e4h ENVIRONMENTS FOR HEALTH ARCHITECTURE

planning & design recommendations for COVID-19

INPATIENT CARE ENVIRONMENTS

2020

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introduction

As our communities begin to grab hold of the COVID-19 crisis, we have a rare opportunity to review current industry challenges and apply innovative thinking to design solutions that will best support current, and potentially future, threats within our healthcare systems. Medical experts agree that once a new and harmful virus is isolated, it could take up to 24 months before effective, proven vaccines and/or therapies are available. A pandemic-causing disease is something that we may likely see again in the future. **The time to strategize future solutions for our healthcare systems to best address these challenges is now.**

Just as the tragic events of 9/11 transformed the design and operations surrounding airport security, we too must look for ways to re-imagine how we design healthcare spaces that continue to foster safety, promote health and wellbeing, and improve patient outcomes. We envision new protocols, workflow, and operations coupled with extensive safety guidelines to support future design strategies.

We are avid practitioners of Evidence-Based Design, however there is little design research or evidence from past viral epidemics, in particular, past pandemics. Designers are now conducting a new cascade of research and information gathering to determine and interpret what impact this global outbreak will have on healthcare design.

Much of what we do is driven by a series of directives and objectives with the goal of improving healthy outcomes. Our initial recommendations for addressing inpatient care spaces includes a new of approach to planning scenarios, FF&E and material selection, incorporating advanced technologies, and infrastructure design.

“This crisis has brought forththe importance of crystal clear communication and coordination, especially as it related to protecting our healthcare service providers and offering the best advice to patients.”

- Dr. Robert Bonar, Gordon A. Friesen Professor of Healthcare Administration, Director of Master of Healthcare Administration Program, George Washington University

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inpatient care considerations

INFECTION PREVENTION	Prevention of viral, bacterial, and fungal infections through hand sanitation zones and cleaning protocols.
MATERIALITY	Finish selection should be made considering many different factors such as cleanability and durability, not aesthetics alone.
COMMUNICATION	Clear and concise signage should be displayed to communicate current facility protocols and recommended guidelines.
TECHNOLOGY	Using technology to offer alternative methods of delivering care, provide innovative ways to communicate, and maximize hands-free interactions.
NAVIGATION	Directional elements tied into the design of the space serve as an easy to comprehend guide to navigate throughout a facility.
PROXEMICS	Decompression of dense spaces can be achieved by reducing seat counts and by distancing users from one another.
STORAGE	Sufficient storage should be provided for both personal belongings as well as for protective equipment and disinfectants.
VENTILATION	Balance the HVAC system to create negative pressure spaces, improve airflow, and allow for increased med/gas usage.

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Yale North Haven Medical Center
North Haven, CT

planning considerations

PATIENT ROOMS + ISOLATION UNITS

In units where shared rooms have been converted into private rooms, the legacy med gasses are often left in place. Converting private rooms back to shared rooms allows for increased capacity without having to move patients and staff to temporary facilities off site.

Whether existing or adapted from normal positive pressure rooms, **Isolation Rooms** are critical to containing infectious disease.

- Rooms that do not have supplemental med gasses but are large enough to accommodate a second bed can be adapted or can be supplemented with bottled med gasses.
- Existing systems in newer facilities can be converted to a negative pressure air system, whereas older facilities may require mechanical system adjustments or supplemental systems.
- Assessing the best inpatient unit in the hospital to implement isolation units will be measured by available infrastructure, and selection should consider ease of access.

STAFF SUPPORT

Planning a safe working environment for staff is key in limiting the spread of infection. Staff flow should be planned to reduce unnecessary contact and cross contamination between healthy staff and contagious patients. Some considerations include:

- Where possible, **designate separate corridors for staff and for patient flow**. This would allow staff to move throughout the facility and reduce unnecessary contact.
- Reconsider how medical staff hold meetings and gather together. Incorporate flexible rooms within the facility to adapt to different uses.
- Additional respite areas should be provided for staff in times of high occupancy and crisis, to improve staff wellness.
- Staff lounges and respite areas should be designed to aid in social distancing with individual pods or smaller seating arrangements in lieu of one large table.
- Allowing safe donning and doffing of PPE is crucial to managing the spread of infections. **Implement separate donning and doffing rooms in the unit**. Designate one room near the unit entrance with a direct path to the unit where staff can don PPE with assistance. Provide a separate space where staff can complete the multi-step process of doffing soiled PPE before exiting the unit.

planning considerations

SUPPLY FLOW

The flow of medicines, clean supplies, linens, and food into the unit should be delivered so as to not to cross the flow of soiled materials, and stored in clean storage rooms or areas for distribution to patients.

- The **flow of soiled linens should be in the same direction as patients**.
- Soiled holding rooms should be located towards the end of the circulation path and near the exit door for safer transfer out of the building.

ALTERNATIVE WORK FLOWS

Creating alternative care workflows with room equipment is a key element in limiting the spread of infections during an event such as COVID-19.

