AGNEWPECKHAM

HEALTH CARE
& FACILITY
PLANNERS

FACILITY IMPLICATIONS OF COVID-19

January, 2021

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Introduction

Background

About Agnew Peckham

Agnew Peckham is Canada's premier health care programming and planning firm. For over 70 years, we have worked with hospitals and other health care organizations throughout Ontario, across Canada and internationally to plan contemporary and future oriented health care programs/services, and facilities that meet patient and community needs. We keep abreast of events, such as new and emerging infectious diseases, that have the potential to impact care delivery and facility requirements.

As a firm, we believe it is our responsibility to participate in developing and sharing information that will help to improve our collective response in addressing new and emerging infectious disease outbreaks/pandemics.

COVID-19 in Canada

Coronavirus disease (COVID-19) is a highly infectious disease that spreads between individuals in close contact (i.e., within about 6 feet or 2 meters), primarily through droplets of saliva (speaking, singing, shouting) or discharge from the nose of an infected person, often by coughing or sneezing[1]. The symptoms (typically fever, cough, shortness of breath) closely resemble those of many other respiratory infections. Symptoms may take up to 14 days to appear after exposure to COVID-19[2]. Challenges that further complicate care delivery have also been reported, including:

- evolving knowledge about the disease and the most effective method of treatment
- physical and psychological stress experienced by health care workers, caring for persons with COVID-19
- additional clinical challenges posed by the disease, as a result of this being a novel virus and uncertainty around characteristics of COVID-19

Context for this Report

The process for developing the recommendations in this report included discussions with leaders of ***hospital facilities that were redeveloped based on programming and planning guidelines in use between 2010 and 2013*** (i.e., Generic Output Specifications, which later informed Canadian Standards Association Z8000). Of note, hospitals that were programmed for redevelopment prior to 2010 were not consulted in this process. This is because the standards in place at that time did not fully reflect the learnings from SARS, another infectious disease that influenced changes in care delivery and hospital programming and planning guidelines/standards.

Much of the information presented in this document builds on, or reinforces, basic planning parameters that have been in place for many years.

[1] The Mayo Clinic, Coronavirus disease 2019 (COVID-19) (2021).
[2] Government of Canada, Coronavirus disease (COVID-19): Symptoms and treatment (2021).

Purpose of the Document

In consultation with a broad range of subject matter experts and health care leaders, the purpose of this document is to:

- identify the major implications of COVID-19 on hospital/health care facilities
- develop recommendations to inform hospital facility programming and planning, as it relates to the management of infectious disease outbreaks/ pandemics

This document does not provide comment/direction on:

- the role of individual hospitals in responding to pandemic/major events (e.g., developing an on-site vs. off-site assessment centre)
- requirements regarding power, ventilation and utilities
- guidelines concerning protective equipment requirements and the frequency of equipment changes
- operating systems to deal with infectious disease outbreaks/pandemics (e.g., integrated tracking systems that allow early identification of epidemics and dissemination of appropriate screening and treatment practices)
- existing hospital planning guidelines and standards (e.g., CSA Z8000)
- space requirements for individual rooms or areas

Our overall goal is to create a comprehensive source document that details the most up to date information on facility requirements necessary to manage infectious diseases, within hospital and other related health care settings.

Organization of the Document

The remainder of this report is organized into four sections:

- strategic directions and principles that guide the recommendations
- facility and space concerns identified thorough the structured consultations
- recommendations for future planning
- other considerations for planning

The report begins by introducing high level concepts and considerations, and builds on these concepts to present detailed planning recommendations in the following sections. As a result, some concepts may be mentioned more than once.

Acknowledgements and Development Process

This document reflects a group effort. It was developed with input from clinical, planning and infection prevention and control leaders at our client hospitals, including:

- Halton Healthcare
- Humber River Hospital
- Joseph Brant Hospital
- Niagara Health
- The Ottawa Hospital
- Trillium Health Partners
- William Osler Health System (Osler)

In addition, we consulted with representatives at the Centre Hospitalier de l'Université de Montréal (CHUM) in Montreal; and Barbara Shea, a representative of IPAC Canada reviewed draft #2.

Lucy Brun and Stephen Bagworth, partners of Agnew Peckham led and facilitated the discussions and investigations. The consultant team at Agnew Peckham also participated in the development process and Alia Bacchus provided project management support and facilitated development of the document.

