High level isolation room consensus statements along with strategies for implementation

These consensus statements outline physical infrastructure recommendations to provide isolation and management of patients with suspected high-consequence infectious diseases (HCIDs) at frontline acute care hospitals. This guidance is designed to be generalizable and scalable across different geographies and types of US acute care hospital facilities.

Where applicable, dollar signs ($) indicate relative cost, with an increasing number of dollar signs indicating recommendations with higher relative cost.

N/A = not applicable

Patient Rooms

1. High-consequence infectious disease (HCID) patient room location

Consensus statement	The facility should identify, evaluate, and designate locations that can be maintained during ongoing hospital operations, and which have the appropriate environments in place for isolation of patients under investigation (PUI) for high-consequence infectious disease (HCID) during their transport and care. Possible options include within or near the Emergency Department, Observation Unit, or Intensive Care Unit (ICU).
Recommended strategies	N/A
Existing standards and other useful references	None

2. HCID unit – Model as an observation unit

Consensus statement	Model an HCID patient care unit after an observation unit. The unit should have the following minimum elements in place, based on Facility Guidelines Institute (FGI) 2022 Hospital Guidelines sections 2.2-3.3: ▪ A nurse station that allows observation of the patient room entry ▪ A nourishment area in or readily accessible to the unit ▪ An equipment and supply storage area for gurneys, supplies, and emergency equipment ▪ A nurse or supervisor workspace ▪ A medication safety zone ▪ A clean workroom or clean supply room ▪ A soiled workroom or soiled holding room ▪ An environmental services room ▪ A patient room, preferably with natural light

	▪ Easily accessible picture archiving and communication system (PACS) and/or X-ray illuminators ▪ A staff toilet room either in or adjacent to the unit ▪ A staff lounge on the same floor as the unit
Recommended strategies	1. Pre- and Post-operative care areas have similar elements; consider these as alternate potential locations. ($) 2. Consider using existing wings or hallways of floors that can easily be sectioned off. ($)
Existing standards and other useful references	FGI 2022, *Guidelines for Design and Construction*, Hospital Guidelines sections 2.2-3.3

3. HCID Patient room location – Unit within a unit

Consensus statement	If the HCID patient rooms are located within a larger unit, they should be located at one end of the unit, close to an entry or exit door, and have restricted access. If possible, provide a means to maintain physical separation from other patient care areas.
Recommended strategies	1. Indicate separation visually with distinctive floor and/or wall paint color; and/or digital or paper signage. ($) 2. Install temporary partitions to separate a distinct area, if compliant with life safety requirements. Ensure there is space for adequate storage of clean PPE. ($$) 3. Establish workflow plans for entering/exiting the designated space and communication to ensure only those with training enter it.
Existing standards and other useful references	None

4. Patient room dimensions

Consensus statement	To be adequate to provide the broadest level of care in the room and to avoid transporting patients within the facility, the HCID patient room should have a minimum clear floor area of 140 square feet, with a minimum clear dimension of 10 feet (similar to that of an ED Observation Room). Room size should permit a minimum clearance of 4 feet at each side and at the foot of the gurney or bed for clinical care.
Recommended strategies	1. If available existing space is smaller, consider removing any fixed cabinetry and replacing it with mobile storage or work

	surfaces to increase flexibility of clinical workspace around the patient. Test the space's functionality with a mockup and simulation of care for an HCID patient. ($) 2. Enclose two open bays to create appropriate enclosure for room size requirements. The enclosure should be constructed to meet pressurization requirements of Air Handling Statement #1. ($$)
Existing standards and other useful references	FGI 2022, *Guidelines for Design and Construction*, sections 2.1-3.2.2.1 (modified per above)

5. Doffing area in patient room

Consensus statement	If it is not possible to provide a physically separate area for doffing of personal protective equipment, the HCID patient room should have an additional, designated/delineated zone within the room at the exit door for this purpose. This space should be a minimum of 6 feet 6 six inches by 6 feet 6 inches and delineated with a visual cue (e.g. different color floor finish, floor decals, etc.).
Recommended strategies	1. Install a prefabricated portable anteroom outside of the designated HCID patient room. It is necessary to maintain life safety compliance (e.g. cannot interfere with required corridor width or existing requirements). ($) 2. Use an available room adjacent to the designated HCID patient room for doffing. Add a door between the patient room to the adjacent room. See Air Handling statements regarding pressurization requirements. Room should have easily cleanable finishes and be equipped with a trash receptacle and hand sanitizer, at a minimum. ($$)
Existing standards and other useful references	FGI 2022, *Guidelines for Design and Construction*, sections 2.1-2.4.2.3

