

DESIGNING FOR A PANDEMIC

Design can be an ally in the fight against an invisible foe

By Mike Miller & Blake Webber

PREPARATION

The facilities that have been hit hardest by this pandemic are those that contain fragile patient populations confined to a low acuity environment. *How can we adapt the entire building or cam-pus to accommodate isolation rooms?*

REACTION

In anticipation of existing medical infrastructure becoming overburdened, what can we do to quickly adapt other existing structures to provide emergency relief? Any building that contains the essential spaces such as large-scale laundry, private rooms, toilets, cleaning and cooking facilities have the potential to be rapidly repurposed.

CONTAINMENT

Current healthcare design practices provide a strong foundation for how to control air in an existing building without a built-in mechanical system. These techniques have been perfected over decades while carrying out construction in occupied healthcare facilities.

DESIGN FOR IMPACT

Sitting in our makeshift offices, working remotely because of the shelter in place order currently in effect, it is impossible for designers and planners to avoid thinking about a response to control or prevent the spread of the coronavirus pandemic. Like many in the design professions, we are thinking about how our talent and experience can be leveraged to avoid the devastating impact of highly transmissible diseases in our communities. Though there are many factors outside our control, there is much that we can do in the design and construction of the built environment to prepare for, respond to, and contain the spread of pervasive pathogens.

There is no one size fits all solution for a problem of this scale and we do not claim to have all the answers. Our thoughts and ideas are not backed by comprehensive data or clinical research. Rather, in the spirit of the informal charrettes we commonly use early in design to promote free thinking and debate possible solutions, we are sharing our thoughts and ideas to solve a current issue whose massive scale has changed everything we know.

There are three primary areas that have been identified for how we might respond better to a future air-borne pandemic: how we prepare ahead of time, how we react quickly once the pandemic hits, and how we effectively control and contain the virus once residents and patients become infected and Healthcare hits maximum capacity.

OPPORTUNITIES FOR FUTURE-PROOFING



"36% of these respondents stated that the odds of a Covid-19 infection are extremely or definitely likely in their community, that they are not fully prepared, and they are being overlooked by government and suppliers in favor of acute care hospitals."

-Part of recent poll results published by Senior Housing News in their March 30, 2020 issue

Preparation is key. We are learning the hard lessons about how we could have mitigated the effects of COVID19. The stark realization is that, as a society, we do not have enough supplies such as accurate tests, protective equipment, and ventilators on hand in our facilities for something of this scale and this need to be addressed for future events. That said, focus should be more on the lessons we have learned that can be resolved through design. Engaging healthcare and senior housing architects and engineers early as you prepare to construct new facilities, or renovate existing ones, will maximize the impact of preparedness for future events.

The facilities that have been hit the hardest by this pandemic are those that contain fragile populations confined to a low acuity environment. These include many diverse populations and buildings such as assisted living facilities, nursing homes, inpatient behavioral health facilities, prisons, shelters for the home-less, and more. Most of these settings do not have adequate infrastructure to deal with the containment of an airborne illness or to quarantine patients that are infected. The plan, prior to COVID19, was to send residents to the hospital whenever a complication requiring a higher acuity environment presented itself. As we saw first in Washington State, and throughout the country, care environments and hospitals were quickly overwhelmed and, in some cases, had to turn virus infected patients away. This resulted in patients being transported from one facility to another exposing staff, other patients, and emergency responders. This presents an opportunity to better design low acuity environments with systems to control the spread of future airborne illnesses reducing the impact on our healthcare system.

Its logical to assume that based on our COVID19 experience existing codes will change. Developers, administrators , architects and engineers can be a catalyst for changes that will better protect our most vulnerable populations.

THE NEED FOR ISOLATION

In the event of an airborne pandemic, most of the strategies involve isolation. Isolating areas of the building or campus and the those being cared for can be looked at from three scales. First, the residents themselves. The standard should be the design private resident rooms. We have known for decades

about the social, psychological, and physical issues presented by semi-private rooms. The effects of this virus make it clear that shared rooms exacerbate the infectious situation and leave no flexibility for isolation. In many of the nursing homes that have been hardest hit it can be assumed many residents shared rooms separated by a curtain resulting in spread between residents and residents to staff, creating a snowball effect that quickly spread throughout the facility.



Bayview Retirement Community, Seattle, WA

Secondly, the resident rooms. Ideally, several rooms should be designed with negative isolation mechanical systems that can be used to isolate infected residents, or protect healthy ones. Currently, airborne isolation rooms are not required by code in sub-acute environments such as: assisted living, and behavioral health facilities, but we are learning that if isolation room(s) are included in future designs, and renovated into existing facilities, we would be able to slow the virus spread thus reducing the impact on our healthcare infrastructure. Residents that are infected could be relocated to areas within the building where they can be cared for while minimizing the spread to others.

This allows healthy residents to safely remain in their rooms after a case is discovered rather than having to evacuate an entire facility. Many of these residents are completely dependent on these facilities for their care and safety and evacuating them can result in major complications beyond the virus.