The development process included:

- identifying health care organizations that have redeveloped or had substantial expansions based on the General Output Specifications (GOS) developed for the Ontario Ministry of Health and Infrastructure Ontario in 2008; GOS was subsequently used as the basis for the Canadian Standards Association (CSA) Z8000 standards
- meeting with representatives from Halton Healthcare, Humber River Hospital, Joseph Brant Hospital, Osler, The Ottawa Hospital and CHUM to identify space concerns resulting from COVID-19 (i.e., identifying missing/ undersized spaces and other concerns)
- conducting focussed discussions with thought leaders to better understand challenges and identify best practices in areas such as infection prevention and control (IPAC)
- developing preliminary recommendations based on advice from our specialist consultants

Key individuals (thought leaders, subject matter experts and process advisors) who participated in the process are listed in Appendix A.

Your Thoughts and Feedback

This document is presented as a framework for discussion and consensus building. Accordingly, we are requesting your input and suggestions to further enhance the content and usefulness of the document for ongoing planning purposes.

Planning guidelines must evolve to reflect new knowledge and insights. As a result, this document will be updated regularly to identify new and evolving information that will influence new/revised guidelines and planning standards.

Hospital Strategic Directions and Principles

Overview

This section describes four areas of strategic focus that will support hospitals' ability to effectively respond to emerging infectious diseases. These include:

- strengthening the level of preparedness and ability to respond
- strengthening effective infection control requirements
- maintaining health, wellness and safety of health care providers and staff
- prioritizing capital asset management and facility redevelopment

Strengthening the Level of Preparedness and Ability to Respond

Strategies to Ensure Flexibility and Adaptability

Flexibility will be enhanced by developing spaces and strategies to support physical distancing, repurposing space for alternative functions, and increasing the capacity of key functions. For example

- planning spaces that can be used as secured storage for personal protective equipment (PPE) in a pandemic in a central location as well as decentralized close to providers within clinical areas
- planning shelled space
- incorporating flexible spaces adjacent to emergency and critical care units (e.g., rehabilitation gym, classroom, administrative space) that could be used as overflow)
- installing mechanisms to support easy conversion to patient care area

Effective Site Planning and Building Access

Effective site planning and building access must address the need to separate patient, material and staff flow, which requires:

- strategies to protect patients and staff entering and exiting hospitals (e.g., having separate and designated staff and patient entrances)
  - for staff, reduce the number of entry points and control access to them (e.g., using technology such as cameras, swipe cards, facial recognition, thermal imaging, no-touch entry systems, swipe-card entry, etc.)
  - for patients, consider a designated emergency department (ED) entrance and waiting space for patients requiring testing or a separate, designated area of the ED with a dedicated entrance
- strategies to support effective flow of traffic for staff using public transportation and the drop-off zone to avoid congestion at entrances
- capacity at key entrances to repurpose or add protected space for screening and the associated line-ups, respecting physical distancing guidelines
- additional site capacity for external testing facilities (i.e., tent structure) if required
- climate-controlled areas at entrances/vestibules and in external testing facilities to address weather considerations

Supply Chain and On-site Availability of Pandemic Supplies

Providing health care staff with appropriate PPE to care for patients requires careful consideration of:

- the amount of supplies that should be held on-site (e.g., three weeks or more during an outbreak)
- ease of access to supplies and equipment in temperature and humidity controlled off-site locations, such as storage sites, regional distribution centres, etc.

- tracking and supply management (e.g., implementing distribution control mechanisms as a standard practice such as scrub exchange and mask dispensing machines)

Storage and Distribution to Ensure Availability of PPE at Point of Use

Facilitating easy access, storage and distribution of supplies should include:

- locating PPE in a secure location within clinical areas (e.g., gatekeeper model, locked storage room, etc.)
- ensuring there is sufficient staff available to maintain PPE stock on the unit/in clinical areas (e.g., to refill carts, supply closets, nurse servers, etc.)
- using appropriate storage to limit exposure and contamination of PPE

Strengthening Effective Infection Control Requirements

Infection control requirements will be strengthened by:

- ensuring adequate physical barriers, that can be easily disinfected
- enhancing compliance with hand hygiene and other necessary barrier precautions, enabled by alcohol-based hand rub (ABHR) at point of care and hand hygiene sinks in locations where body fluid exposure is likely to occur
- strengthening protocols for storage and handling of soiled material/waste and ensuring adequately sized rooms
- incorporating sufficient building circulation and elevators to facilitate separation of flows (e.g., patients, staff, and soiled and clean materials) throughout the hospital
- educating/re-educating hospital staff, particularly front-line workers, to enhance awareness of outbreak/infectious disease issues and institutional/ clinical infection control guidelines and protocols (e.g., continuous updates to PPE protocols resulting from introduction of new versions of masks, gowns and eye protection)
  - emphasize scenario/problem based learning and practical application to enhance uptake for clinicians and support staff
  - implement IPAC and patient and staff safety education as an organizational priority, delivered by a resourced IPAC specialist

Maintaining the Health, Wellness and Safety of Staff

The threat and impact of infectious diseases exacerbates the stress on front-line health care providers and other staff. These negative impacts can be mitigated by:

- developing strategies to ensure adequate supply of PPE and pandemic supplies to support all staff (i.e., support services staff) and care providers in safely caring for patients and protecting themselves
- reviewing hiring practices during a pandemic to minimize staff that may work at multiple hospitals, increase the number of full-time staff, avoid human resource shortages and reduce burnout
- determining the need for cross-training to increase flexibility and support reallocation vs. ensuring staff are assigned to one designated area
- creating adequate and safe spaces that allow health care providers battling emotional strain and physical exhaustion to rest, decompress and recover
- providing separate and sufficient staff and patient facilities (e.g., washrooms, eating space, etc.)
- providing improved access to mental health services for staff managing anxiety and psychological distress as a result of the disease
- addressing the ethical issues associated with interruption to services as a result of protocols required to limit spread of the virus
- monitoring the use of multi-skilled workers to ensure that tasks are not increasing the risk of cross-contamination (i.e., staff engaging in both environmental cleaning and patient care or working at multiple facilities)

Prioritizing Capital Asset Management/Facility Redevelopment

It is vital that health care facilities have adequate spaces that allow the health care team to provide safe and high-quality care to patients. Many of the following principles and parameters are embedded in current planning initiatives and incorporated in contemporary hospital design; nevertheless, it is important to highlight them here.

Facility Planning

- Create more airborne isolation rooms that include technique/anterooms and 3-piece washrooms in acute and post-acute care areas.
- Provide space for equipment and supplies, centrally and in clinical areas, required for care delivery during infectious disease outbreaks.
- Ensuring flexible capacity to accommodate the receiving and staging of large equipment and supply deliveries.
- Plan for facilities that separate inpatient, outpatient and commercial services where viable and separating the highly impacted units and access to these areas (e.g., critical care), while maintaining key interdepartmental adjacencies.

- Create adequate individual space per patient, following physical distancing guidelines (i.e., a two-meter distance between each patient/ visitor at all times).
- Ensure adequate space to hold waste.

Engineering

- Implement appropriate mechanical and ventilation systems (e.g., ensuring necessary negative and positive pressure capacity to support isolation and appropriate separation of air intakes and exhaust). However, it is important to recognize the risk of switching systems back and forth.
- Consider the importance of HVAC systems in critical spaces to support appropriate pressurization, directional air flow and an adequate number of air exchanges for the procedure being performed (e.g., during aerosol generating medical procedures, etc.).

Architectural

- Ensure that physical space design, floor/wall treatments and furniture/ equipment support thorough cleaning.
- Consider use of materials with antimicrobial surfaces for shared patient areas.
- Incorporate advanced technologies, where appropriate, to support disinfection following cleaning of shared patient areas (e.g., integrated ultraviolet C (UV-C) disinfectant lights).
- Re-assess the number and size of elevators to ensure sufficient flexibility when cab capacity is restricted during a pandemic.