6. Patient toilet facilities

Consensus statement	HCID patient rooms should have an adjoining, dedicated patient toilet room that can be entered without going into the general corridor. The toilet room should be equipped with a toilet, hand-washing station, and nurse call button. The door of the toilet room should swing out into the patient room to allow rescue of a patient who may have collapsed. Alternatively, equip the patient room with a commode and a privacy screen.

| Recommended strategies | 1. Select a patient room for HCID designation that is adjacent to a toilet room entered from the corridor. Add a door from the patient room directly to the toilet room. ($)

2. Add a hospital toilet cabinet to the room if there is sufficient space. ($$) |
|---|---|
| Existing standards and other useful references | FGI 2022, *Guidelines for Design and Construction*, section 2.1-2.4.2.2 (Airborne Infection Isolation Room requirements) |

7. Patient room finishes

| Consensus statement | Finishes in HCID patient rooms should include:

- Flooring: cleanable and wear-resistant; stable, firm, and slip-resistant

- Floor and wall base assemblies: monolithic floor with integral covered wall base carried up the wall a minimum of 6 inches

- Wall/Doors & window finishes: cleanable; free of fissures, open joints, or crevices

- Ceiling: monolithic, able to be scrubbed, able to be cleaned and disinfected, and with gasketed access openings |
|---|---|
| Recommended strategies | 1. Replace non-monolithic floors with sheet vinyl ($), sheet rubber flooring ($$), or poured flooring ($$$).

2. Replace lay-in ceiling with a durable, gasketed tile that can be scrubbed ($) or with drywall ceiling with durable, paint that can be scrubbed. ($$$) |
| Existing standards and other useful references | FGI 2022, *Guidelines for Design and Construction*, section 2.1-7 |

Anterooms

8. Unidirectional flow

Consensus statement	Ensure the HCID unit is able to support unidirectional flow of staff and supplies/equipment from the clean area, into the patient room, into a space designated for the doffing of personal protective equipment (PPE) and then back into a clean area. Clearly delineate

	the separation between these areas.
Recommended strategies	1. Ideally, the HCID unit would be made up of three connected spaces: a donning area outside of the room, a patient room with its attached toilet room, and a doffing area. If not possible, designate these areas within the space available, using flooring differentiation, wall paint color, wall signage, or at a minimum, floor color. 2. After establishing a designated workflow of staff supplies, and equipment, place a visual tool to educate staff within the room to ensure awareness and compliance with unidirectional flow.
Existing standards and other useful references	None

9. Designated PPE doffing room

Consensus statement	There should be a physically separated space for doffing of PPE. The physical space should have a minimum clear floor area of 6 feet 6 inches by 6 feet 6 inches so that healthcare personnel can doff without touching any adjacent wall, door, or furniture. Provide a means for a healthcare personnel to have clear visual access to and communication with staff in the doffing space. The doffing area should be equipped with a sink, biohazard waste receptacle, and alcohol-based hand rub.
Recommended strategies	1. If there is no window to the doffing space, consider mounting a video camera or tablet on wheels so that a remote staff member can monitor the doffing process and offer verbal instruction when necessary. ($) 2. Install a new door with a window or install a window for the door of the doffing space. ($$)
Existing standards and other useful references	None

Patient Room Doors & Windows

10. Patient room – visibility

Consensus statement	Provide a safe means for healthcare personnel (HCP) to visualize the patient without entering the room. A direct line of sight is

Recommended strategies	1. If there are rooms with existing equipment for audiovisual surveillance, consider these spaces as a potential location for an HCID patient room, providing other minimum requirements listed in these consensus statements can be met. ($) 2. Replace the existing door to the patient room with one that incorporates a window. Consider including an integral blind to preserve patient privacy. ($$)
Existing standards and other useful references	None

(row above continues: "optimal. Video monitoring may be considered as an option.")

