): despite anything in any general or special *Act*, the provisions of this *Act* & the regulations prevail
- Workplace parties comply with all legal requirements
- Seek legal counsel &/ or expert in OHS, where needed
- Employers & supervisors have a general duty clause to comply with under sections 25.(2)(h) & 27.(2)(c)
- More than a legal defence, a standard to which one can judge the quality of their OHS program

Precautionary Principle (PP)

- The PP applies where there is a need to err on the side of caution because of scientific uncertainty
- Where there is an IDT, "safety comes first & reasonable efforts to reduce risk need not await scientific proof“ (Campbell, 2006).
- The PP applies in RAs where there is no definitive scientific evidence regarding the risk posed by a hazard
- The PP serves to guide workplace parties in the prudent selection of controls measures related to subject hazards

Risk Factors

Decision-making should be informed by risk factors:

- health status (e.g., chronic & underlying conditions; smoker)
- degree of community spread
- close contact (< 2 m)
- duration & frequency
- highdensity/overcrowding(e.g.,breaks,bottlenecks)
- indoors with inadequate ventilation
- small enclosed spaces (e.g., trailers, vehicles, elevators, porta potties)
- low temperature & relative humidity
- frequent touching of face / mucus membranes (i.e., eyes, nose & mouth; outside of face covering, mask or respirator; intact skin)

Source: **Lisa Brosseau (2020)**

Additional Risk Factors

Decision-making should be informed by risk factors:

- inadequate PPE
- poor hand hygiene
- incorrect doffing practices (i.e., self-inoculation, cross contamination)
- infrequent cleaning & disinfection (e.g., surfaces & shared items)
- hands-on direct care (with suspected or confirmed case)
- sharing items / food & drink
- incompetent supervision, leadership & culture
- lack of motivation, knowledge, understanding, skills & ability