Thirdly, the most successful approach looks at how the entire building or campus can be used to isolate resident populations. This approach looks at how wings, or portions of wings, could be designed with the required infrastructure in place to care for residents including a mechanical system that can be used to isolate the building. This approach is especially important in behavioral health, memory care, or lock down facilities where it is difficult or unsafe for residents to be transferred.



Anteroom Creation at Corridor



Resident Room Isolation

Photos courtesy of WA Veterans Home

RAPID ADAPTATION

Beyond ideas that we can design into future facilities, we also need to look at how we can react by implementing better emergency strategies when our existing facilities are at maximum capacity. It could be argued that this virus took the world by storm, and while it is the first of its kind, at this scale, in almost a century, that is not exactly the case. With a globally connected world, some countries will have more warning than others as a virus moves across the world. This warning provides time to react, prepare, adapt, gather supplies, create a strategy, and confirm options.

Rice Fergus Miller reached out to our skilled nursing clients with the idea of creating temporary negative pressure isolation rooms or zones within their existing facilities using plastic zipper walls, temporary ante rooms, and HEPA filter exhaust systems; strategies adapted from infection control procedures in construction. In several cases, this strategy quickly resulted in negative isolation rooms or zones. Although this is not the same as a hospital environment, it provides a measure of safety and time to control the virus spread, resulting in less impact on our healthcare infrastructure, and a safer environment for the greater resident population and staff.

FORMER PATIENT TREATMENT FACILITIES

There are two major parts to this: one, analyzing what buildings make the most sense to repurpose and two, determining what techniques should be used to do so quickly and effectively. As we have found with COVID19, every country that has been affected has hit a point where hospitals are overwhelmed and unable to accept more patients. Cities needed to consider alternative structures. An idea that comes to mind immediately is looking at nursing facilities that were previously used for patient care but have now been abandoned or repurposed. In Western Washington there has been a rash of nursing home closings. These buildings contain many of the essential spaces needed such as a commercial kitchen, soiled and clean holding, medication rooms, eight-foot corridors and four-foot doors, and nurse stations with good sight-lines and access control security.



Clearwater Resort Hotel Room, Suquamish, WA

HOTELS ON STANDBY

Beyond buildings that were specifically designed to house these patients at one time, the next best solution are the hundreds of thousands of hotels rooms that will be vacant for the duration of the pandemic due to shelter-in-place orders. These buildings contain many of the spaces that are needed, such as private rooms and toilets, large scale laundry, cleaning and cooking equipment, and many times they are designed with wings or floors that could be isolated efficiently. Once the most appropriate buildings are selected, then we need to find ways to override the existing mechanical systems to isolate patient areas and condition them appropriately.

CONTAINING INFECTION

An idea that quickly came to mind to us, as healthcare architects, is the process and techniques we use to control infections and other complications arising from doing construction in an existing hospital. We have been perfecting these ideas for decades and the strategies and best-practices being used, provide a strong foundation for how the air in an existing building can be controlled without a built-in mechanical system. Equipment such as negative air machines, HEPA filters, temporary partitions, and plastic screening can be used to segregate areas of an existing building quickly with minimal renovations.

LOOKING TO THE FUTURE

Looking to the future, when we design environments for our frail populations, we should consider how we can provide design opportunities to mitigate virus spread and create isolation and negative environments quickly, and at little cost. Some ideas to consider are:

MINIMAL INVESTMENT: MAXIMUM IMPACT

- 100% private rooms in skilled nursing, behavioral health, assisted living and memory care environments.
- Temporary Negative Isolation at private rooms or sections of wings to create an isolation environment.
- Deeper entry recesses to a resident room or apartment. Five feet would allow creation of a reasonable anteroom for isolation purposes and air lock for hand sanitizing, gown change, etc.
- Convertible wings that can immediately convert to an isolation and/or quarantine area.
- Variable air pressure mechanical systems in zones of a facility that can provide a quick switchover to a negative air pressure environment.
- Anti-microbial materials for finishes such as copper or brass push plates on doors and/or brass hardware.
- Ultraviolet lighting to provide in-room infection control while room is vacant.

As we look back at what could have been done differently in our reaction to this virus, more equipment will most likely be designed and available specifically for this response in the future, but our current process construction process is a great place to start. The more we can document and share these solutions from facility to facility, the more prepared we will all be for another pandemic like COVID19.

ABOUT THE AUTHORS

Mike Miller has over 35 years of experience in architecture and master planning of healthcare and senior living communities. His extensive background in healthcare, housing, and hospitality design brings a valuable perspective to the teams that he advises as Principal in Charge. Mike has led the design of more than six million square feet of projects in these related industries and is a national speaker on design strategies.

Blake Webber is a healthcare project architect at Rice Fergus Miller. He has worked on the facility side as a technical architect for Kalispell Regional Medical Center and brings this invaluable real-world experience to his clients. Focus on a design-driven but practical approach, Blake's diverse knowledge and experience contributes to the success of his projects.