- Relocate nurse server carts to outside the room to minimize contamination of supplies.
- IV Pumps can be modified with an extended tube and placed outside the room.
- Separate Ventilator Control Panels from the unit, placing them outside the room. This enables staff to monitor and change drips/medications without physically entering the room and donning and doffing PPE.

MANAGING VISITORS

- End-of-Life visits can be planned through **dedicated visitor rooms** adjacent to the exterior corridors with a vision glass between the spaces.

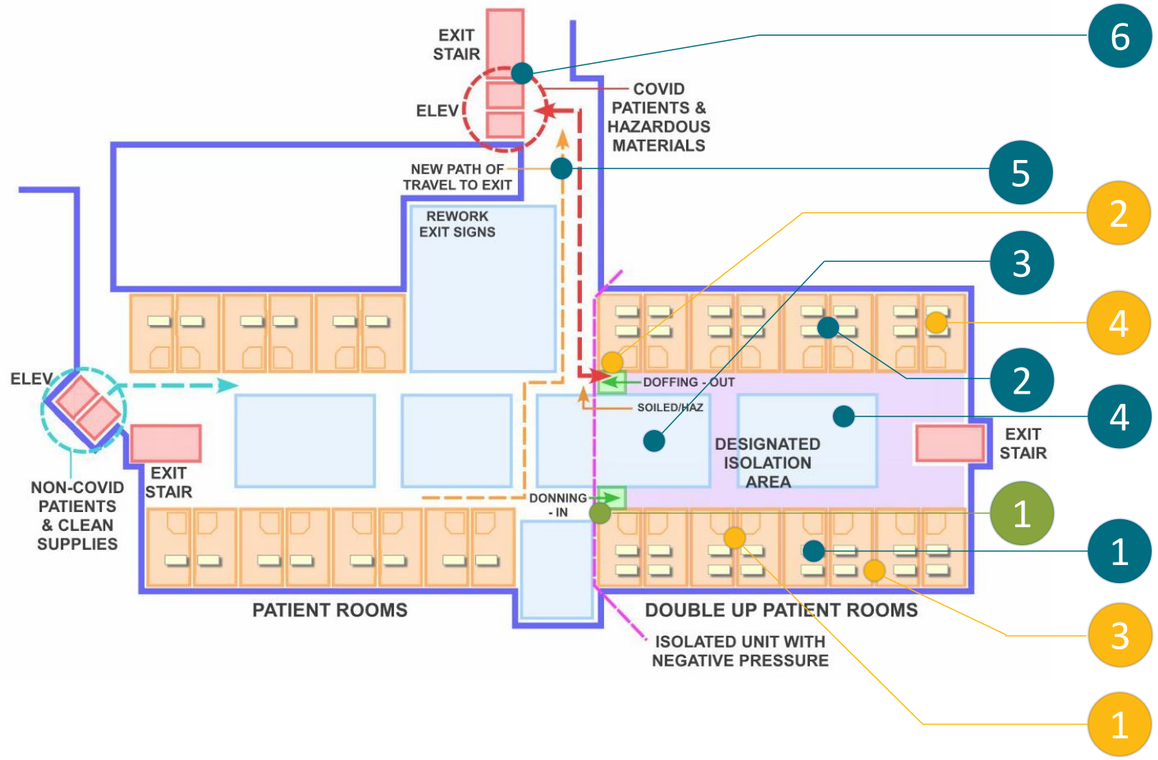
MED/SURG UNIT CONVERSION

If elective surgeries are halted during an infectious disease event, **Medical Surgical units can be used for either patients recovering from the illness, or for infected patients**.

- Med/Surg floors can be considered for an entire floor of infected patients or partial floors. When a partial floor is used, cross corridor door locations can act as the defining perimeter with the addition of a secondary temporary wall vestibule, such as STARC or DIRTT, to further protect from cross contamination.
- **Adapt the mechanical systems** to provide adequate negative air in the patient rooms either with adjustments to the main system, supplemental exhaust to the main system, or portable exhausts at individual rooms.
- An **operable window** in each patient room allows for easily adding exhaust to individual rooms without construction.

med/surg unit conversion

If elective surgeries are halted during an infectious disease event, Med/Surg units can be converted for patients recovering from the illness, or for infected patients.



Existing Space Benefits

1. Private patient rooms – can be used for double occupancy
2. Medical Gasses, Power, Tel/Data
3. Nurse stations & support space for staff
4. Clean, Soil, Nour & Equipment Space
5. Life safety provisions
6. Ability to Isolate elevator cores

Changes Recommended

1. Convert to negative pressure
2. Ante rooms for donning & doffing
3. Remove excess furniture and equipment in patient rooms
4. Privacy for patients

Challenges

1. Infection control at entry / exit

Infrastructure

- All necessary infrastructure is available in a med/surg suite for post acute care