11. Patient room – sliding doors

Consensus statement	To optimize space and for greater visibility, where feasible, use appropriately sealed or gasketed glass sliding doors rather than swing doors for HCID patient rooms.
Recommended strategies	1. If sliding doors are not possible, provide a swinging door with a window and integral blinds. ($) Consider installing a pair of swinging doors. ($$) Doors should have closers and edge seals to maintain pressurization requirements. 2. If possible, provide hands-free automatic door openers on both sides of the door to minimize opportunities for touch. ($$$)
Existing standards and other useful references	None

12. Patient room – door dimensions

Consensus statement	The door to the patient room should be a sliding breakaway door with a minimum width of 36 inches. Alternatively, if sliding doors are not feasible, ideally provide a 44.5-inch clear door width as a minimum.
Recommended strategies	N/A
Existing standards and other useful references	FGI 2022, *Guidelines for Design and Construction*, section 2.1-7.2.2.3(2)a

13. Touch-free door mechanism

Consensus statement	Where feasible, provide a touch-free mechanism to open the HCID

	patient room.
Recommended strategies	1. If hands-free automatic door opener is not possible, consider providing door hardware that can be opened without using hands (e.g. a 4-5' long pull bar, mounted vertically, that one can open using an elbow or a foot; or a pull that can be operated using a part of the arm, other than one's hands). ($) 2. Install a hands-free automatic door opener. ($$)
Existing standards and other useful references	None

14. Patient room – door closure mechanism

Consensus statement	The doors for HCID patient rooms should be self-closing and latching with no hold-opens.
Recommended strategies	1. Retrofit the existing door to add a self-closing mechanism.
Existing standards and other useful references	None

15. Patient room – seal for pressurization

Consensus statement	Ensure that seals maintain adequate pressurization in the HCID patient room.
Recommended strategies	None
Existing standards and other useful references	None

Air Handling

16. Negative pressure – pressure differentials

Consensus statement	Airflow and air pressure relationships must be directional across areas in accordance with ANSI/ASHRAE/ASHE 170 requirements or the governing standards for airborne infection isolation rooms. If facilities consider exceeding the minimum pressure differential, this should be evaluated in conjunction with subject matter experts.

	a) The pressure differential between an occupied HCID patient room and adjoining rooms (including anterooms if applicable) should remain negative with > -2.5 Pa (0.01" water gauge) differential. b) The pressure differential between an occupied HCID patient room and the hallway should remain negative with > -2.5 Pa (0.01" water gauge) differential.
Recommended strategies	1. Use an existing Airborne Infection Isolation Room to create an HCID room. ($) 2. Modify an existing room to achieve temporary negative pressurization according to ASHE recommendations (see reference below). ($$)
Existing standards and other useful references	This link provides options for creating negative pressure and modifying air changes as needed.

17. Negative pressure – air changes per hour (ACH)

Consensus statement	Designated HCID patient rooms should have a minimum of 12 air changes per hour (ACH).
Recommended strategies	1. Use an existing Airborne Infection Isolation Room with 12 ACH. ($) 2. Modify an existing room to achieve minimum ACH, according to ASHE recommendations (see references below). ($$)
Existing standards and other useful references	This link provides options for creating negative pressure and modifying air changes as needed. This link demonstrates how to measure air changes per hour.

18. Air exhaust to outside

Consensus statement	Exhaust air should be vented 100% to the outside of the building. All HVAC system intakes and exhausts should be located at least 25 feet from public ways or public access points, according to ASHRAE/ASHE 170 (2021) Table 6-1. Air Intake Minimum Separation Distance. If there is any possible risk of re-entry of exhaust air, or risk of human exposure to exhausted air, HEPA filtration of exhausted air is required. If recirculating systems are used, recirculated air when utilized must be HEPA filtered.
Recommended strategies	1. Use an existing Airborne Infection Isolation Room. ($)

	2. Modify an existing room to achieve HEPA exhaust to outside, according to ASHE recommendations (see reference below). ($$)
Existing standards and other useful references	ANSI/ASHRAE/ASHE Standard 170 (2021): *Ventilation of Health Care Facilities*, Table 6-1. Air Intake Minimum Separation Distance This link provides options for how to achieve HEPA exhaust to outside.