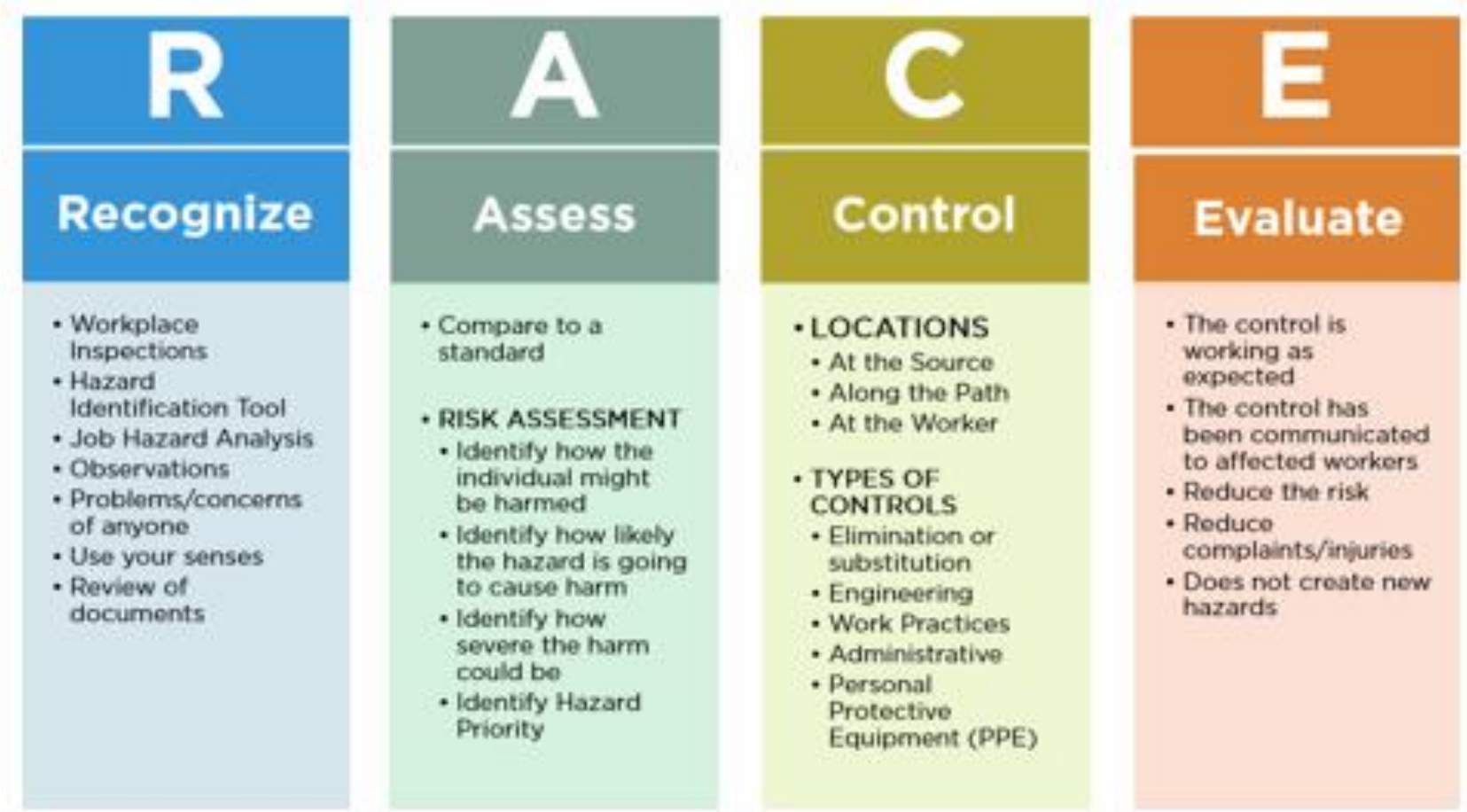
Individual Risk Factors

There are certain vulnerable groups at increased risk:

- older age (65 +)
- underlying health conditions
- pregnancy
- race / ethnicity
- gender
- poverty
- occupation (HCWs)

National Post (2020)