Staff Flow

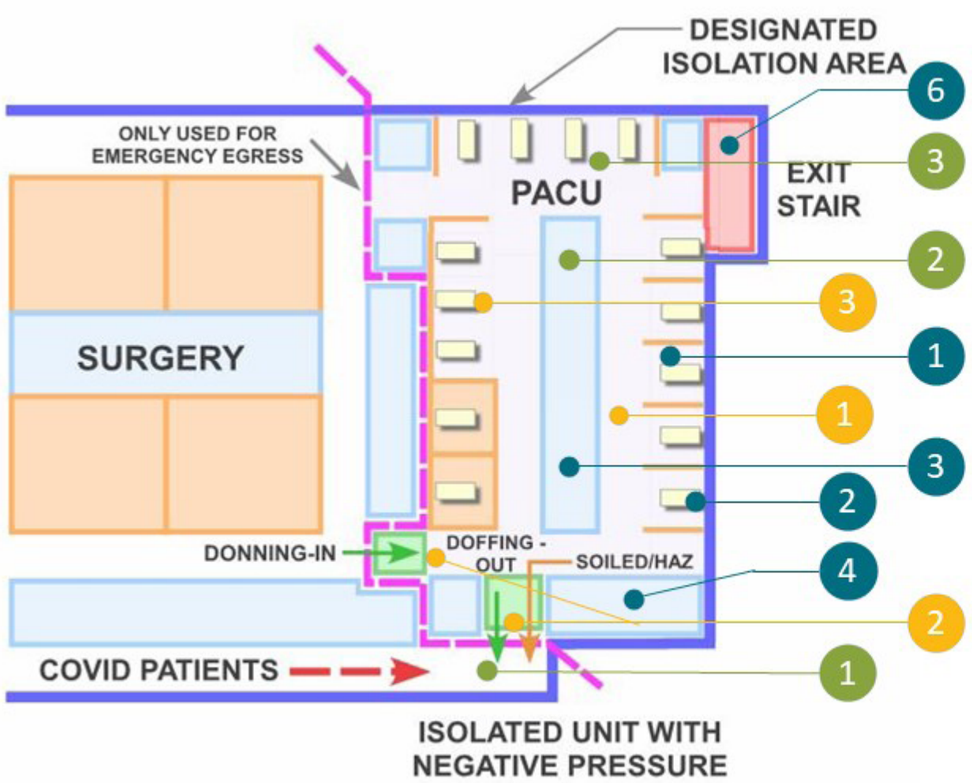
- Control clean and dirty entries with ante rooms

Patient Flow and Life Safety

- Good patient flow and egress from clinical spaces

PACU unit conversion

If elective surgeries are halted during an infectious disease event, PACUs are another space that can be converted for patients recovering from the illness, or for infected patients.



Existing Space Benefits

1. Patient recovery bays adequately sized
2. Medical Gasses and power
3. Nurse stations & support space for staff
4. Clean, Soil, Nour & Equipment Space
5. Cleanable surfaces
6. Life safety provisions

Changes Recommended

1. Convert to negative pressure
2. Ante rooms for donning & doffing
3. Remove excess furniture and equipment in patient bays