19. Negative pressure – fan redundancy

Consensus statement	While existing minimum standards (ANSI/ASHRAE/ASHE 170) does not require redundant fan systems for either the supply of exhaust or any system, HVAC system redundancy, when possible, may be considered, and if desired, evaluated in conjunction with subject matter experts.
Recommended strategies	1. For exhaust, install a secondary redundant exhaust system for the HCID patient room. For supply, use a multi-fan wall system in the air handling unit system serving the HCID patient room. Engage with a subject matter expert consultant.
Existing standards and other useful references	ANSI/ASHRAE/ASHE Standard 170 (2021): *Ventilation of Health Care Facilities*

20. Short Label: HVAC controls

Consensus statement	HCID patient rooms should have dedicated and independent HVAC controls. The HVAC system and controls should be served by the essential systems branch. Access to serviceable portions should not require access to the patient room.
Recommended strategies	1. Provide dedicated controls that report through existing building automation systems. ($) 2. Provide a dedicated independent HVAC control system for the HCID patient room. ($$)
Existing standards and other useful references	None

21. Exhaust grille placement

Consensus statement	Positioning of exhaust grilles as close to the source (patient) as possible serves to reduce the concentration of infectious particles present. Thus, when possible, consider placement of exhaust grilles

	over the head of the bed or on the wall near the head of the bed, although with patient movement in the room the impact of this positioning is reduced.
Recommended strategies	1. Relocate existing grilles to ensure the exhaust grille is over the patient by extension of a flex duct within the existing HVAC ductwork system. ($) 2. Reconfigure the existing HVAC ductwork system to locate an exhaust grille above the patient. ($$) 3. Install an additional exhaust grille to provide exhaust above the patient. ($$$)
Existing standards and other useful references	ANSI/ASHRAE/ASHE Standard 170 (2021): *Ventilation of Health Care Facilities* SMACNA HVAC Duct Construction Standards

22. HEPA filter - bag-in/bag-out system

Consensus statement	HEPA filter maintenance and changes should adhere to bag-in/bag-out procedures.
Recommended strategies	1. Follow the manufacturer's recommendations and hospital policy for filter removal and disposal practices. 2. Follow CDC and public health recommendations for filter removal and disposal practices, based on the pathogen of concern.
Existing standards and other useful references	None

23. Negative pressure – local monitor placement & alarms

Consensus statement	Air pressure monitors are mounted locally, visible to staff, and equipped with audible alarms.
Recommended strategies	1. Use an existing Airborne Infection Isolation Room to create an HCID room with a local air pressure monitoring system. ($) 2. Create an HCID room from an existing patient room with a local air pressure monitoring system. ($$) 3. Create an HCID room from an existing hospital patient care area with a local air pressure monitoring system. ($$$)

	4. Create an HCID room from an existing non-patient care area with a local air pressure monitoring system. ($$$$)
Existing standards and other useful references	None

24. Negative pressure – central monitoring & management

Consensus statement	In addition to local visual detection of air pressure, air pressure monitors are observed and managed in a centralized location.
Recommended strategies	1. Provide a dedicated air pressure differential monitoring system that reports locally (within patient care unit) to an observed and managed centralized location (e.g. nursing station). ($) 2. Provide a dedicated air pressure differential monitoring system that reports through the existing building automation system. ($) 3. Provide a dedicated independent air pressure differential monitoring system for the HCID patient rooms that reports to an observed and managed centralized location (e.g. private branch exchange (PBX) station, which is a telecommunication console used for communication). ($$)
Existing standards and other useful references	None

Electrical and Plumbing

Electrical
    25. Number of electrical receptacles in the HCID patient room

Consensus statement	A minimum of 12 single receptacles should be accessible to the head of the gurney or patient bed, with an additional 4 in accessible locations to support clinical functions.
Recommended strategies	1. Using existing infrastructure, find negative pressure rooms that have 12 receptacles and an additional 4 receptacles to support clinical functions. ($) 2. If existing infrastructure is insufficient, conduct an assessment of equipment needed for the HCID room to identify the gap to be filled, and engage a subject matter expert for electrical design modification. ($$)
Existing standards and other useful	NFPA 70, NFPA 99, and FGI 2022, *Guidelines for Design and Construction*, Hospital Guidelines, Table 2.1-1

