

Guidelines for Limiting Contagion in COVID-19 Tent Clinics



Misha Friedman (Getty Images)

Tents are not ideal facilities for the treatment of patients with the highly infectious COVID-19. Regardless of the tent's design and construction, there is a strong possibility of contagion when sick patients, uninfected patients, and uninfected health care providers are co-located in tight quarters. However, when a community has no better alternative than the erection of a tent facility, the risk of contagion might be lessened if the tent construction follows these basic infection control guidelines.

COVID-19 is understood to be primarily spread by large droplets and perhaps secondarily by surface contamination. Some research indicates that it might become aerosolized in particular circumstances, which is a tertiary concern. A tent clinic design must consider all 3 modes: 1) droplet spread - distances between people of ideally 6' or more to prevent direct contact with respiratory droplets; 2) droplet contamination - touch surfaces simplified, obvious, and easy to clean; and 3) airborne - dilution and removal, or UVGI or HEPA disinfection of contaminated air.



Limit droplet spread between people.



Mitigate contagion via surfaces.



Control for airborne infection.

About this Document

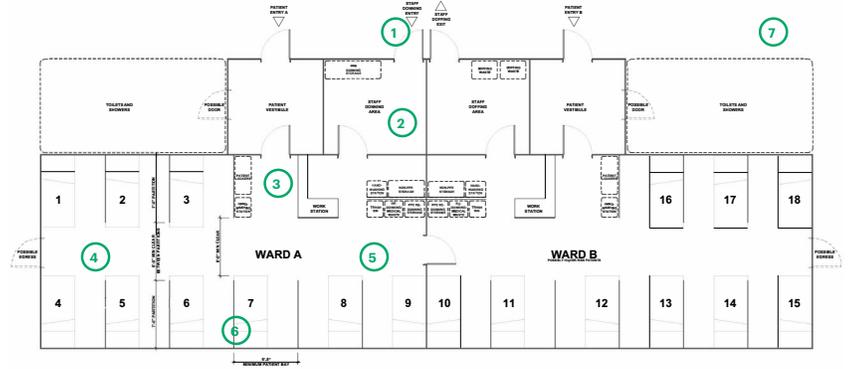
These guidelines are written in reference to a two-ward clinic 20 feet by 80 feet with 10 foot square vestibules, but the principles apply to clinics of other configurations and other assemblies. [Click here](#) for a spreadsheet listing furniture and equipment for this tent clinic.

This module may be aggregated to create more wards serving more patients. Boston Health Care for the Homeless' experience has been that separate wards allow administrators to flexibly meet the demands of rapidly shifting patient populations such as triage cases, asymptomatic and untested close-contact observation patients, asymptomatic tested patients awaiting results, low and high risk symptomatic patients awaiting results, and confirmed positive patients. Note that infection control to limit cross-contagion between asymptomatic and untested close-contact observation patients and between all asymptomatic patients may be more critical in limiting spread than it is for symptomatic and confirmed cases.

Limit droplet spread between people.

COVID-19 is transmitted between people via direct contact with respiratory droplets. Keeping a minimum distance of 6 feet between people in the tight quarters of a tent is difficult but critical. Basic planning ideas will help minimize direct respiratory droplet spread.

Download the [full plan](#).



1 Health care providers should have a separate entrance from patients. This avoids close contact between patients and providers, outside and inside the tent.

2 Providers should enter directly into a donning vestibule or room, where they can put on their Personal Protective Equipment (PPE) before interacting with patients. (Re-donning supplies within the tent allow PPE to be refreshed.)

3 A simple MDO, plastic laminate, or draped work surface provides a buffer between a provider and an ambulatory patient. This link shows one example of a [simple site-built workstation](#).

4 Aisles within tents should allow for social distancing, but tents come in fixed dimensions. When possible, strive for larger dimensions than the 6' between partitions and 5' between beds shown here.

5 Centralizing clinical staff spaces - donning, doffing, storage, and work areas - will make clinical work efficient and limit uncontrolled interaction between providers and patients.

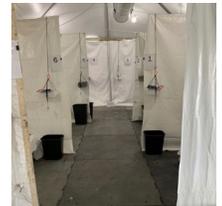
6 Separation of beds by a partition or tensioned vinyl screen of 8' high will limit cross-contamination between patients.
7 A stand-alone 10'x10' conditioned tent (not shown) can serve as a staff break area.

Mitigate contagion via surfaces.

The [CDC understands](#) that contaminated high-touch surfaces may be a transmission route for COVID-19. In a tent clinic, doors (often supplied with the tents), doorknobs, bed linens, partitions between beds, outlets, storage containers, counter tops, toilets, and sinks are examples of high touch surfaces.

