

SENIOR LIVING NURSING FACILITIES: PREPARING FOR COVID-19 POSITIVE RESIDENTS

Innovative and successful infection control design strategies.



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Introduction: Preparing for COVID-19 Positive Residents

A lot has changed since early January, when the World Health Organization was made aware of a novel coronavirus named COVID-19 and first alerted the world.

Much of the world has now implemented various levels of lockdown and social distancing measures. While this effort appears to be effectively reducing the strain on our hospital capacity, the pandemic is proving to be particularly deadly to our seniors. Eighty percent of all COVID-19 deaths have been those who are 65 years of age and older¹. Some studies show this percentage even higher, and this doesn't include undiagnosed cases which are predicted to be significant and we are just beginning to understand the potential impact of. While scientists continue to debate the true mortality rate of this virus, there is no doubt that our elderly population is taking the brunt of this pandemic.

Studies from Italy show an average age of 81 for those who have died from COVID-19. This virus is not unique in attacking seniors; last winter influenza killed more than 34,000 people in the United States; and while the mortality rate for the flu is only 0.1%, on average, 75%² of those who died were over 65 years of age. Clearly, innovative and successful infection control design practices are critical in our senior living communities now and in the future.

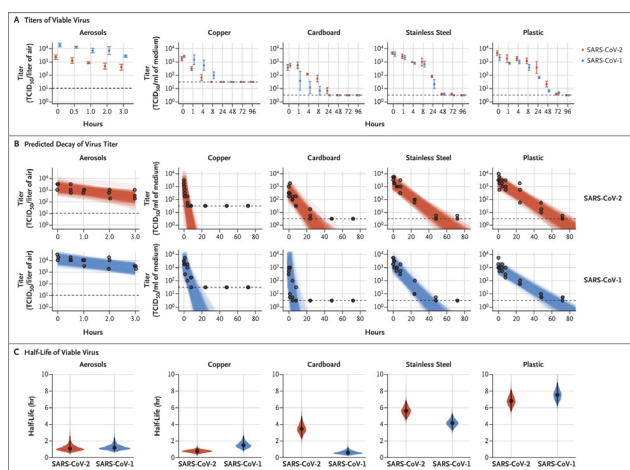
What facility preparations should be made to help mitigate this risk?

CURRENT GUIDELINES

Both the CDC³ and CMS⁴ have issued guidelines to help inform care givers on how best to protect our seniors. Many of these guidelines are procedural and if they have not done so already, medical, nursing, and caregiver staff should become familiar with these guidelines and begin implementing them immediately. In addition to these safety preparations, it is imperative that the building facilities and maintenance staff also be aware of the guidelines as they relate to facilities. The suitability and adequacy of existing building spaces and HVAC systems are paramount to effectively isolate suspected COVID-19 patients and protect other residents and staff.

Currently, the CDC⁵ recommends COVID-19 positive patients only be placed in Airborne Infection Isolation Rooms if undergoing aerosol generating procedures, as it is believed that most transmissions are from person to person, as well as surface contact. The current theory is that airborne droplets spreading over a long distance is unlikely. However, the CDC does acknowledge that we have a limited understanding of how this virus is transmitted.

One initial study published in the New England Journal of Medicine⁶, suggests that it is plausible that the virus can remain infectious in the air for hours and on surfaces for days.

