

Hospital Operations Toolkit for COVID-19

Infection Prevention and Control:

Engineering Controls

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Engineering controls involve modifying the physical workspace to separate individuals from the hazard (i.e., the SARS-CoV-2 virus). While some hospitals had designated rooms to safely isolate and manage patients with highly transmissible diseases prior to the COVID-19 pandemic, the large numbers of suspected and confirmed COVID-19 patients and the geographic spread of the disease across the nation require all hospitals to consider engineering controls as they expand, modify, or create new treatment spaces.

Information on modifying hospital infrastructure to address surge needs can be found in the [Space](#) section.

Many hospitals cohort COVID-19 patients in rooms, units, or floors, depending on the size of the facility. This allows them to physically separate COVID-19 patients from other patients and limit necessary structural changes to specific areas of the hospital.

Due to the ability of the SARS-CoV-2 virus to travel via large and small droplets farther than the two meter or six feet distance, hospitals should assess their heating, ventilation, and air-conditioning (HVAC) systems, evaluate their negative pressure capacity, understand where and how air flows throughout the building, and identify methods to channel or redirect air flow. This includes:

- Conducting maintenance to ensure the HVAC system is operating maximally.
- Determining if the HVAC system can be modified in certain zones.
- Increasing fresh air intake when possible and reducing recirculated air.
- Increasing filter levels to enhance filtration of recirculated air.
- Minimizing the use of box fans in enclosed spaces.
- Identifying areas of the hospital that may benefit from the addition of portable air filtration units.
- Installing in-room high-efficiency particulate air (HEPA) units with exhaust through fittings on the patient room window.
- Installing temporary or long term use negative pressure systems in non-isolation rooms.
- Regularly monitoring negative pressure, temperature, and humidity.
- Ensuring items in the room do not block vents or otherwise obstruct air flow.
- Keeping doors closed, when feasible.

Temporary physical barriers can be used to restrict movement of people or the virus.

- Zippered doors may separate areas with COVID-19 patients from other areas of the hospital.
- Screens, ropes, or other dividers may be installed to reduce transmission risks in open space areas.
- Temporary walls may limit access to units through a single entry or may direct movement of personnel in a one-way fashion.
- Plastic or other dividers may be used to reduce exposures to triage staff, caregivers, or visiting loved ones.
- Drive-through style windows or partitions can be installed for COVID-19 testing or vaccination of staff and patients.

Additional information on the policy and procedural changes that should accompany many Engineering Controls may be found in the [Administrative Controls](#) section.

Over the past several months, hospitals have implemented a variety of innovative engineering solutions to reduce their reliance on other controls such as personal protective equipment. These include:

- Placing certain pumps, monitors, and supplies in the hallway (when space and tubing is sufficient to allow safe movement) to reduce the number of times staff need to enter patient rooms.
- Using “go boxes” for rapid response for airway management and resuscitative needs.
- Installing windows in solid doors to enable visual monitoring of patients from the hallway and non-verbal communication between staff inside and outside the room.
- Setting up a desk outside the room with a tablet or computer that mirrors the screen inside the room to reduce the number of room entries.
- Designating one-way traffic flow where possible with signage or floor markings for staff and patient arrival and departure.
- Using floor markings to promote six feet distancing in elevators, queues, and waiting areas.
- Reconfiguring waiting and break room seating to allow for appropriate social distancing. This could include removing excess chairs from the room or clearly marking areas on tables for seating.
- Using copper or copper-coated tape on high touch surfaces. Research shows that SARS-CoV-2 has low stability on copper surfaces.

Hospitals should assess their full footprint when considering engineering controls. Some hospitals set up tents in their outdoor space for initial screening and triage. Suspected COVID-19 patients are escorted inside via pre-determined pathways to COVID-19 evaluation and treatment areas to limit interactions with other areas of the hospital. The feasibility of this option is dependent on weather and other considerations.

Resources Related to Engineering Controls

- American College of Emergency Physicians: [ACEP COVID-19 Field Guide](#)
- American Society for Health Care Engineering:
 - [Innovative IV Pump Placement](#)

- [Pressurization](#)
- ASHRAE:
 - [Filtration/Disinfection](#)
 - [Healthcare](#)
- ASPR TRACIE
 - [COVID-19 Hospital Resources Collection](#)
 - [Healthcare Operations During the COVID-19 Pandemic Speaker Series](#)
 - [Maintaining Healthcare Safety During the COVID-19 Pandemic Speaker Series](#)
- Centers for Disease Control and Prevention: [Guidelines for Environmental Infection Control in Health-Care Facilities, Appendix B. Air](#)
- Minnesota Department of Health: [Engineering Services](#)
- Society of Critical Care Medicine: [Configuring ICUs in the COVID-19 Era](#)

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