Facility Planning Guidelines

Introduction

This section highlights facility planning guidelines, including:

- flexibility to accommodate expanded capacity of key clinical departments
- airborne isolation room design
- additional storage requirements in clinical and support areas
- size of entrances and vestibules
- size and design of waiting areas/spaces
- staff facilities
- capacity of the morgue

Recommended Guidelines for Clinical Areas

Critical Care

Recommendations include:

- Design a minimum of 12 beds (and more in larger centres) with mechanical capacity to be converted to a negatively pressurized isolation zone with direct exhaust and not affected by HVAC in surrounding areas.
- Create additional critical care bed capacity (during a pandemic) by using spaces such as the post anesthetic care unit (PACU) and/or other recovery areas augmented with the required technology, headwalls, medical gases and additional emergency power required for ventilated patients, etc.
  - These recovery spaces should be sized to accommodate equipment required to support critical care patients.
- Update provincial critical care bed planning standards.
  - Current standards in Ontario are 8% of acute care beds in community hospitals; 12% in teaching hospitals. They understate the requirements especially in community hospitals that have regional/specialty roles.
- Plan/design all Level 2 critical care beds similar to Level 3 beds.
- Include washrooms adjacent to all critical care rooms.
- Ensure enhanced visibility to patient rooms, considering use of technology to support virtual care supported with cameras in each room and a viewing station, clear partitions, nurse call capability, etc.

Medical/Surgical Units

Recommendations include:

- Plan 100% 1-bed (private) rooms, with associated private washrooms.
- Create additional medical/surgical bed capacity (during a pandemic) by using spaces such as the prep/recovery areas in the surgical suite and endoscopy unit. Planning should ensure that sufficient washrooms, patient separation and space for privacy is included within these areas to allow them to be converted for inpatient care. Building capacity in external locations (e.g., school gym, tent in the parking lot, etc.) should be a last resort.
- Plan documentation stations outside of patient rooms (similar to contemporary critical care room design) to allow at least one 36-bed pod within the inpatient unit capacity to be easily converted to a stepdown/ critical care unit and support 1:2 nurse per patient coverage.
- Plan adequate corridor circulation within clinical areas to facilitate donning of PPE.
- Consider a design that allows patient rooms to be grouped (in a pod or zone) and segregated to create an isolation zone. The plan and location should ensure staff/caregivers do not need to pass through the area to service the building or other patients.

- Plan service corridors between key departments (e.g., inpatient unit and diagnostic imaging; emergency department and surgical suite) to minimize distances and avoid transferring patients within public corridors.

Emergency Department

Recommendations include:

- Plan all rooms with capacity to be enclosed to ensure flexible use of the space.
- Provide a segregated isolation area within the ED, or in larger facilities, create an area for infectious patients with separate waiting areas for non-infectious patients and patients under investigation.
- Design a minimum of 12 beds (and more in larger centres) with mechanical capacity to be converted to an isolation zone.
- Ensure sufficient distancing in waiting and subwaiting areas.
- Plan entrance to allow temporary space for screening.
- Plan separate entry and exit vestibules at the walk-in entrance to support separation of flows.
- Plan appropriate support spaces for pandemic-related requirements (e.g., equipment and supply storage and others).
- Plan larger staff facilities (e.g., change room, lounge, etc.), recognizing that staff may not be able leave ED during a pandemic.
- Provide a segregated area within the emergency department to separate patient populations (e.g., dedicated mental health area).

Airborne Isolation Room (AIR) Design

Incorporate the current CSA standards for AIR design which are included in the Appendix B (Figure 2). Other recommendations include:

- Plan 15% to 25% of critical care patient rooms as AIRs, with 15% being the minimum and 20% to 25% reflecting needs of tertiary and quaternary centres.
- Plan approximately 8% of medical/surgical rooms as AIRs; typically, this results in three isolation rooms per 36-bed medical/surgical unit. The number may need to be higher in hospitals with a high number of respirology patients, high incidence of airborne infections (e.g., serving a large immigrant population, etc.) and designated pandemic facilities.
- Provide AIRs in speciality ambulatory care clinics (i.e., infectious diseases, respiratory, etc.) to be used if required for patient care.
- Ensure staff have visibility into AIRs and leverage cameras and other technologies to support communication and monitoring of patients from a central or decentralized location.

Storage Capacity for Additional PPE/Pandemic Supplies in Clinical Areas

Recommendations include:

- Plan secure storage space for PPE outside each patient room (e.g., in supply cupboards or carts).
- Provide additional space for waste bins and soiled PPE hampers, to alleviate the pressure on environmental (EVS) and portering services.
- Plan additional flexible space (e.g., 225 nsf meeting room per unit/clinical area) that can be converted to a secure PPE storage room. Furniture selection should ensure tables and chairs can be easily moved and cleaned.

