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CHICA-CANADA POSITION STATEMENT

Healthcare Facility Design Position Statement

All acute healthcare facilities (e.g., hospitals) should be able to promote and support an environment that is safe for patients, visitors and healthcare workers. Planning of healthcare facilities, room designs, surfaces and processes should take into account the chain of transmission of infectious agents, so users can easily take steps to avoid spreading potentially harmful microorganisms. There are Canadian Standards to address Infection Control for Construction and Renovation, Routine Practices and Additional Precautions, Sterilization and specific disease entities. Currently, there are no Canadian Infection Control Standards to address the overall design of healthcare facilities. Infection Prevention and Control concepts need to be incorporated into design, to facilitate desired practices by the healthcare worker and to provide a safe environment.

1. Infection Prevention and Control Professionals should be involved in all phases of healthcare facility design, construction and renovation. This includes but is not limited to:
   - participation in proposal for funding
   - design planning
   - review of tender documents and mockups
   - final commissioning

2. Infection Prevention and Control Professionals should be involved to ensure that design and construction of specific structures facilitates desired Infection Prevention and Control practices, and meets or exceeds current guidelines including American Institute of Architects (AIA), Canadian Standards Association (CSA), Public Health Agency of Canada (PHAC) and American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

3. Infection Prevention and Control Professionals should review preventive measures and construction specification sections to ensure that adequate language and requirements are included in the tender documents prior to document issuance.

4. In-Patient Bedrooms:
Single patient rooms have been shown to help decrease the risk of infection by reducing cross contamination. [1,2,3,4] Having a single room also provides access to a dedicated toilet for each patient. This will improve the management of human waste and decrease the risk of transmission of organisms such as *Clostridium difficile*. In addition, evidence shows single patient rooms are cost effective and safer; (see appendix attached)

- In new construction, the maximum number of beds per in-patient room should be one unless the functional program can demonstrate the necessity of a two-bed arrangement. [5] Approval of anything other than single rooms should be obtained from the licensing authority.
- Where renovation work is undertaken, the current bed capacity should not be exceeded and, an assessment should be done to determine whether there is an opportunity to decrease multi-bedrooms to the lowest achievable number of beds per room. e.g. decrease a 4-bed room to 2-bed room whenever feasible.

5. Designs should include:

- A washroom that includes a toilet and hand washing sink in each in-patient single-bed room. [4,5]
- Dedicated HCW hand wash sinks in each patient room exclusive of the patient washroom sink. [4,5]
- Minimum of one Airborne Infection Isolation room in each in-patient care unit and additional Airborne Infection Isolation rooms as per Institutional Infection Control Risk Assessment.[5]
- Management of patient bodily waste in such a manner as not to pose a risk to staff or patients. The use of rim-flushing sinks or hoppers should be eliminated. Spray wands should not be used.
- Separation of clean and dirty utility rooms and provisions for storage of equipment and supplies in a clean and dry area.[5]
- Triage areas and new clinical spaces that are designed and ventilated to reduce potential exposure of staff, patients, and visitors/families to infectious diseases.[5]

Space allocation and distances between patients in all areas of the Healthcare Facility should meet AIA and CSA standards as a minimum.

6. Before installing hand washing sinks and hand hygiene product (e.g., alcohol-based hand rub - ABHR) dispensers, prepare a workflow pattern and risk assessment to facilitate the decision about where to place sinks and products.[6]

7. Sink Standards

7.1 Placement

For example of indications for placement of handwashing sinks see: http://www.health.gov.on.ca/english/providers/program/infectious/diseases/ic_hh.html

- There should be sufficient hand washing sinks such that staff do not need to walk more than 6.1 meters/20 feet to reach the sink. [6]
- Sinks should be located at least one metre (three feet) from patients, clean supplies and adjacent counters. [6]
- Handwash sinks should be free standing and not inserted into or immediately adjacent to a counter. [6]
- Sinks should be installed at least 34 inches (863.6 mm) above the floor. [6]