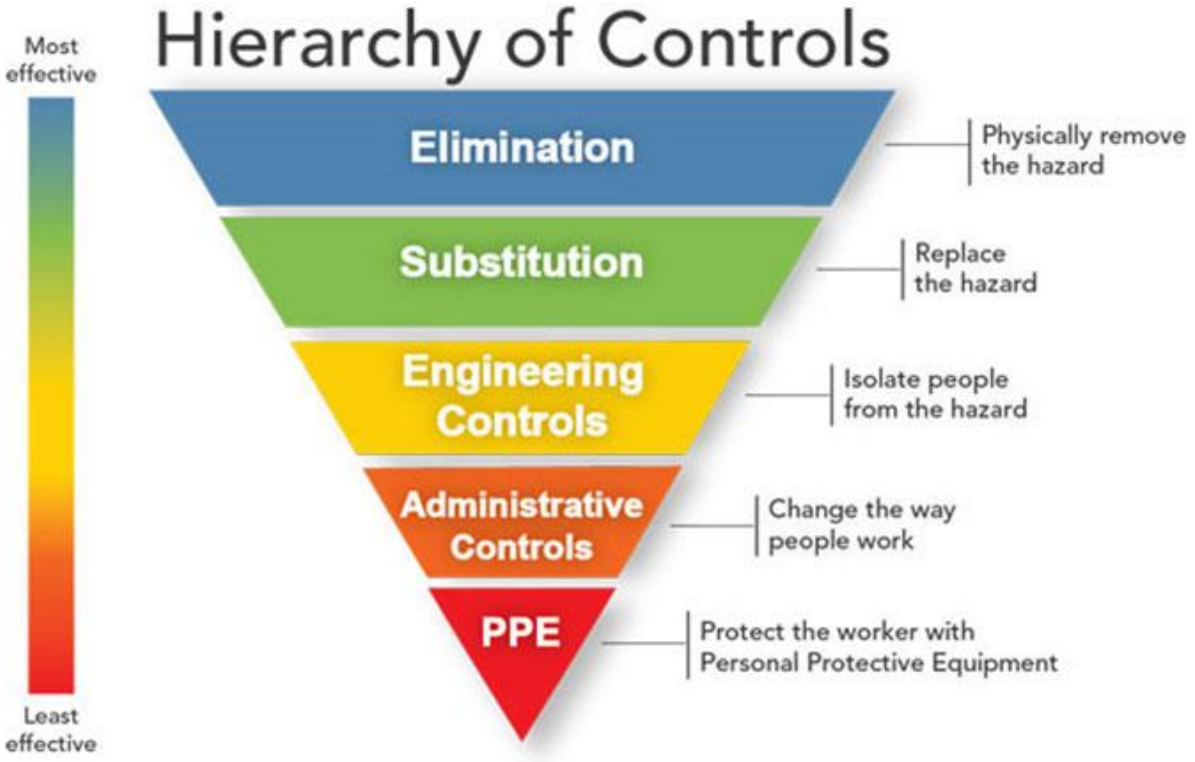
Data source: **CDC (2020)**


R
Recognize
• Workplace Inspections
• Hazard Identification Tool
• Job Hazard Analysis
• Observations
• Problems/concerns of anyone
• Use your senses
• Review of documents
A
Assess
• Compare to a standard
• RISK ASSESSMENT
• Identify how the individual might be harmed
• Identify how likely the hazard is going to cause harm
• Identify how severe the harm could be
• Identify Hazard Priority
C
Control
• LOCATIONS
• At the Source
• Along the Path
• At the Worker
• TYPES OF CONTROLS
• Elimination or substitution
• Engineering
• Work Practices
• Administrative
• Personal Protective Equipment (PPE)
E
Evaluate
• The control is working as expected
• The control has been communicated to affected workers
• Reduce the risk
• Reduce complaints/injuries
• Does not create new hazards

Hazard & Risk Assessment

- Identifies & foresees the existence of infectious disease exposure based on all modes of transmission
- Assesses the actual or potential risks of exposure (low, medium, high) posed to all workers from infected sources within the context of facilities, work setting, vehicles, services, available conditions & control measures
- Determines whether the risk is acceptable or whether additional controls measures are required
- Evaluates the effectiveness of present control measures & the implementation of the hierarchy of controls

Hierarchy of Controls



CDC (2020)

Hierarchy of Controls

- Selection of controls for risks of SARS-CoV-2 should be guided by the hierarchy of controls
- The categories & order of applying hazard control measures are: (1) elimination; (2) substitution; (3) engineering; (4) administrative (including training) & work practices; & (5) PPE
- Hazards can be controlled or eliminated using controls at the **source**, along the **path**, or at the worker
- PPE at the worker are the last line of defence

CDC (2020)

Physical Distancing

Separate Workers & Infected Sources

Stay out of reach or contact by:

- Prescreening patients at time of appointment reminder (e.g., postpone & reschedule, if possible)
- Assessing & manage patients through nurse advice lines & telemedicine
- Excluding non-essential HCWs from patient care area
- Limiting face-to-face encounters through bundling care activities
- Communicating with patients by alternative means (e.g. telephones, video monitoring & video-call applications on cell phones or tablets)

CDC (2020)

Safe Environments.
Healthy Workers.

Engineering Controls

Isolate Workers or Infected Source

- Utilize enclosures with transparent shields (plexiglass) or physical barriers (full or partial with exchanges of items)
- Make use of airborne infection isolation rooms (AIIR) with HEPA for AGMPs on patients with suspected or confirmed COVID-19

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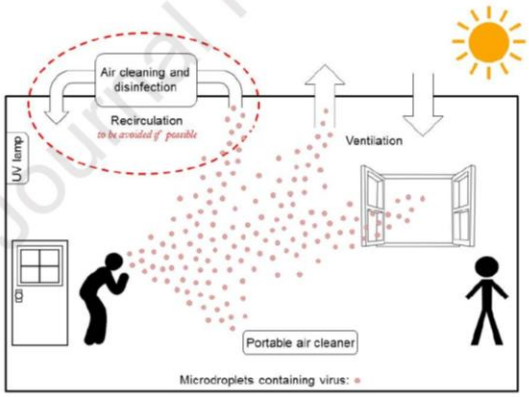
CDC (2020)

Lights Alive (2020)
www.seelightsalive.com/ppe-box/

Engineering Controls
Ventilation



Morawska et al. (2020)

- Properly maintain ventilation systems
- Maximize ventilation effectiveness
- Utilize in room portable & fixed HEPA filtration units
- Setup expedient patient isolation rooms
- Build & use ventilated headboards / local exhaust hoods
- Make use of high suction devices / tools

CDC (2020)
/www.cdc.gov/coronavirus/2019-ncov/community/office-buildings.html

Properly Maintain Ventilation System

- Check supply & return grills & registers, outdoor air intake
- Balance air, provide constant air movement, adequate air flow rates
- Verify room air flow movement direction from **clean to less clean**, air exchange rate (ACH), & mixing factors
- Set optimal temperature:
  - 75 to 80 ˚F summer
  - 68 to 74 ˚F winter
  - 40 to 60% RH