Challenges

1. Infection control at entry / exit
2. Limited patient toilets
3. Limited privacy in suite

Infrastructure

- All necessary infrastructure is available in a PACU suite for post acute care

Staff Flow

- Control clean and dirty entries with ante rooms

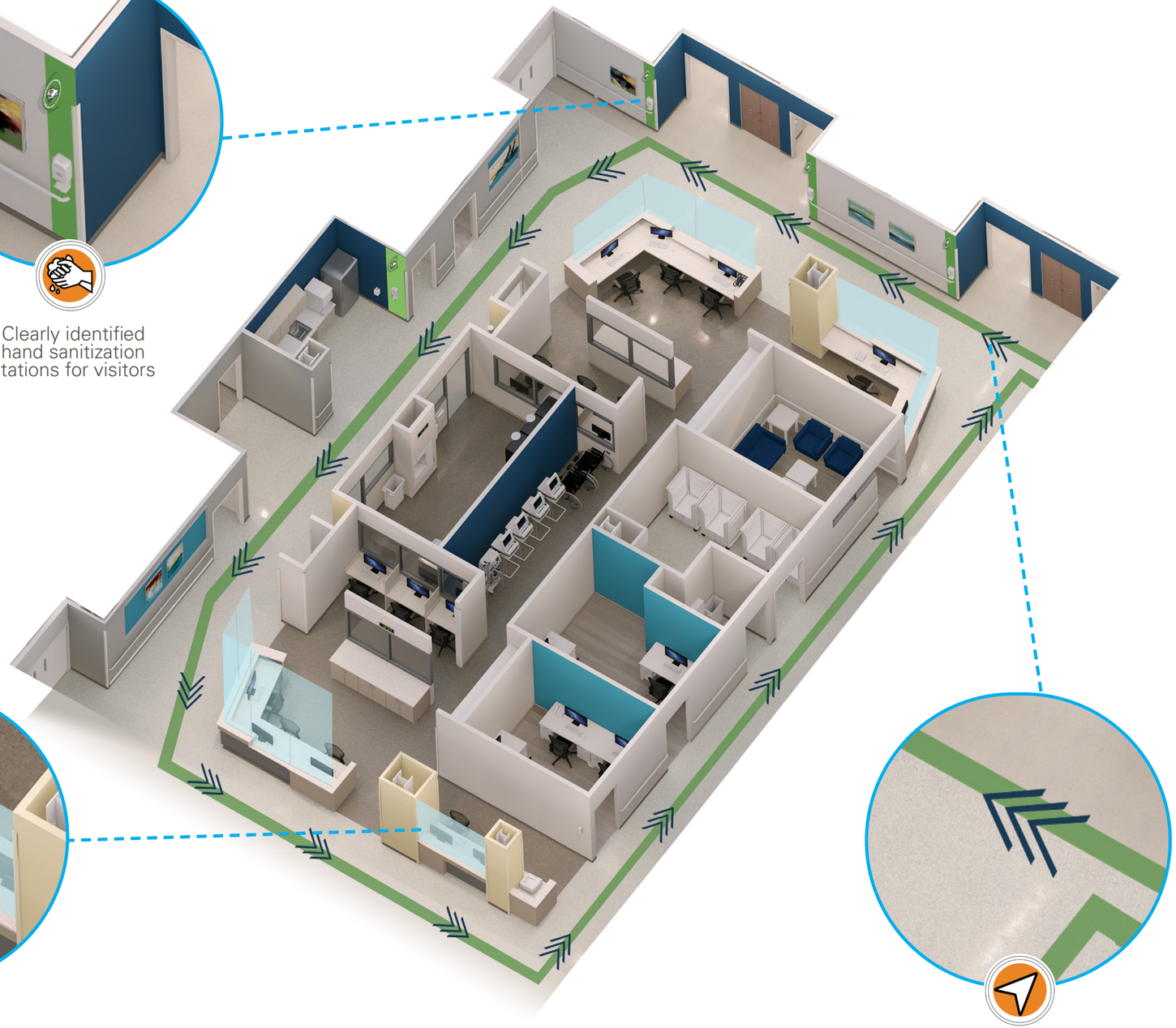
Patient Flow and Life Safety

- Good patient flow and egress from clinical spaces

clinical support zone

- INFECTION PREVENTION
- MATERIALITY
- COMMUNICATION
- TECHNOLOGY
- NAVIGATION
- PROXEMICS
- STORAGE
- VENTILATION

Clearly identified hand sanitization stations for visitors



Transparent dividers between nurse stations and visitors

Directional floor patterns help encourage patients to travel in a one-way pattern

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Winchester Medical Center
Winchester, VA

patient rooms

design considerations

TOUCHLESS TECHNOLOGY

- **Automatic operators** with wave sensors aid in touchless entry.
- Sliding doors mounted on the corridor side that are ADA compliant allow staff to use their elbows or shoulder to push open without touching.
- Implement foot grab hardware to open doors if auto operators or sliding doors aren't available.
- **Implement hands-free and voice-activated systems** to operate lights, nurse call, and electrified window shades within the rooms.

MATERIAL SELECTION

- **Select materials and finishes that are easily cleaned**. Fabric that can withstand the harshness of increased use of disinfecting agents should be considered
- Consider materials and finishes that are germ resistant, such as copper.
- The overall environmental impact of selected materials should be taken into consideration. Environmentally-friendly polyurethanes and silicones hold up better than vinyl over time.

UV LIGHT FOR DECONTAMINATION

Integrate Ultraviolet lighting into the lighting plant to kill germs and bacteria.

- Human-safe UV lamps can be used continuously, or a more intense frequency of UV light can be deployed on a scheduled basis when rooms are unoccupied.
- UV "robots" can be brought into a room for decontamination and removed after use.
- UV light fixtures can be mounted on walls or ceilings, within ceiling fans, or installed in ventilation or air ducts.
- Selecting materials and finishes that can hold up to this type of decontamination should be considered.