Recommended Guidelines for Support Spaces

Public Areas

Entrances and Vestibules

Recommendations include:

- Provide dedicated, controlled staff entrance(s) to facilitate optimal separation between staff flow and patient/family flow including screening. Screening areas may be mobile with capability for greater separation/ security during an outbreak (e.g., Plexi-glass enclosure).
- Designate a limited number of patient/public entrances to be used as primary control points of access during an outbreak. This should be an entrance other than the Emergency Department entrance to avoid congestion.
- Ensure the designated public entrances can accommodate a drop off area for families to deliver personal patient items.
- Plan vestibules, sized to accommodate controls, physical distancing, security, etc. at all entrances designated as primary control points of access.
- Plan cafeterias to accommodate physical distancing, when required; for example, size the cafeteria for 'normal' operations including public and staff capacity and remove public access during a pandemic to achieve distancing.
  - Consider retractable, easy to clean walls that can be used when segregation of different staffing groups within the cafeteria is required.
  - Consider that mask removal in eating/cafeteria spaces may necessitate additional single seating or barriers in place.
  - Optimize outdoor eating spaces when possible.
  - Plan for additional garbage receptacles.

- Other considerations include:
  - site planning to include space for temporary shelter(s) to allow staff and patients/public to wait outside to be screened (while respecting physical distancing)
  - longer vestibules to allow an airlock and capability to secure the vestibule when necessary
  - separate 'in' and 'out' traffic/vestibules to support physical distancing with clear partitions/windows and an intercom system, to minimize exposure to screening staff providing direction to patients upon entering

Waiting Areas/Spaces

- Mitigate challenges related to the size and design of patient and visitor waiting spaces through operational solutions (e.g., changing scheduling practices, alerting patients when to enter the building by text or other means). In situations where this is not possible, adjustments to waiting areas may include:
  - use 40 nsf (rather than current standard of 15 nsf) per standard seat which will result in fewer seats, or
  - maintain 15 nsf per seat and procure furniture that can be easily closed off/removed when the seating area needs to be 40 nsf. The type of furniture best suited to achieve this (e.g., avoiding row-mounted or tandem seating in favour of removable seating options) will also be a consideration.
- Other considerations include:
  - provide segregated waiting spaces for different patient populations, similar to the ED

Materials Management

PPE and Pandemic Supply Stock and Supply Chain

- Plan adequate storage space for
  - *general supplies*: on-site, 21-day supply of everything; rapid access to re-supply from off-site provider (note: supply may be less than 21-day if reliable supply chain is available)
  - *pandemic supplies*: on-site 21 to 30-day supply in a pandemic; off-site three-week supply
  - *PPE*: on-site 21 to 30-day supply in a pandemic (e.g., visors, gowns, protective suits, respirators, ventilators, etc.); off-site three-week supply from vendor with 24-hour delivery
  - on-site stock needs to be rotated to avoid financial loss resulting from expired materials
  - flammable items (e.g., ABHR bulk supply)
  - uniforms/lab overcoats, within central uniform storage rooms

- Consider creating an off-site distribution centre or working with a provider to hold the stock necessary for sustained PPE/pandemic supplies during the pandemic. Considerations include:
  - creating of a hybrid local-regional model that facilitates equitable distribution of PPE/pandemic supplies to hospitals from a centralized location
  - establishing secure and reliable supply contracts that ensure sufficient stock is available to users, particularly during a prolonged pandemic (which may be assigned to the off-site provider)
- Create enablers to expand PPE/pandemic supply storage capacity by
  - converting existing on-site space to a storage area for additional PPE/ pandemic supplies during a pandemic (e.g., secure IT or equipment holding area in receiving)
  - ensuring space for laboratory equipment and supplies to accommodate additional testing and sterilization
  - adopting dashboards to track 'run rates' to allow distribution to be tracked against need (and avoid hoarding): consider creating regional command centre to track use and demand to assist in fair distribution
  - adopting emerging technology to support reprocessing of PPE for re-use (would require soiled holding, processing and clean holding)

Patient, Staff and Material Flow

- Develop a flow strategy for transporting soiled materials that mitigates potential cross-contamination and does not intersect with other supply flows (e.g., clean supplies, meals), patient flow or staff, flow. Also, plan adequate capacity within clinical areas for the holding of soiled materials/ linen until pick up/transportation to a central holding area.
- Designate service elevators for the transportation of either clean or soiled materials; these must be separate from public elevators.
- Create separate routes for clean and soiled material flow and separate clean and soiled holding areas; soiled material must not pass through areas where clean supplies are held and may be exposed to cross-contamination. During an outbreak, consider the creation of a transportation schedule to ensure that clean and soiled material flow routes do not intersect.