ASHRAE (2020)
www.ashrae.org/technical-resources/healthcare

Maximize Ventilation Effectiveness

- Set demand-controlled systems to "constant on" fan mode
- Set a VAV system to provide a constant minimum airflow
- Increase % of outdoor air to maximum feasible for the space
- Examine filter ratings – MERV 13 or higher are preferred, if feasible
- Minimize filter bypass, if possible
- Use standalone fans, cautiously
- Install ultraviolet germicidal irradiation (UVGI or UVC) within upper room air, ducts / plenums in air handling unit

ASHRAE (2020)

Image Sources: **ASHRAE & Bahnfleth (2020)**

HEPA Filtration Units

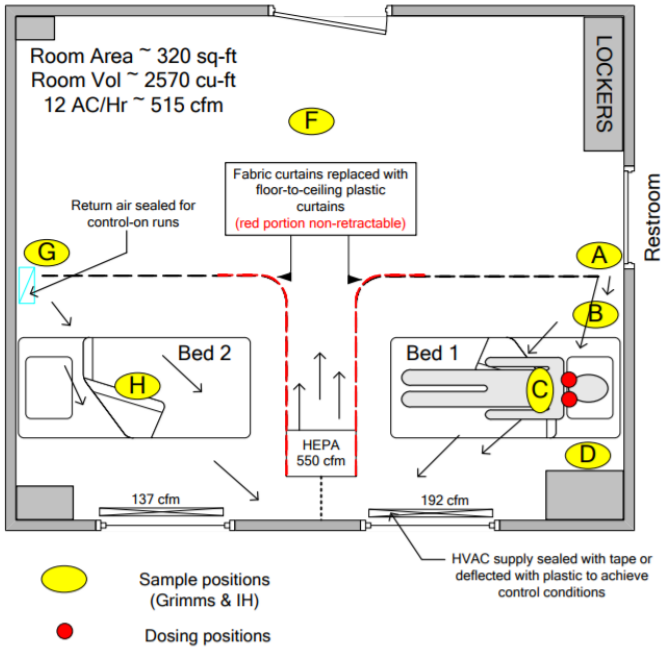
- Portable & fixed filtration units
- Local exhaust hoods or area exhaust capture
- Expedient patient isolation rooms
- Temporary constructed anterooms
- Ventilated headboards or workstation hoods

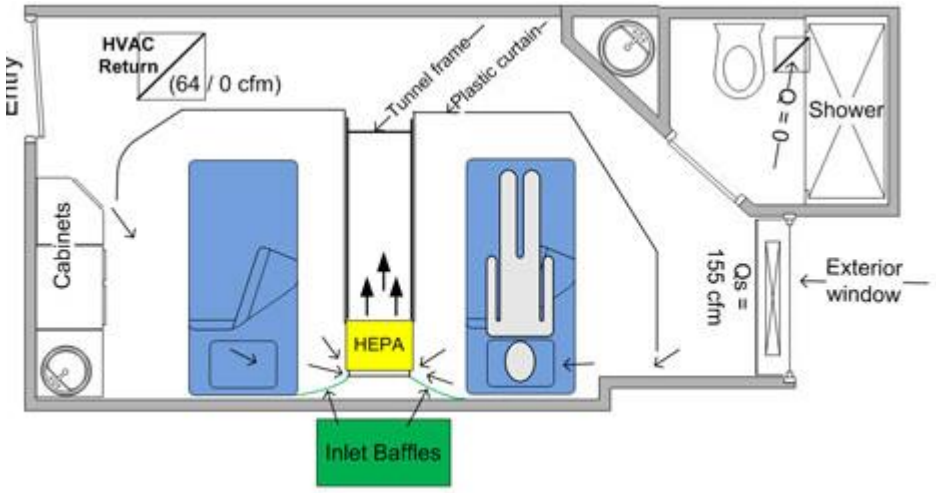
Image Sources: **Quatro & Airrex (2020)**

Expedient Patient Isolation Rooms

- Involves establishing a high-ventilation-rate, negative pressure, inner isolation zone that sits within a “clean” larger ventilated zone
- NIOSH has developed (research based) guidance for using portable HEPA filtration system
- Considered an effective solution for surge isolation capacity during outbreaks when traditional airborne isolation rooms are not available