TOILET ROOMS

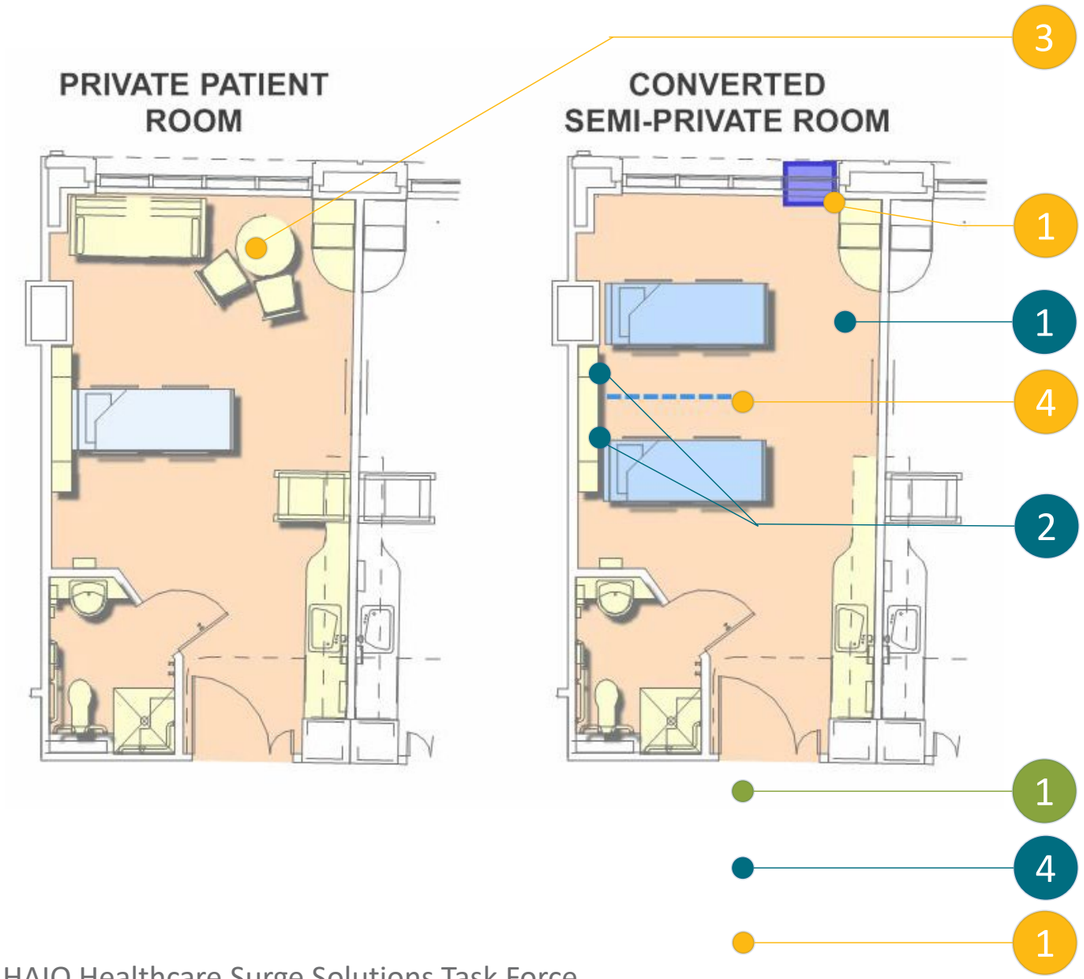
- All toilet rooms should be equipped with floor drains to washed down in entirety. Consider tiling the entire toilet room using large scale, cleanable tiles reducing grout lines on walls.
- Wash basin designs should relieve aeration, spills, and splashes. The faucet location in relation to the drains is critical to prevent the aerosol of germs.
- Hand dryers with UV lights and splash mitigation should be specified.
- Touchless waste receptacles should be implemented.
- Vacuum toilet systems that flush inward mitigate aeration and the spread of germs into the immediate atmosphere.

MANAGING VISITORS

- **Patient rooms do not need to accommodate visitors** with sleeper sofas, so these should be removed to allow more room for staff and equipment, and to eliminate furniture that needs to be sanitized.

University of Vermont Medical Center
Burlington, VT

private patient room conversion



HAIO Healthcare Surge Solutions Task Force

Existing Space Benefits

1. Private patient rooms – can be used for double occupancy
2. Medical Gasses and power
3. Nurse stations & support space for staff
4. Clean, Soil, Nour & Equipment Space
5. Life safety provisions

Changes Recommended

1. Convert Unit to negative pressure or rooms to negative pressure (through window unit & portable exhaust fan w/HEPA filter)
2. Ante rooms for donning & doffing
3. Remove excess furniture and equipment in patient rooms
4. Privacy for patients

Challenges

1. Infection control at entry / exit

Infrastructure

- All necessary infrastructure is available in a med/surg suite for post acute care