Additional Recommendations

- Consider a central equipment depot to hold some selected equipment following proper cleaning and maintenance, for re-deployment to the program areas, as requested and based on demand.
- Ensure capacity in the medical device reprocessing department (MDRD) area to perform additional high level disinfection when required.
- Consider implementing a real time locating system (RTLS) or other equipment tracking system, particularly for higher use/need areas.

- Plan storage space for excess furniture/seating during a pandemic (e.g., storing the tables/chairs when cafeteria is shifted to a pandemic layout).
- Create temporary facilities to accept and hold donations (e.g., PPE provided by outside parties). This could be located off-site.
- Address the requirements for central storage area(s) for larger inventory, balanced with decentralized storage spaces, near the clinical/patient care areas able to accommodate up to 72-hours worth of supplies.
- Plan storage areas based on the following estimates of net square feet (nsf) per bed:
  - 2.0 nsf for general medical supply stores
  - 2.0 nsf for emergency stores
  - 2.0 nsf for pandemic supply stores (specialty items)
  - 2.0 nsf for PPE stores
- Plan for immediate removal of infectious waste, following biohazardous protocols. When immediate removal is not feasible (e.g., due to transportation challenges, inclement weather, staffing shortages, etc.), plan an on-site waste management strategy, including segregation area to temporarily hold waste.
- Ensure routes for transporting biohazardous patient specimens are as direct as possible.

Staff Facilities

- Consider that the space and design of staff facilities will be affected by the following factors:
  - Staff may be required to change into and out of their uniform on-site; additional lockers, change areas and uniform storage/distribution areas will be necessary.
  - There may be a need for a consolidated/segregated staff entrance with adjacent lockers (central lockers versus pods of lockers).
  - There may be an increased need for scrub exchange machines located centrally or decentralized to accommodate adjustments to changing practices.
- Plan designated staff lounges and meeting rooms in each clinical area with teleconferencing capability and adequate space to meet physical distancing requirements. During a pandemic, some other rooms within the unit (e.g., family lounge) can be reallocated for additional staff facilities.
  - Consider creating larger break rooms in key areas such as the ED and critical care to accommodate reclining furniture or create dedicated quiet zones.
- Ensure flexibility to accommodate on-site day care services for essential workers with children.

- Plan a sufficient number of on-call rooms and locate them within reasonable distance to the clinical units. On-call rooms should include a toilet and shower.

Morgue

- Consider the need for a segregated morgue/autopsy suite for infected patients (e.g., as required for Ebola).
- Plan capacity for
  - overflow holding to accommodate increased deaths
  - external body holding space (e.g., refrigerated trailers or other temporary fixtures), adjacent to the hospital facility
- Provide a private and covered area for body transfer entrance, with an area for donning/doffing PPE.

Additional Considerations and Recommendations

Overview

In addition to the information received related to the facility implications of COVID-19 and recommendations for hospitals to consider in their planning, additional important feedback was provided by multiple stakeholders, and is categorized under the following headings:

- Operational considerations
- Architectural considerations
- Engineering considerations
- Information and Communication Technology considerations

Additional feedback is incorporated in Appendix C. The feedback should be considered by each hospital organization and discussed with subject matter experts.

Additional Considerations

Operational

Operational considerations include:

- providing programmable signage at entrances to notify staff and patients/ visitors about closures, capacity issues or redirections
  - also consider additional large, portable/programmable signage to display daily flow of information, assessment centre visitor restrictions, etc.
- equipping supply storage rooms with ability to monitor high-value goods through closed-circuit television (CCTV) monitoring, locks or other solutions, to ensure PPE can be safely held on-site
- working with funeral homes to ensure timely transport and minimize the need to expand the morgue
- considering scheduled break times for staff to ensure physical distancing guidelines can be maintained
- considering the effective management of large volumes of donated items (e.g., food, gifts for staff, other) as the can become overwhelming and requires optimal staffing

Architectural

Architectural considerations include:

- providing automatic sensors/doors for corridors and entrances to avoid unnecessary contact of common surfaces
- creating barriers between staff and patients at information desks, volunteer areas, registration, etc., (e.g., Plexi-glass, other), ensuring a design that supports accessibility and comfortable patient/staff interactions
- designing entrances that accommodate screening activities and avoid crowding (e.g., consideration for optimal shape and size)
- considering fixed or portable hard barrier partitions rather that curtains for easier cleaning and disinfecting
- enhancing elevator cab cleaning to minimize downtime (e.g., addition of UV-C lights for disinfecting purposes)
- ensuring adequate magnetic locking of exterior doors to minimize need for security personnel

Engineering

Engineering considerations include:

- designing public areas to allow for power and connection points, adjacent to parking lots, to facilitate quick installation of temporary external structures such as tents and trailers
- incorporating flexibility and controls in current and future HVAC systems to allow adjustments in patient rooms if required and accommodate additional capacity
- ensuring the power supply is able to accommodate increased electrical load

Information and Communication Technology (ICT)

ICT planning considerations include:

- using intercom systems or other communication solutions to facilitate communication with patients and/or staff within clinical areas such as patient rooms, ED trauma/resuscitation rooms and critical care rooms
- using technology such as cameras/integrated bedside terminals (IBT) located in patient rooms to monitor the care needs/acuity of patients from a centralized location
- leveraging technology to capture real-time data for tracking and monitoring (e.g., hand wash compliance, antibiotic tracking, cleaning durations, chemical disinfection validation, duct cleaning indicators, etc.)
- incorporating technology to enhance patient care experience (e.g., mobile registration) and virtual inpatient and outpatient communication/visitation with families/caregivers

Appendices

A: Individuals Who Provided Comments

Agnew Peckham would like to express our gratitude to everyone who contributed the knowledge, experience and insights to the document.

Figure 1: Thought Leaders, Subject Matter Experts and Process Advisors

Thought Leaders	CHUM • Dr. Réal Lapointe, Deputy Director of CHUM Professional Services • Marc Pepin, Deputy Director of Operations Halton Healthcare • Bill Bailey, Senior Vice President of Redevelopment and Facilities • Doug McCann, Director of Redevelopment • Mary O'Driscoll, Director of Planning, Equipment and Asset Management Humber River Hospital • Jennifer Tredinnick-Moir, Senior Director of Redevelopment Joseph Brant Hospital • Eric Vandewall, President and CEO of Joseph Brant Hospital • Peter Osgood, Director of Redevelopment, Facilities and Biomedical Engineering The Ottawa Hospital • Karen Stockton, Director of Planning at The Ottawa Hospital • Lisa Young, Clinical Program Planning Manager • Michelle Currie, Program Planning Manager • Jessica Fullerton, Construction Lead, Infection Prevention and Control • Dr. Kathryn Suh, Medical Director, Infection Prevention and Control

	William Osler Health System • Ann Ford, Vice President of Facilities, Redevelopment, IT and Chief Privacy Officer • John Marshman, Executive Director of Facilities Operations • Cathy Renaud, Director of Planning and Programming
Subject Matter Experts	• Barbara Shea, Chair of the IPAC Canada Health Facility Design & Construction Interest Group • Hung Tan, Manager of Emergency Management at The Ottawa Hospital • Caroline Nolan, Emergency Management Coordinator at The Ottawa Hospital • Jeff Tochkin, Emergency Management Coordinator at The Ottawa Hospital
Process Advisors	• Cliff Harvey, Chief of Planning at Niagara Health • Matthew Kenney, Director of Project Management Office (Master Plan) at Trillium Health Partners • David Longley, Vice President of Capital Planning and Redevelopment at Trillium Health Partners • Andrea Nguyen, Project Director, Service Planning and Operational Readiness at Niagara Health • Karen Stockton, Director of Planning at The Ottawa Hospital • Krista Wells Pearce, Vice-President, Planning & Corporate Support Services at Providence Care