CDC / NIOSH (2020)
www.cdc.gov/niosh/topics/healthcare/engcontrolsolutions/expedient-patient-isolation.html





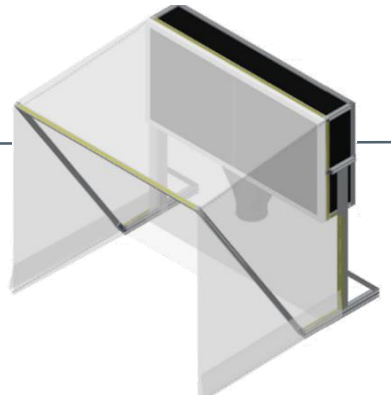
CDC / NIOSH (2012)

www.cdc.gov/niosh/surveyreports/pdfs/301-05f.pdf

Oklahoma State Public Health (2005)

Minnesota Department of Health (2005)

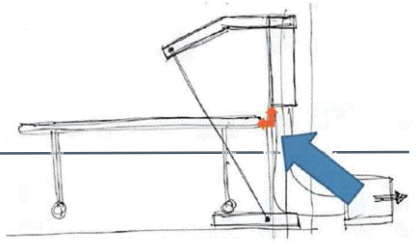
www.health.state.mn.us/communities/ep/surge/infectious/airbornenegative.pdf