Staff Flow

- Control clean and dirty entries with ante rooms

Patient Flow and Life Safety

- Good patient flow and egress from clinical spaces

patient rooms

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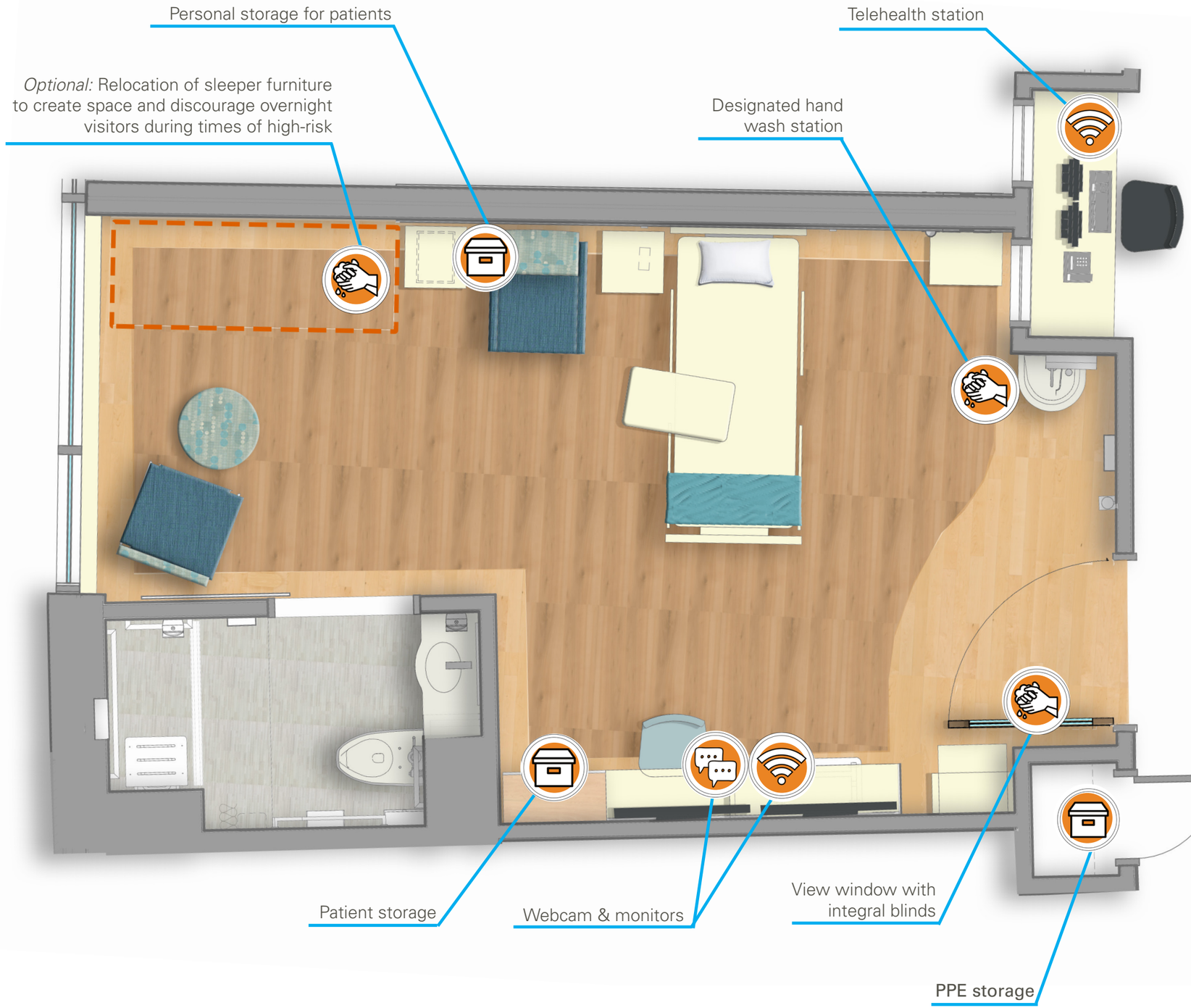

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Shady Grove Fertility Clinic & Surgery Center
Rockville, MD

visitor waiting areas

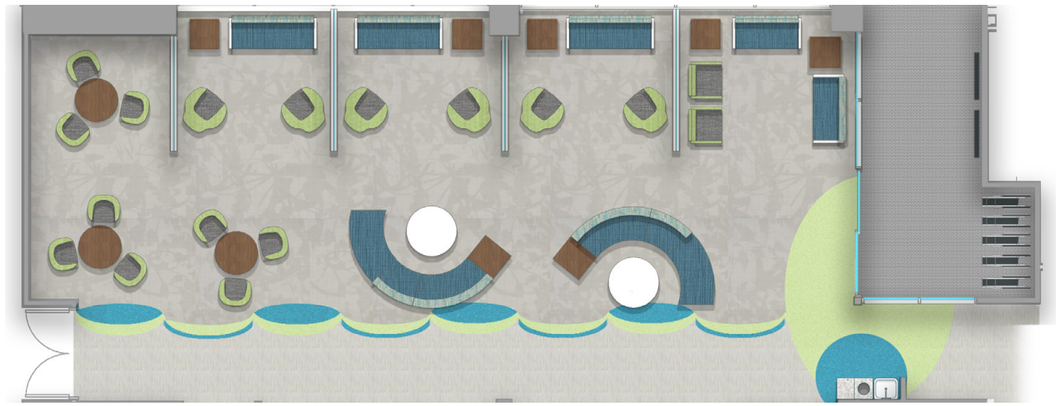
visitor waiting areas

PLANNING CONSIDERATIONS

- **Identifying red, yellow, and green levels of threat** can be accommodated by flexible design. For example, in the height of flu season, waiting rooms can be adjusted to provide only a third of the seat positions to visitors. In the summer when infections may be lower, additional seating can be made available again.

- **Implement visitor screening** in an anteroom prior to entry into the main waiting area. Consider a multipurpose room located near the entry of the facility that can function as a conference or public teaching space during day to day operation, but during a flu season or a pandemic scenario, can be utilized for visitor screening.

- From the waiting area, the **path of visitors through the space could be in a single direction flow**. This will prevent visitors from backtracking and coming in contact with other patients, visitors, and staff in the space, thereby reducing the chances of cross contamination.