7.2 Design

- All materials used to construct handwash sinks should be capable of sustaining regular cleaning/disinfection with hospital-approved cleaners and disinfectants. [7]
- Sinks should be porcelain, enamel, vitreous china or 18 gauge, 304 stainless steel, [8] or Corian or other non-porous materials. Granite or marble is not appropriate for healthcare settings.
- Sink size should be sufficient to prevent recontamination (from splashing) during use for hand hygiene. Suggested minimum inside diameter of 14" x 10" and a minimum depth of 9 inches. Cup or bar sinks are not of sufficient size for hand washing.
- Sink and spout should be designed to minimize splashing and aerosolization.
- Sink spouts should be free of aerators/modulators/rose sprays.
- Finishings around plumbing fixtures should be smooth and water resistant.
- Plug or overflows capable of taking a sink plug should not be used. [4,9]
- Strainers and anti-splash fittings at outlets should not be used as they easily become contaminated with bacteria. [4]
- Taps and controllers:
    - Controls (water taps) should be hands free. Either electric eye or foot pedal operation is acceptable (these should be triggered by hand, not body placement). [6]
    - Taps such as gooseneck taps should not swivel. [6]
    - Ultrasonic controls or automatic temperature controls should not be used. [6]
    - Electric eye technology should have a backup

that allows for operation during power interruptions, and have a means for users to adjust water temperature adjacent to the sink. [6]

- Towel dispenser design should be such that only the towel is touched during removal of towel for use. [6]
- Hot air dryers should not be used in clinical areas as warm air currents dry hands slowly and can be used by only one individual at a time. This results in queues and the temptation to dry hands on clothing. [6]

REFERENCES

1. Ulrich R., Quan X., Zimring, C. Joseph, A. et al. (2004). The role of the physical environment in the hospital of the 21st Century: a once-in-a- lifetime opportunity. Report to the Center for Health Systems and Design. http://www.healthdesign.org/research/reports/physical_environ.php. Accessed Dec 14, 2007
2. Van Enk, R., Modern Hospital Design for Infection Control. Healthcare Design Magazine. September 2006
3. Bracco, D., Dubois, MJ., Boulai, R., Eggimann, P. Single rooms may help to prevent nosocomial bloodstream infection and cross-transmission of methicillin-resistant Staphylococcus aureus in intensive care units. Intensive Care Med. 2007 May;33(5):836-40. Epub 2007 Mar 9.
4. NHS Estates. Infection control in the built environment: design and briefing. 2002 March 24, 2008 [cited March 22, 2008]; http://www.md.ucl.ac.be/didac/hosp/architec/UK.Built.pdf
5. American Institute of Architects. 2006 Guidelines for Design and Construction of Health Care Facilities:The American Institute of Architects; 2006.
6. Provincial infectious Diseases Advisory Committee Best Practices for Hand Hygiene in all Health Care Settings PIDAC May 2008. http://www.health.gov.on.ca/english/providers/program/infectious/diseases/ic_hh.html
7. Noskin, G., Peterson, L. Engineering infection control through facility design. Emerg Infect Dis 2001;7(2), March-April Canadian Standards Association. Infection Control During Construction, Renovation, and Maintenance of Health Care Facilities. 2007. CSA Z317.13 (2nd edition).
8. Whole Building Design Guide USACE/NAVFAC/AFCESA/NASA UFGS-22 04 00.00 20 (April 2006). Unified Facilities Guide Specifications http://www.wbdg.org/ccb/DOD/UFGS/UFGS%2022%2004

%2000.00%2020.pdf Section 2.4.11. Accessed December 14, 2007.
9. Colville A., Weaving P., and Cooper T. How infection prevention professionals can make it easier for designers and planners. British Journal of Infection Control 2007 September;8(4):22-24.
10. Chaudbury, H., Mahmood A., and Valente M., (2003) The Use of Single Patient Rooms vs. Multiple Occupancy Rooms in Acute Care Environments, Simon Fraser University. Pilot Study on Comparative Assessment of Patient Care issues in Single and Multiple Occupancy Patient Rooms. Nov 2003. http://www.aia.org/SiteObjects/files/05_Pilot_Study_on_Assessment.pdf
11. Plumbing Design for Healthcare Facilities by Linda Seigler. http://www.plumbingengineer.com/feb_07/healthcare.php. Accessed Dec 14, 2007
12. APIC Text of Infection Control and Epidemiology 2005: Association for Professionals in Infection Control and Epidemiology, Inc.; 2005.
13. Boyce, .M., Potter-Bynoe, G., Chenevert, C., & King, T. (1997). Environmental contamination due to Methicillin-resistant Staphylococcus aureus: Possible infection control implications. *Infection Control and Epidemiology, 18 (9). 622-627*
14. Planning, Design, and Construction of Health Care facilities, (2006) By the Joint Commission on Accreditation of Healthcare Organizations.
15. Committee to Establish Recommended Standards for Newborn ICU Design: Report of the Sixth Consensus Conference on Newborn ICU Design, January 25-27, 2006. Recommended Standards for Newborn ICU Design.