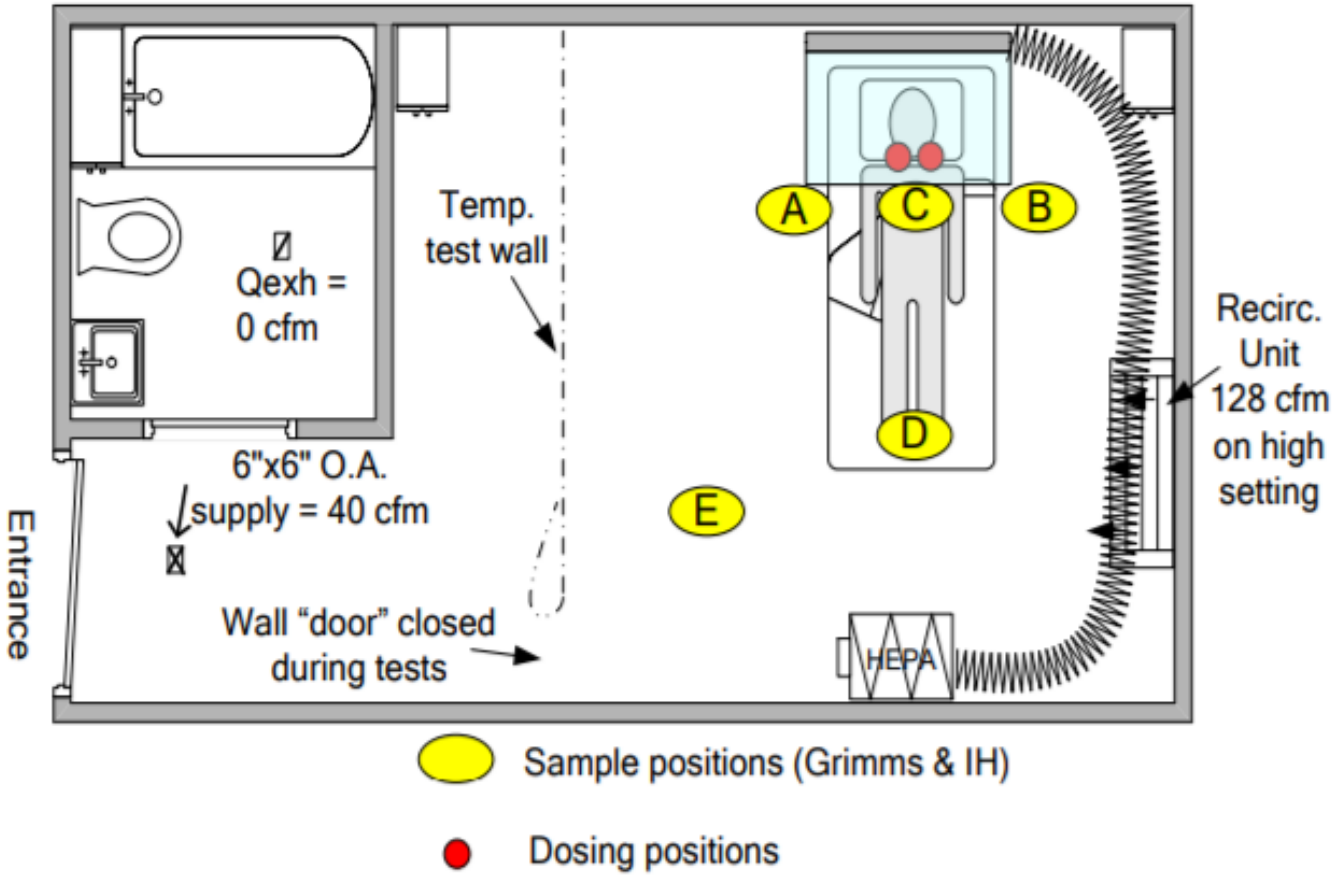


Ventilated Headboards

- Uses a local control technique for near-instant capture & containment before contaminants have a chance to disperse
- Protects the air & surrounding surfaces from contamination
- Canopy allows low-velocity air currents to capture/remove contaminants without irritating the patient
- Canopy easily retracts to allow hands-on healthcare procedures to the patient's head & neck
- Canopy material (plastic sheeting) is held into place by removable retainer clips & can easily be replaced between patients

CDC & NIOSH (2020)
www.cdc.gov/niosh/topics/healthcare/engcontrolsolutions/ventilated-headboard.html





CDC / NIOSH (2012)

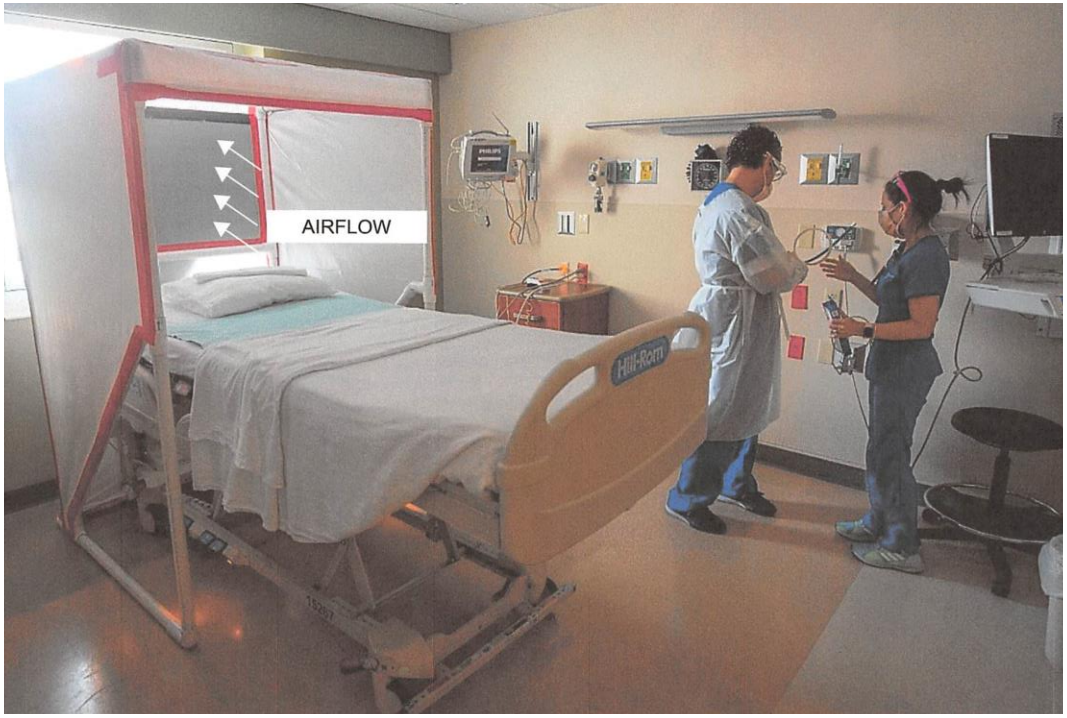
www.cdc.gov/niosh/surveyreports/pdfs/301-05f.pdf