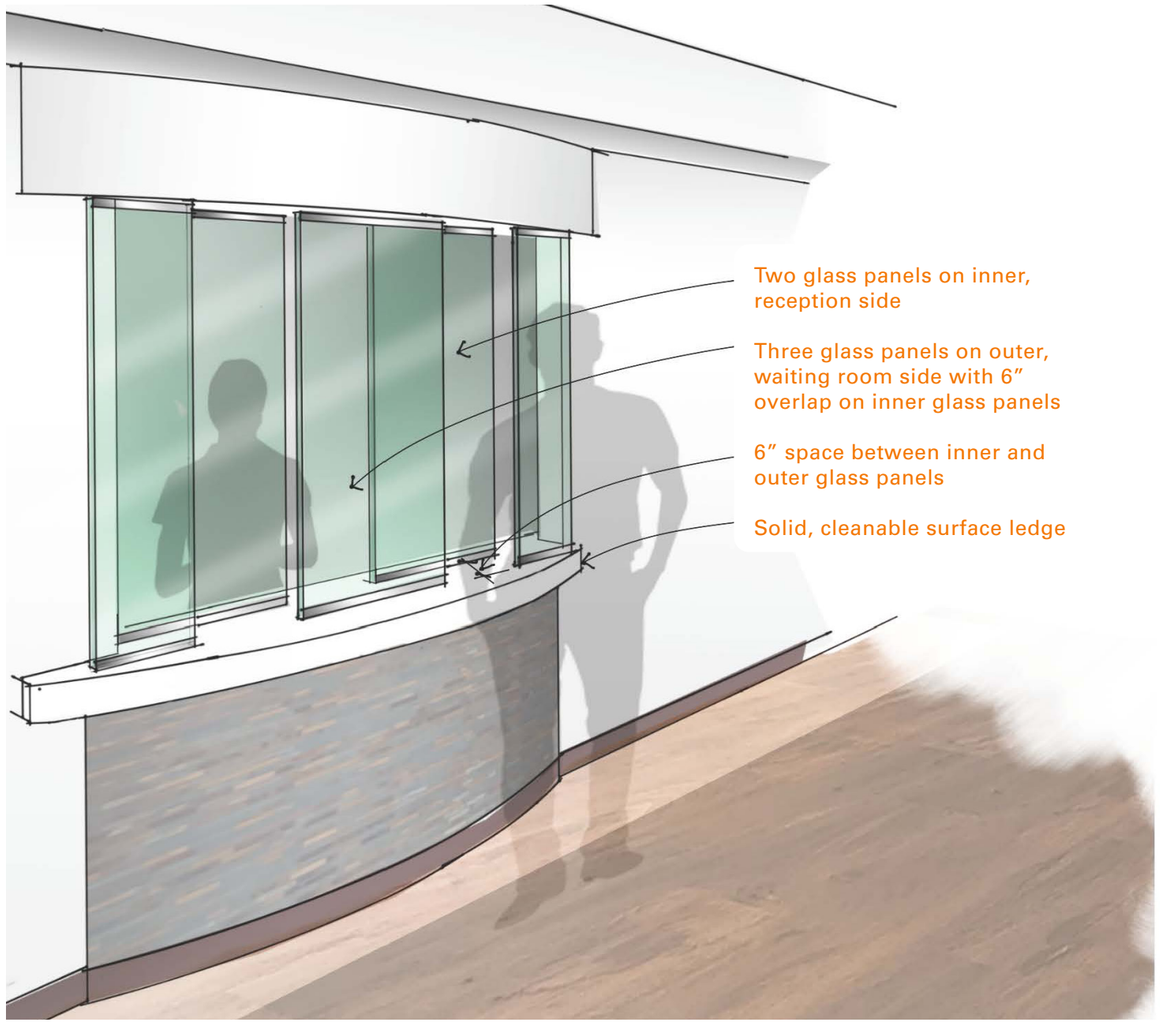
Waiting Area Concept

- **Segmented waiting areas** that are broken into smaller "pods" allow visitors the ability to distance themselves from others, and still remain together as a family.

- Create a **designated visitor room with glazing** to separate the patient and visitors, and microphones built into each space, allowing visitors to see and speak with their loved ones.

- **Repurpose underutilized on-call rooms** as small waiting rooms to accommodate one family per room, offering visitors a safe, private space in which to regroup or decompress.

- Just as in patient rooms, employ **touchless technology** throughout, with automated entry to family waiting areas.



Conceptual Illustration of registration window with infection control glass panels

visitor waiting areas

VISITING A CONTAGIOUS PATIENT

- Provisions for secure video conferencing for family and friends from a **dedicated room near the waiting area** will add comfort to the healing of the patients and lessen the stress of family and friends.
- **Changes to visiting hours** can be provided to reduce waiting room crowding for visitors. This could be tied into even and odd patient room numbers.

SIGNAGE

Implement universal signage at key locations describing the measures the facility is taking to keep everyone safe, similar to health grading standard for restaurants.

- For example, letting visitors know that high-touch surfaces are cleaned around the clock, and that the environment is being continuously sanitized with decontaminating UV lights etc, brings a level of comfort and reassures visitors that the environment is sanitary and safe.
- Build design motifs into the flooring every six feet in a contrasting color to encourage social distancing precautions and single-direction flow of visitors.

HAND WASHING AND SANITIZING STATIONS

- Provide a hand washing sink built into the waiting room, or a hand sanitizing station with furniture wipes to encourage visitors to propoerly santize their hands, wipe down seats, armrests, and tables before and after use.