Appendix: Rationale for single patient rooms in healthcare facilities:

Facilities are continually challenged in having to close rooms and /or units due to patient exposure to infections. Many outbreaks start from roommate exposures or exposures in shared bathroom facilities. Patient placement and waiting times in emergency rooms are significantly hampered as a result of lack of appropriate rooms to place patients.

If all patient rooms were single, there would be improved patient flow, improved occupancy rates, decreased risk of exposure to infections, and improved safety for patients and health care providers. The improved flexibility would also increase the life span of the building.

A 2004 review by Ulrich and Xiaoho found rigorous studies that link the physical environment to patient and staff outcomes. [1] This review found 120 studies linking infection to the built environment of the hospital. They identified at least 16 studies relevant to the question of whether nosocomial infection rates differ between single-bed and multi-bed rooms. They concluded that infection rates are lower when patients are in single-bed rather than multi-bed rooms. Placing patients in single-bed rooms decreases the risk of exposure to infections from other patients. In part, this occurs because environmental surfaces near the patient become contaminated with organisms which can then be transmitted to other patients. Boyce (1997) et al. found that in the rooms of patients infected with MRSA, 27% of all environmental surfaces sampled were contaminated with MRSA. [13] Multi- bed rooms are more difficult to decontaminate thoroughly after a patient is discharged than a single-bed room.

Ulrich et al.[1] indicate that based on a large and varied body of research, there can be no question that single-bed rooms have several major advantages over multi-bed rooms. These advantages include reductions in nosocomial infection rates. The review recommends that single-bed rooms should be provided in almost all situations. It suggests that adaptable-acuity single-bed rooms with decentralized nursing stations should be adopted as they reduce nosocomial infection rates, reduce room transfers and associated medical errors, greatly lessen noise, improve patient confidentiality and privacy, facilitate social support by families, improve staff communication to patients, and increase patients' overall satisfaction with health care.

Further support for single rooms can be found in the report from a study commissioned by the American Institute of Architects [10] to answer three questions regarding single rooms:

1. What are the differences in costs and efficiency of management and care delivery in single and double occupancy patient rooms in acute care settings?
2. What are the advantages and disadvantages in disease control and falls prevention in single versus double occupancy rooms in acute care settings?
3. What are the therapeutic impacts of socio-behavioural issues on patient privacy, social interaction and daily functioning of single versus double occupancy hospital rooms?

Their findings included:

1. Operating costs are reduced in single patient rooms compared with multi-occupancy rooms due to reduction in transfer cost, higher bed occupancy rates and reduction in labour costs. This cost reduction can be better achieved when conversion to single room is paired with other healing environment design principles.
2. Cost-savings because of reduction in transfers is particularly applicable with acuity-adaptable rooms. [1,10]
3. Patient length of stay is associated with hospital costs. Patient length of stay in a single room is shorter (in part due to reductions in nosocomial infections), which reduces the cost per patient.
4. In comparison to multi-occupancy rooms, medication errors are reduced in single rooms, resulting in reduced costs.

It was also noted that there is research on the negative impacts resulting from additional precautions/isolation which is often a result of acquiring a hospital infection. Isolated patients were twice as likely as non-isolated patients to experience an adverse event during hospital stay.

Based on these data, the American Institute of Architects, and the United Kingdom National Health Service have recommended that new hospital construction should be comprised exclusively of single rooms [(14,15)].