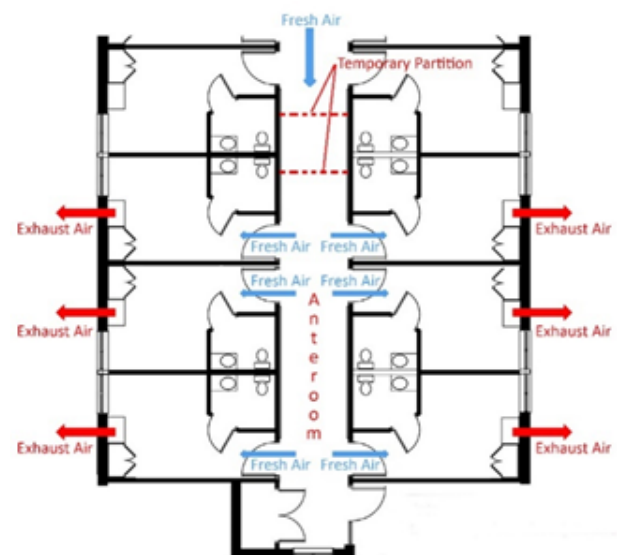


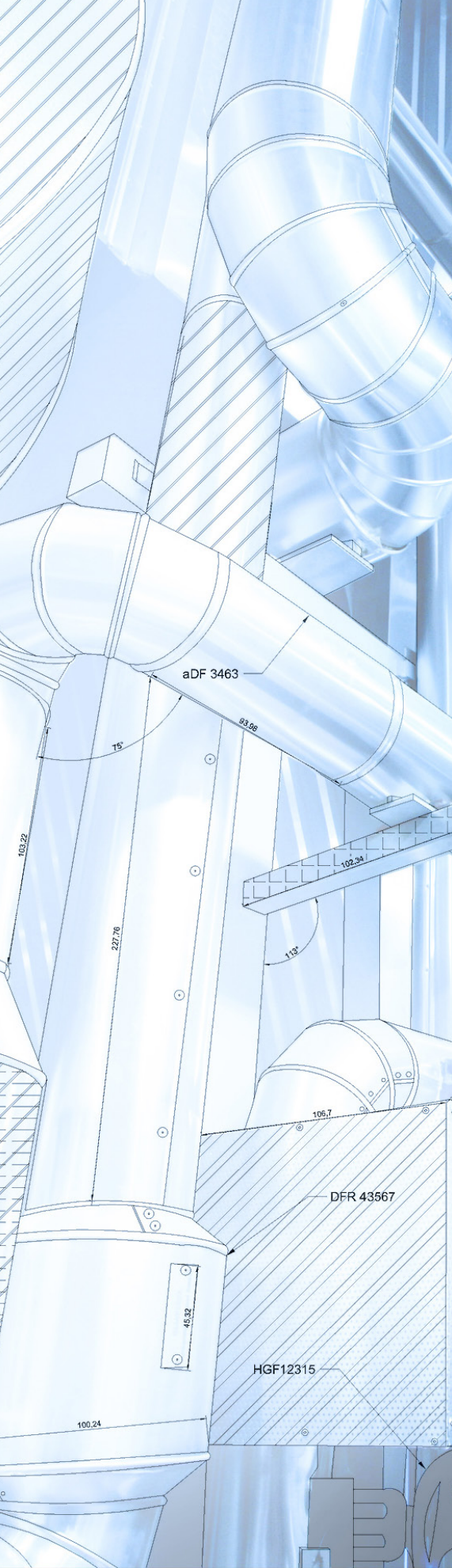
Viability of SARS-CoV-1 and SARS-CoV-2 in Aerosols and on Various Surfaces. Source: *New England Journal of Medicine*

If not for the limitation of available Airborne Infection Isolation Rooms, residents with an infectious disease would normally be isolated in these special rooms. Unfortunately, most senior living nursing facilities do not have more than one or two purpose-built isolations rooms, and some do not have any. However, there are measures that facilities can take to modify existing rooms to make them perform better. When selecting which rooms to designate for COVID-19 positive residents, it is important that rooms have good exhaust, are under negative pressure, are modified with some type of anteroom and are kept well disinfected.

WHICH ROOMS SHOULD BE DESIGNATED FOR COVID-19 POSITIVE RESIDENTS?

It is ideal to utilize only private rooms with private bathrooms. Other considerations include selecting groups of rooms that can be isolated or separated from other parts of the facility. Select rooms that are not on a main circulation, requiring staff or residents to pass by, will reduce the chance of infecting others within the facility. Either a dedicated household, if your facility is already designed into small groups, or a corridor wing that can be separated from rest of the community, or at least a group of rooms at the end of a corridor that will not have unnecessary staff and resident circulation are best.





MECHANICAL SYSTEM: NEGATIVE PRESSURE CONSIDERATIONS

Many older facilities that have had numerous expansions over the years may have multiple mechanical systems within their complex.

When designating groups of COVID-19 rooms, those with more exhaust and fresh air systems are ideal. There should be more exhaust than fresh air coming into the designated room(s) so that negative pressure results. This helps mitigate contaminated air from migrating from the room into the corridor or adjacent spaces. Typical nursing rooms may only have 2 air changes per hour of outdoor ventilation air supplied to the space with exhaust from the resident room bathroom, but true isolation rooms should have 6 to 12 air changes per hour total air circulation and exhaust from the room. These additional air changes significantly dilute contaminants in the air, making the room safer for care givers.

Ways to improve exhaust and negative pressure include the following:

- Supplemental exhaust fan units can be added to the room to increase the volume of exhaust air. Some facilities have made this permanent by ducting them above the ceiling. Where the ceiling space and access is limited, a more temporary solution is to duct through window opening block outs. Exhaust discharge points should be located far enough away from any operable windows, doors, or fresh air intakes. By code this should be at least 25'.
- When locating a supplemental exhaust unit, consider the pressure and direction of air flow within the room. It is best that air closest to the infected patient be exhausted as quickly as possible, drawing fresh air from the entrance portion of the room. This helps to keep the entry area cleaner, mitigates contagion migrating into the corridor and helps to protect the staff as they enter the room.