CDC / NIOSH (2012)

www.cdc.gov/niosh/surveyreports/pdfs/301-05f.pdf

Oklahoma State Public Health (2005)

www.researchgate.net/publication/228387741_Oklahoma_State_Department_of_Health_Design_and_Implementation_Guidelines_for_Airborne_Infectious_Isolation_under_Epidemic_Emergency_Response



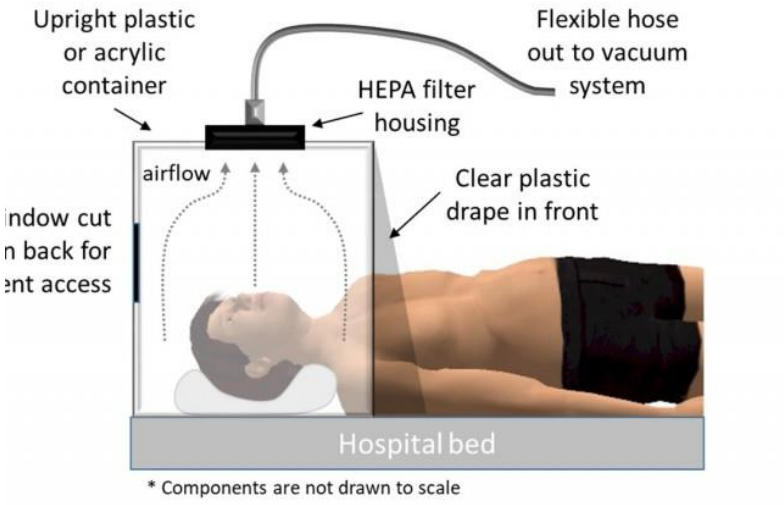
Lee Health (2020)
Value of Ventilated Headboards
www.leehealth.org

NIOSH (2020)
www.cdc.gov/niosh/topics/healthcare/engcontrolsolutions/ventilated-headboard.html
https://youtu.be/8H2kmZkbuR4

Local Exhaust Devices

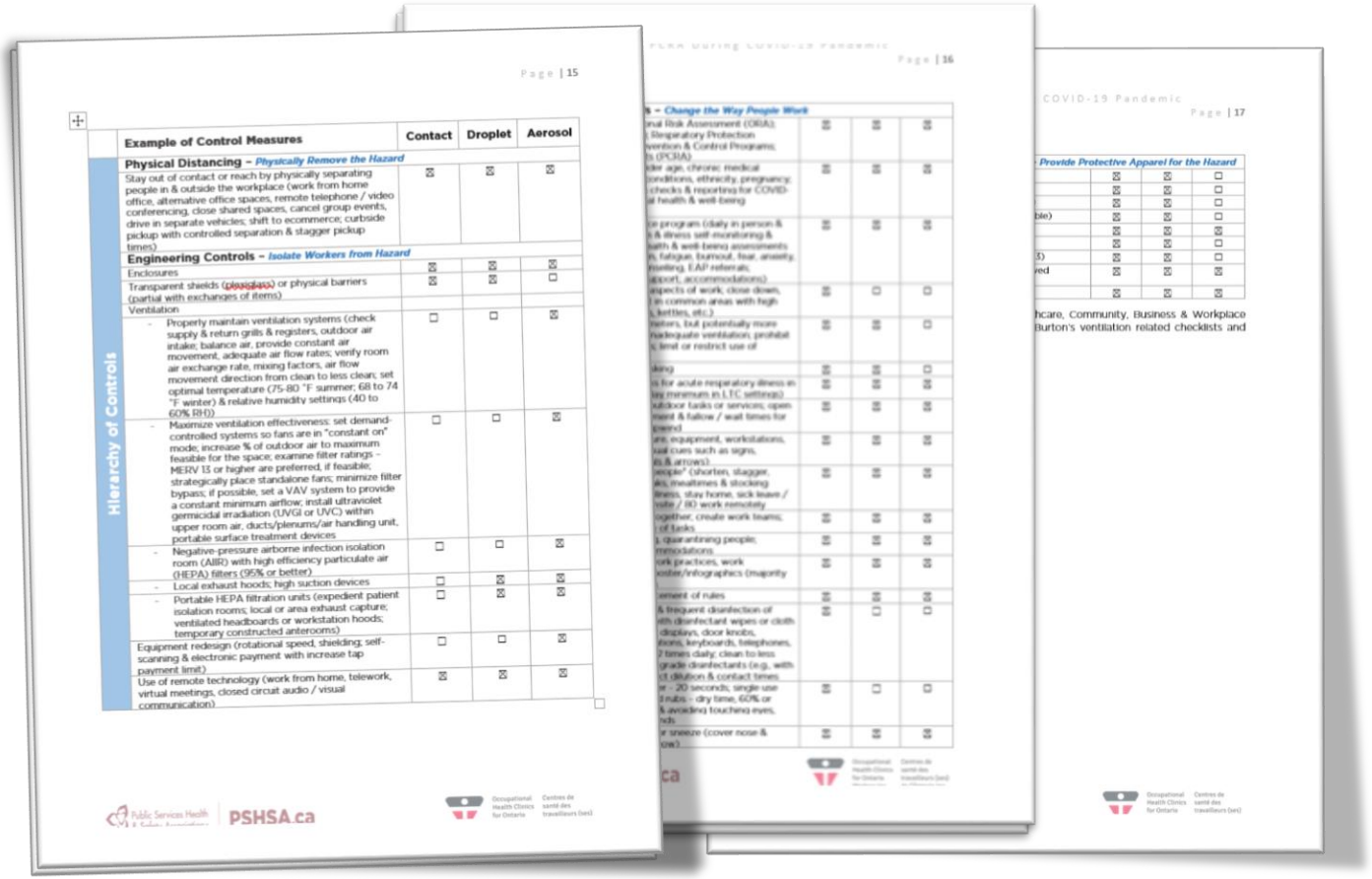
- University of Melbourne researchers working in collaboration with Western Health have designed a personal ventilation hood to help contain the droplet spread of COVID-19 in ICUs