| | references | |

26. Number of emergency electrical receptacles in the HCID patient room

Consensus statement	At a minimum, assign 6 receptacles to emergency (critical branch) power. Ensure that the receptacles in the room are serviced by two separate sources of power.
Recommended strategies	1. Using existing infrastructure, ensure there are 6 receptacles assigned to emergency power. Assess equipment needed to ensure the available capacity would not be exceeded by the minimum equipment list. ($) 2. If existing infrastructure is insufficient, conduct an assessment of equipment needed for the HCID room to identify the gap to be filled, and engage a subject matter expert for electrical design modification. ($$)
Existing standards and other useful references	NFPA 70, NFPA 99, and FGI 2022, *Guidelines for Design and Construction*, Hospital Guidelines, Table 2.1-1

27. Number of data outlets in the HCID patient room

Consensus statement	Provide a minimum of 4 data outlets capable of providing internet and telephone connectivity.
Recommended strategies	1. Using existing infrastructure, ensure there are 4 data outlets capable of providing internet and telephone connectivity. ($) 2. If existing infrastructure is insufficient, conduct an assessment of equipment requiring data connections for the HCID room to identify the gap to be filled, and engage a subject matter expert for IT design modifications. Having Wifi capability is ideal, but does not replace the need to also have the minimum required data outlets. ($$)
Existing standards and other useful references	ANSI/BICSI 004, Information Communication Technology Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities (2018) ANSI/BICSI 007, Information Communication Technology Design and Implementation Practices of Intelligent Buildings and Premises

Plumbing

28. Hands-free sink

Consensus statement	A. Ideally, provide a handwashing station with a hands-free faucet in

	the patient room. Hands-free faucets are defined as faucets that are controlled by knee or foot-operated pedals or by motion sensors such as electric eye controls. Note that this term does not refer to faucets operated using wrist blades or single-lever faucets. B. In addition, provide a handwashing sink with a hand-operated faucet in the patient toilet room.
Recommended strategies	1. Using existing infrastructure, ensure there is a handwashing station with a hands-free faucet or one with a wrist blade or single lever in the HCID room. ($) 2. If there is not a hands-free faucet at the handwashing station, replace the faucet with a hands-free faucet. ($$) NOTE: Implementation of these faucet strategies should be done in coordination with your water management team.
Existing standards and other useful references	FGI 2022, *Guidelines for Design and Construction*, Hospital Guidelines, Section 2.1-8.4.3.2 (Handwashing station sinks)

29. Sink without splash back

Consensus statement	Select a sink and faucet setup that mitigates water splashing out of the sink (i.e. splash back).
Recommended strategies	1. Using existing infrastructure, ensure the sink in the HCID room does not produce splash back. ($) 2. If there is a sink that produces splash back, replace or modify sink to prevent splash back (e.g., install an after-market splash guard). ($$)
Existing standards and other useful references	FGI 2022, *Guidelines for Design and Construction*, Hospital Guidelines, Section 2.1-8.4.3.2 (Handwashing station sinks)

30. No bedpan washing mechanism

Consensus statement	If adapting or modifying the space, consider a design that does not include a bedpan washing mechanism. If a bedpan washing mechanism is in place, consider adopting workflows/protocols that prohibit its use when caring for an HCID patient in the space.
Recommended strategies	1. Use disposable bedpans and dispose of them per hospital policy. ($) 2. Use a disposable bedpan macerator system. ($$)

	3. Use a bedpan washer-disinfector system. ($$$)
Existing standards and other useful references	FGI 2022, *Guidelines for Design and Construction*, Hospital Guidelines, Section 2.1-8.4.3.7 (Handwashing station sinks)

31. Providing dialysis

Consensus statement	Ensure there is a means to provide dialysis to the patient at the bedside. Consult clinical leadership for the type of dialysis that would be offered by clinicians in this space and if a dialysis hook-up box would be appropriate. Facilities are encouraged to consult their public health and water authorities for additional requirements.
Recommended strategies	1. Use existing infrastructure, select a room for HCID care that has an installed dialysis hook-up box available for use. ($) 2. Deploy a portable bedside dialysis unit in a room that has two sinks: one for hand hygiene and one for dialysis hook-up. ($$) 3. Install a dedicated dialysis water supply and drain wall box assembly at the bedside. ($$$)
Existing standards and other useful references	None