Materials and surfaces should be deployed and installed to minimize touching, to make touch points obvious, and with the understanding that they must be frequently cleaned and disinfected.

- The CDC advises that cleaning of visibly dirty surfaces followed by disinfection is best practice for prevention of COVID-19.
- Cleaning removes dirt and most germs, while disinfection - with a bleach solution, an alcohol solution, or a proper disinfectant - kills germs.
- A storage area for cleaning supplies and other non-PPE items should be provided.



The COVID-19 virus has [different life spans](#) on different materials, but in tents material choices will most likely be driven by availability and cleanability.

Control for airborne infection.

The COVID-19 virus may [become aerosolized](#) by certain procedures such as intubation and mechanical ventilation. Additionally, some recent research suggests that COVID-19 might be aerosolized via fecal matter. Tent clinics that might eventually be treating soiled patients, or patients needing aerosolizing procedures should plan for airborne infection control.

Airborne infection control systems require specialized equipment best specified by a mechanical engineer. A few hours of time from an engineer in your community will help incorporate the following principles into a tent clinic:



Source Control: Trap droplets before they spread

Beyond use of PPE for providers for droplet protection, the [CDC recommends](#) standard face masks, such as surgical masks, for confirmed and suspected patients. Aerosolizing procedures such as intubation should be source controlled with a portable HEPA filter/fan unit.



Dilution: Decrease the number of contaminants in the air

Contaminated air is diluted when it is combined with clean air. Clean air is created by HEPA-filtration and ultra-violet germicidal irradiation (UVGI) equipment, which efficiently recirculates conditioned (heated/cooled/dehumidified) air. However, HEPA-filtration and UVGI strategies require more specialized expertise and equipment. Contaminated air can also be diluted by adding fresh outside air, which is technically simpler, but is inefficient since this dilution strategy requires more energy, and therefore cost, to keep the air properly conditioned. Tent clinics should strive to meet [CDC guidelines](#) of 12 air changes per hour (ACH), but 6 ACH or even 4 ACH are likely beneficial. Limits on equipment, ductwork, and power may in turn limit the number of achievable ACH.



Airflow Direction: Remove contaminated air before it spreads

Carefully sealing gaps in the tent construction, supplying clean air through ducts above the center aisle of the tent, and then exhausting air through a vent ([see possible detail here](#)) next to each patient's head at the tent perimeter may lessen the risk of contagion to providers and patients. Air venting strategies that stir air within the tent, or move contaminated air towards healthy people may heighten the risk of contagion.

Toilets, Showers, and Hand Washing Stations

Toilets and showers will likely be rented mobile units vulnerable to the three modes of contagion outlined above. These rental units are spatially tight and direct droplet contagion should be addressed by patient management. Surface contamination must be addressed by cleaning between patients, and ideally different patient populations should not share the same facilities. Toilet and shower units should have passive or active ventilation systems. Healthcare providers must have separate facilities. Install within the tents, separate hand washing stations for patients and providers, whether mobile units or constructed on site.



Water, Power, and Ventilation

For water and power, tent clinics can most easily tie into an available adjacent building, utility pole, or fire hydrant. If necessary, for power, rent a mobile diesel generator that meets the amperage and phasing requirements for HVAC and other equipment. If water is transported to site and stored, anticipate a pump or gravity feed system.

Almost certainly a mobile HVAC unit will be required for three critical reasons: to provide comfort, to dilute air to as many as 12 ACH, and to create directional air flow. The HVAC unit must have the conditioning, ventilation, and control capacity to maintain consistent air flow and temperature, which is beyond the capability of many construction-grade fans and heaters.



Dignity and Efficacy

Beyond frustrating pathogens, tent clinics must support people. Voluntary patients might leave clinics and further spread contagion if the clinics seem unsafe to them, are uncomfortable or are undignified. This is especially true for asymptomatic and untested close-contact observation populations who might perceive themselves as being at greater risk and discomfort within a clinic than outside of it.

Tent clinics might offer the following to promote patient dignity, comfort and security:

 A legible, obvious [ventilation strategy](#) that clearly demonstrates environmental safety

 Partitions between beds for privacy and contagion control

 Individual lockable storage for valuables, electronics, and medications

 Large storage, such as a plastic tub, for clothing and personal items

 WIFI, power, and USB charging ports at patient beds

 Screens and access to Netflix or Hulu for patients who lack these

Contributors

These guidelines are offered within rapidly evolving clinical and research contexts. MASS is grateful to those who have advised on them. They do not represent the opinions or full understanding of any one person.

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