The University of Melbourne (2020)
www.youtube.com/watch?v=r0WJJee7saU



University of Pittsburgh Medical Center (2020)
www.army.mil/article/234554/researchers_hope_biocontainment_unit_will_help_during_covid_19_crisis

Resource



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Hierarchy of Controls	Example of Control Measures	Contact	Droplet	Aerosol
	Physical Distancing – *Physically Remove the Hazard*			
	Stay out of contact or reach by physically separating people in & outside the workplace (work from home office, alternative office spaces, remote telephone / video conferencing, close shared spaces, cancel group events, drive in separate vehicles; shift to ecommerce; curbside pickup with controlled separation & stagger pickup times)	☒	☒	☒
	Engineering Controls – *Isolate Workers from Hazard*			
	Enclosures	☒	☒	☒
	Transparent shields (~~plexiglass~~) or physical barriers (partial with exchanges of items)	☒	☒	☐
	Ventilation			
	- Properly maintain ventilation systems (check supply & return grills & registers, outdoor air intake; balance air, provide constant air movement, adequate air flow rates; verify room air exchange rate, mixing factors, air flow movement direction from clean to less clean; set optimal temperature (75-80 °F summer; 68 to 74 °F winter) & relative humidity settings (40 to 60% RH))	☐	☐	☒
	- Maximize ventilation effectiveness: set demand-controlled systems so fans are in "constant on" mode; increase % of outdoor air to maximum feasible for the space; examine filter ratings – MERV 13 or higher are preferred, if feasible; strategically place standalone fans; minimize filter bypass; if possible, set a VAV system to provide a constant minimum airflow; install ultraviolet germicidal irradiation (UVGI or UVC) within upper room air, ducts/plenums/air handling unit, portable surface treatment devices	☐	☐	☒
	- Negative-pressure airborne infection isolation room (AIIR) with high efficiency particulate air (HEPA) filters (95% or better)	☐	☐	☒
	- Local exhaust hoods; high suction devices	☐	☒	☒
	- Portable HEPA filtration units (expedient patient isolation rooms; local or area exhaust capture; ventilated headboards or workstation hoods; temporary constructed anterooms)	☐	☒	☒
	Equipment redesign (rotational speed; shielding; self-scanning & electronic payment with increase tap payment limit)	☐	☐	☒
	Use of remote technology (work from home, telework, virtual meetings, closed circuit audio / visual communication)	☒	☒	☒

Public Services Health | PSHSA.ca

Occupational Health Clinics for Ontario Workers | Centres de santé des travailleurs (ses)

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Change the Way People Work

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COVID-19 Pandemic

Provide Protective Apparel for the Hazard

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