32. Emergency shower

Consensus statement	A shower in close proximity to the patient care area should be made available and designated for the use of HCPs supporting the HCID response in the event of a PPE breach. Ideally, showers will also be made available to staff for comfort following doffing and/or prior to the end of their shift.
Recommended strategies	1. Use existing infrastructure, select a unit or location for HCID care that has a staff shower. ($) 2. When there is a patient requiring HCID care, take an adjacent patient room out of service that has a shower and dedicate it for HCID caregiver use. ($) 3. Install a portable shower readily accessible to the HCID patient room. ($$)
Existing standards and other useful references	None

33. Emergency eyewash

Consensus statement	Ensure there are emergency eyewash capabilities within the HCID patient care area. Ideally, an emergency eyewash station would be connected to the sink in the doffing area. Alternatively, provide squeeze bottles for eyewash that are readily accessible in the doffing area.
Recommended strategies	1. Use existing infrastructure, select a patient care location that already has an eyewash station in the room. ($) 2. Provide squeeze bottles in the immediate vicinity for eyewash. Note that the main purpose of these units is to supply immediate flushing. With this accomplished, the injured individual should then proceed to a plumbed or self contained eyewash station and flush the eyes for the required 15-minute period. ($$) 3. Install an emergency eyewash station in the HCID patient room doffing area. ($$$)
Existing standards and other useful references	*Code of Federal Regulations*, Title 29—OSHA Regulations, Part 1910 (29 CFR 1910): *Occupational Safety and Health Standards* OSHA regulations address emergency eyewash and shower equipment in 29 CFR 1910.151. Specifically, 1910.151(c) Read more at the ANSI Blog: ANSI Z358.1-2014: Emergency Eyewash & Shower Standard https://blog.ansi.org/?p=158175 ANSI Z358.1-2014 Standard for Emergency Eyewash and Shower Equipment

Soiled Utility Room and Waste Management
Soiled utility room
34. Access to soiled utility room

Consensus statement	The HCID unit should include a soiled work or utility room that is in close proximity to the patient room. The room should: 1. Have sufficient space for large, fully enclosed, biohazardous waste containers and decontamination supplies. 2. Have access control capabilities for when the area is utilized in the care of an HCID patient.
Recommended strategies	1.1 Use existing designated space for soiled work or utility rooms for biohazard waste storage. ($) 1.2 If existing space is insufficient, repurpose a sufficiently large

	room within the care area for a soiled work or utility room. The space should have alcohol-based hand rub at a minimum for hand hygiene. The space would need to meet minimum air flow and pressurization specifications. ($$) 2.1 Use the existing locking method to control access to the soiled utility room. ($) 2.2 Install access control capability for the soiled work or holding room. ($$)
Existing standards and other useful references	FGI 2022, *Guidelines for Design and Construction*, Hospital Guidelines, Section 2.1-2.8.12 (Soiled workroom and soiled holding room)

35. Waste holding room pressurization

Consensus statement	The in-unit waste holding room requires negative pressure relative to adjacent areas with all room air exhausted directly to the outdoors.
Recommended strategies	N/A
Existing standards and other useful references	ANSI/ASHRAE/ASHE Standard 170 (2021): *Ventilation of Health Care Facilities*, Table 7.1

36. Temporary biohazardous waste storage

Consensus statement	Provide a space for temporary storage of biohazardous waste, specifically to support the HCID unit (not shared with other regulated medical waste). The space must be: secured with access limited to those trained in handling this waste; temperature and pest controlled; flood safe. Ideally, this storage is adjacent to the loading dock or drive where the material can be removed from.
Recommended strategies	1. Obtain a secure, enclosed, dedicated dumpster for this waste. ($) 2. Repurpose flood-safe space close to the location where biohazardous space is treated or picked up for hauling that can be secured. Temperature and pest control features may need to be added. ($$)
Existing standards and other useful references	None

Definition of terms

Bag-in/bag-out: A filter system that by design permits removal of the used air filters into a built in, heavy-duty disposal bag to minimize exposure to maintenance personnel.

Clear floor area: Floor area which is unobstructed by any permanent fixture.