MATERIAL SELECTION

- Select furniture constructed and upholstered with **materials that are easily cleaned** or wiped down with disinfectant.
- Consider seating made of environmentally friendly polyurethanes that will hold up better than vinyl over time. When considering fabrics for use with UV lights, environmentally-friendly polyurethanes and silicones should be explored.
- **Furniture that is flexible, foldable, or stacks** for storage when needed could be incorporated to further reduce crowding. Reduced touch points with hip chairs allow visitors to lean, sit, and stand up without touching armrests.
- **Decorative physical barriers** such as screens or glass partitions can help to create and reinforce the separated pods.

UV LIGHT FOR DECONTAMINATION

- Just as in patient rooms, **human-safe ultraviolet lighting** can be integrated into waiting areas to kill germs and bacteria continuously, or a more intense frequency of UV light can be deployed on a scheduled basis when the spaces are unoccupied
- UV light fixtures can be mounted on walls or ceilings, within ceiling fans, or installed in ventilation or air ducts. Alternatively, UV “robots” can be brought into a room for decontamination and removed after use.

visitor waiting areas

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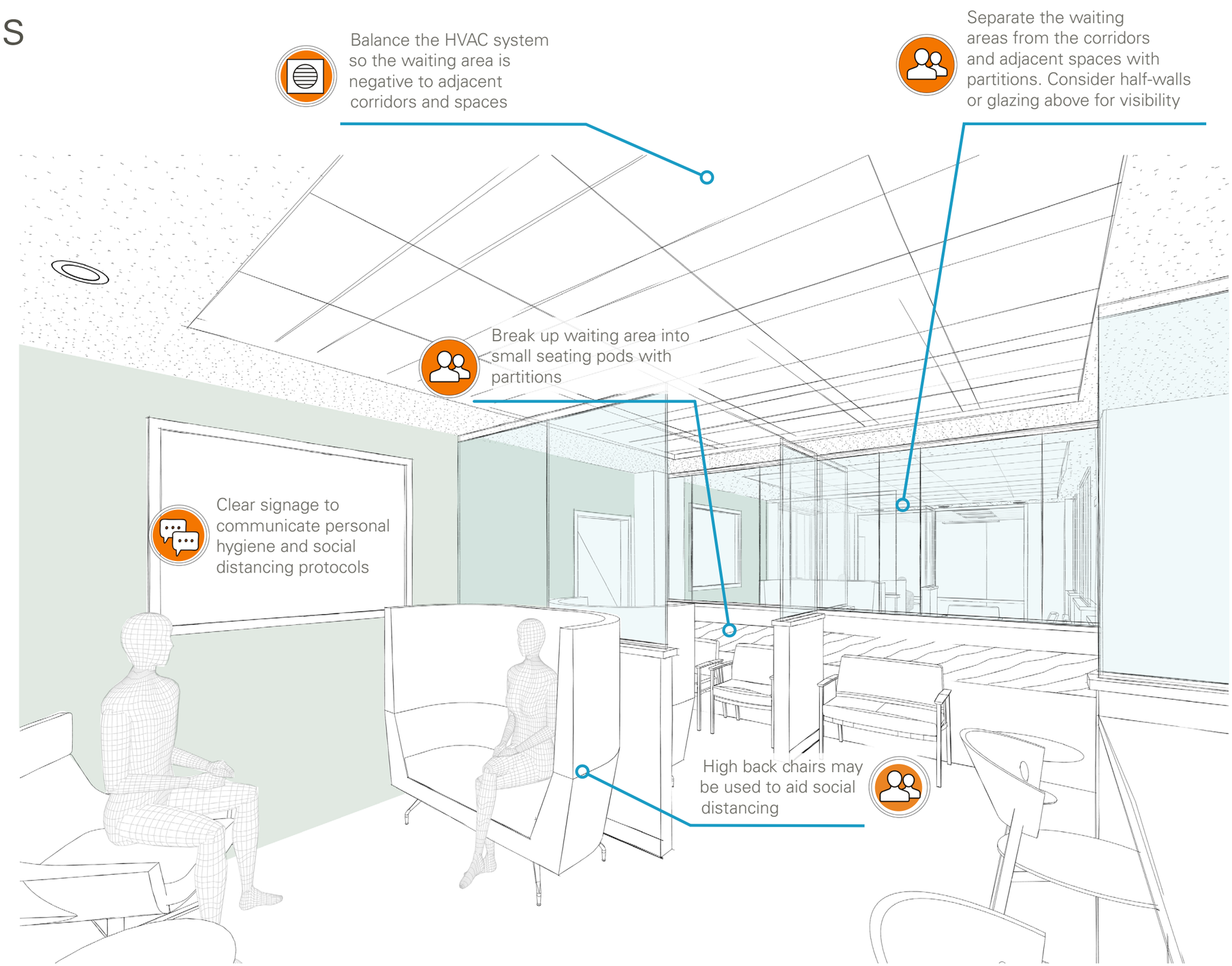

For more information on COVID-19 planning, design, and implementation considerations, visit the COVID-19 Resource page on our website.

e4harchitecture.com/covid-19-resource-page/

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