B: CSA Standards Z8000

Figure 2: Airborne Isolation Room Standards

7.5.5. AIRBORNE ISOLATION ROOMS	
7.5.5.1	The decision whether to include an airborne isolation room, and the number of AIRs needed, shall be made with input from a) the class of HCF; b) the ICRA (see Clauses 4.5.1.3 and 7.5.1.2) and consultation with IPC staff; c) a community assessment of the patient population; and d) the defined role of the HCF in pandemic planning. **Note:** It is recognized that any HCF could encounter a patient with a highly infectious disease. If the regional pandemic plan includes an expectation that the HCF would house that patient for a significant time, an AIR could be needed. If the HCF's role is only to manage the patient until they can be transported, alternative means of isolation could be used.
7.5.5.2	Class A HCFs shall provide at least one airborne isolation room (AIR), to be located in the emergency department.
7.5.5.3	Class A HCFs should consider the additional needs for AIRs for the following services or areas: a) emergency care; b) clinics in areas servicing high risk populations (e.g., tuberculosis or infectious diseases clinics, c) pulmonary/respiratory clinics, and dialysis); d) medical imaging (in HCFs servicing high-risk populations); e) endoscopy/bronchoscopy; f) ICU; g) general medicine and surgical floors (or units); h) pre-operative PACU; and i) hematology/oncology, bone and marrow transplant. **Note:** For AIRs serving bone and marrow transplant patients, see Clause 7.5.5.10.

7.5.5.4	If the functional programming process indicates that additional AIRs could be needed, a needs assessment capacity study shall be completed. During development of the functional program, planners shall consult with the HCF's infection prevention and control program to determine the number of AIRs needed on each unit. **Notes:** a) In general, more than one AIR will be needed in medical-surgical, medical, pediatric, or critical-care areas. During development of the functional program, planners should consult with the HCF's infection prevention and control program to determine the number of AIRs needed throughout the facility. b) The decision to include or omit an AIR on a unit in a Class A HCF should be made in consultation with the provincial/territorial ministry of health, and signed off by the authority having jurisdiction. c) See Clause 11 for specific requirements for AIRs including anteroom design and PPE requirements. d) The inclusion of protective environment rooms (positive pressure) should be considered where appropriate. See Clause 7.5.6. e) Consideration should be given to grouping of rooms for use in pandemic situations. f) In a Class A-1 HCF or pediatric HCF with a role in pandemic planning, the isolation zone within an inpatient unit should be larger (e.g., have consideration of larger anteroom). g) 7) See Clause 11 for specific requirements for airborne isolation rooms.
7.5.5.5	When determining the number of AIRs to be incorporated into any service area, planners shall consider the number of AIRs that are required by the catastrophic event risk assessment (specifically as it applies to pandemic planning) as determined in Clause 7.9.1.
7.5.5.6	Each AIR shall have an anteroom with a closable door. **Note:** *This requirement has been added because AIR anterooms* a) offer additional controls against unwanted air movement; b) help to reinforce user identification of the AIR as a specialized environment; c) provide an enclosed space for donning and doffing of PPE; d) could help in the management of unknown or emerging diseases; and

	e) provide for consistency across functions and facility types.
7.5.5.7	AIRs and anterooms shall comply with the HVAC system requirements in CAN/CSA-Z317.2, including for relative pressurization. **Note:** *To maintain relative pressurization, it is important to ensure careful sealing around all wall penetrations (e.g., for conduit, ductwork, etc.).*
7.5.5.8	An AIR shall have a pressure monitoring system and an alarm in accordance with CAN/CSA-Z317.2.
7.5.5.9	A three-piece washroom directly accessible from the bed space shall be included in all inpatient AIRs. A two-piece washroom shall be provided for emergency care. Consideration should be given to including a two-piece washroom for AIRs in ambulatory care settings. **Note:** *The decision on washroom configuration will depend on the services provided.*
7.5.5.10	Combination airborne isolation room/protective environment rooms shall be equipped with an anteroom and shall be designed and built in accordance with CAN/CSA-Z317.2.

Source: CSA Z8000-18

C: Additional Implications

Figure 3: Additional Feedback from Thought Leaders

#	Category	Feedback Received from Thought Leaders
1	Operational	Consider implementing touchless entry and exit payment systems in public areas (e.g., parking, retail, etc.)
2	Architectural	Consider the location of mounted sanitization stations in areas that are easily accessible by patients.
3	Engineering	Pre-plan Building Automation System (BAS) HVAC to permit automatic re-setting of ventilation and create a slight negative pressure for entire floor area that shares a floor plate with other program
4	Engineering	AIRs and 100% outside air are important design elements that have reassured patients and caregivers.
5	ICT Planning	Augment technology to allow physicians remote reading of clinical equipment and communication with staff in isolation rooms, to reduce use of PPE.
6	Parking	Consider planning patient/public parking in close proximity to designated public screening entrance(s).