Healthcare personnel: All paid and unpaid persons serving in healthcare settings who have the potential for direct or indirect exposure to patients or infectious materials, including body substances (e.g., blood, tissue, and specific body fluids); contaminated medical supplies, devices, and equipment; contaminated environmental surfaces; or contaminated air. HCP include, but are not limited to, emergency medical service personnel, nurses, nursing assistants, home healthcare personnel, physicians, technicians, therapists, phlebotomists, pharmacists, dental healthcare personnel, students and trainees, contractual staff not employed by the healthcare facility, and persons not directly involved in patient care, but who could be exposed to infectious agents that can be transmitted in the healthcare setting (e.g., clerical, dietary, environmental services, laundry, security, engineering and facilities management, administrative, billing, and volunteer personnel).

Medication safety zone: A critical area for medication management where medications are prescribed; where orders are entered into a computer or transcribed onto paper documents; and where medications are prepared, dispensed, or administered (United States Pharmacopeia (USP), 2010).

Monolithic: A surface that is free of seams, fissures, cracks or crevices.

Method for arriving at consensus statements

The aim of this project was to determine and document consensus (or lack thereof) on statements outlining physical infrastructure recommendations to provide safe isolation and clinical management of patients with or suspected of having HCIDs in frontline acute care hospitals. The original draft statements were developed by our contributing partners, all noted subject matter experts, with the intent that the final consensus statements should be generalizable and scalable across different geographies and types of US acute care hospital facilities.

To achieve this aim, we used the RAND ExpertLens system, which is an online platform designed to facilitate a modified-Delphi process. This is an iterative process used to determine consensus for an issue that has limited evidence and where expert opinion is important (BMC Med Res Methodol 2016;16:56).

Twenty-nine subject matter experts (SMEs) agreed to participate in the modified-Delphi process. These SMEs were chosen based on their national recognition as field experts (e.g. plumbing, air handling, electrical experts), clinical experts (e.g. those with clinical leadership experience in HCIDs), and representatives from key organizations (e.g. CDC, FGI, SHEA and

others). These participant SMEs engaged in the process described below in order to provide an initial rating and feedback, discuss with other participants, then provide a final rating on 36 statements describing requirements for physical infrastructure and built environment necessary for isolation of HCIDs in frontline acute care hospitals. Areas covered include patient rooms, anterooms, doors, windows, air handling, electrical, plumbing, waste management, and soiled utility rooms.

The modified-Delphi process employed had three rounds. In Round 1, participants rated each statement on a 9-point Likert scale with regards to appropriateness for inclusion in the final list of statements (1-3 is "not appropriate"; 4-6 is "might be appropriate"; 7-9 is "appropriate"). For a rating of 4-6, participants were asked to provide an edited version of the statement that would be more appropriate for inclusion, and rationale for their recommended edits. Participants also had the opportunity to provide additional draft statements to address additional topics that they believed should be included and that were not represented by the existing statements or topics.

During Round 2, participants engaged in an asynchronous, anonymous discussion on messaging boards moderated by the study team. The goal of the discussion was to improve understanding of discrepancies in ratings or feedback, allow participants to learn from one another and engage other members to strengthen recommended revisions for clarity and precision, and improve consensus on the statements. Participants were able to review the distribution of ratings from Round 1, and a summary of comments from the other participants to support their engagement.

Prior to Round 3, the study team modified some of the draft statements based on data and feedback from Rounds 1 and 2. Any edits were clearly indicated. During Round 3, participants provided their final rating on the appropriateness of the re-drafted statements based on Round 2 feedback and discussion.

The project team analyzed the results from Round 3 to determine whether consensus was achieved for each statement, based on the established methodology. Disagreement exists when more than a third of responses are in the upper and the lower tertile of the rating scale. These topic areas would be acknowledged in the final document as areas of disagreement requiring more research and/or deliberation to achieve consensus. If there was no disagreement on a statement, a median rating of 6.5 and above for a given statement indicates a positive group decision to include the statement in the final document. Statements that did not achieve a median rating of 6.5 and above would not be included as a statement that achieved consensus in the final document and resulting tools.

Subject Matter Experts who drafted the initial consensus statements

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Liz Rogers	NBBJ Design
Lewis Kaplan	SCCM

AHA, American Hospital Association
APIC, Association for Professionals in Infection Control and Epidemiology
ASHE, American Society for Health Care Engineering
FGI, Facility Guidelines Institute
SCCM, Society of Critical Care Medicine