MECHANICAL SYSTEM: NEGATIVE PRESSURE CONSIDERATIONS

(continued)

- Adding supplemental exhaust units will create an imbalance in the overall facility mechanical system. It may be possible to adjust more sophisticated systems to increase the outside air intake to balance the system. Small amounts of additional exhaust can reasonably be made up from various parts of the facility and should not have an impact for temporary situations. However, as you increase the number of rooms and amount of added exhaust, the system should be analyzed to ensure adverse conditions in other parts of the facility do not occur.
- Where it is not possible to add supplemental exhaust, it is still critical to ensure that a negative pressure situation is occurring. Minor adjustments may be made to existing mechanical exhaust and ventilation air systems to create a negative pressure by increasing exhaust airflow and/or decreasing ventilation airflow. A last resort is to reduce the fresh air into the room to bring the room under negative pressure, but by code, you must still maintain 2 air changes per hour.
- Recirculating type HVAC units are not allowed in purpose-built isolation rooms; however, most resident rooms in senior living facilities are designed with this type of room unit. These include fan coil units, water source heat pumps, or packaged terminal AC units. The concern is that as air circulates through the system, contaminants may collect on the filter and internal parts of the unit and contaminated air will be recirculated within the room as the air blows through the unit. If possible, adding a higher quality or HEPA filter is recommended; however, most units of this type do not support the use of a HEPA filter due to the excessive pressure drop of the high efficiency filters. The best option for a temporary situation is to replace the filter with the highest filtration capability that the unit can support, incorporate a shorter filter replacement schedule, and implement more frequent disinfection of the unit.
- Many facilities, especially newer ones, have energy recovery systems utilizing energy recovery wheels, which are designed to exchange the heat from the exhaust air with the cooler fresh air coming into the building in the winter and the reverse in the summer. Typically, this type of system is not allowed in purpose-built isolation rooms because there is the potential for a small amount of cross air contamination as the energy recovery wheel rotates between the contaminated exhaust air and the ventilation air, allowing some crossover between the two airstreams. However, this risk is relatively low as any crossover of the exhaust would be greatly diluted in the ventilation airstream. For these systems, it is recommended that filters be replaced with the highest filtration filter that is possible in both the exhaust airstream before the energy recovery wheel and in the ventilation airstream after the wheel and that these filters be changed on a shorter replacement cycle.
- For rooms that have minimal air changes and where additional exhaust is not possible, an alternative is the use of portable or wall mounted recirculating HEPA filter units. If properly sized, these units can circulate the equivalent of 12 air changes per hour through .3 micron HEPA filters. Higher quality units also incorporate internal UV-C light that is intended to kill any bacteria that manages to get through the .3 micron filter.



HEPA Flow™ Air
Purification System

ANTEROOMS

Purpose-built isolation rooms often incorporate an anteroom, which is a room that separates contaminated resident room from the rest of the facility. This room usually includes a hand washing sink and container space for used PPE's. While a temporary makeshift unit will likely not have dedicated hand washing sinks, anterooms can still be created for the protection of staff while they put on and remove their personal protective equipment.

- If space allows, one option is to create an anteroom area just outside the resident room door. This can be achieved with specialty partitions such as Starc System wall or simple plastic partitions such as those made by BioBubble. For rooms with entry foyers where the bathroom door is not in the foyer space, an anteroom can be created by adding a plastic partition within the room.
- Where groups of rooms can be separated from other parts of the facility, the corridor area just outside these groups of rooms can be designated as the anteroom and a partition can separate this corridor from other clean areas.

These recommendations are not intended to provide full compliance with an Airborne Infection Isolation Room, but rather to temporarily improve existing spaces and exceed the minimum recommendations by the CDC for COVID-19 preparedness in order to create a safer environment for our seniors.

As this crisis begins to recede for the general population, senior living communities will likely remain on high alert for several years at minimum. These precautionary measures will make our senior living facilities safer while we begin looking at more long-term solutions.



Starc Systems' Temporary Partition



BioBubble Anteroom

REFERENCES

¹ CDC <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html>

² CDC <https://www.cdc.gov/flu/about/burden/2018-2019.html>

³ CDC Preparing for Covid-19: Long term Care Facilities, Nursing Homes https://www.cdc.gov/coronavirus/2019-ncov/hcp/long-term-care.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhealthcare-facilities%2Fprevent-spread-in-long-term-care-facilities.html

⁴ CMS Covid-19 Long-Term Care Facility Guidance, April 2, 2020 <https://www.cms.gov/files/document/4220-covid-19-long-term-care-facility-guidance.pdf>

⁵ CDC Interim Infection Prevention and Control Recommendations <https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html>

⁶ New England Journal of Medicine "Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1" March 17, 2020 <https://www.nejm.org/doi/full/10.1056/NEJMc2004973>