Design and Evaluation: The Transformation Continues

St. Catharines Site Niagara Health Post Occupancy Evaluation

Celeste Alvaro, PhD | Deyan Kostovski, AMA | Melanie Elliott, MA | Brenda Wong, PhD

June 2018

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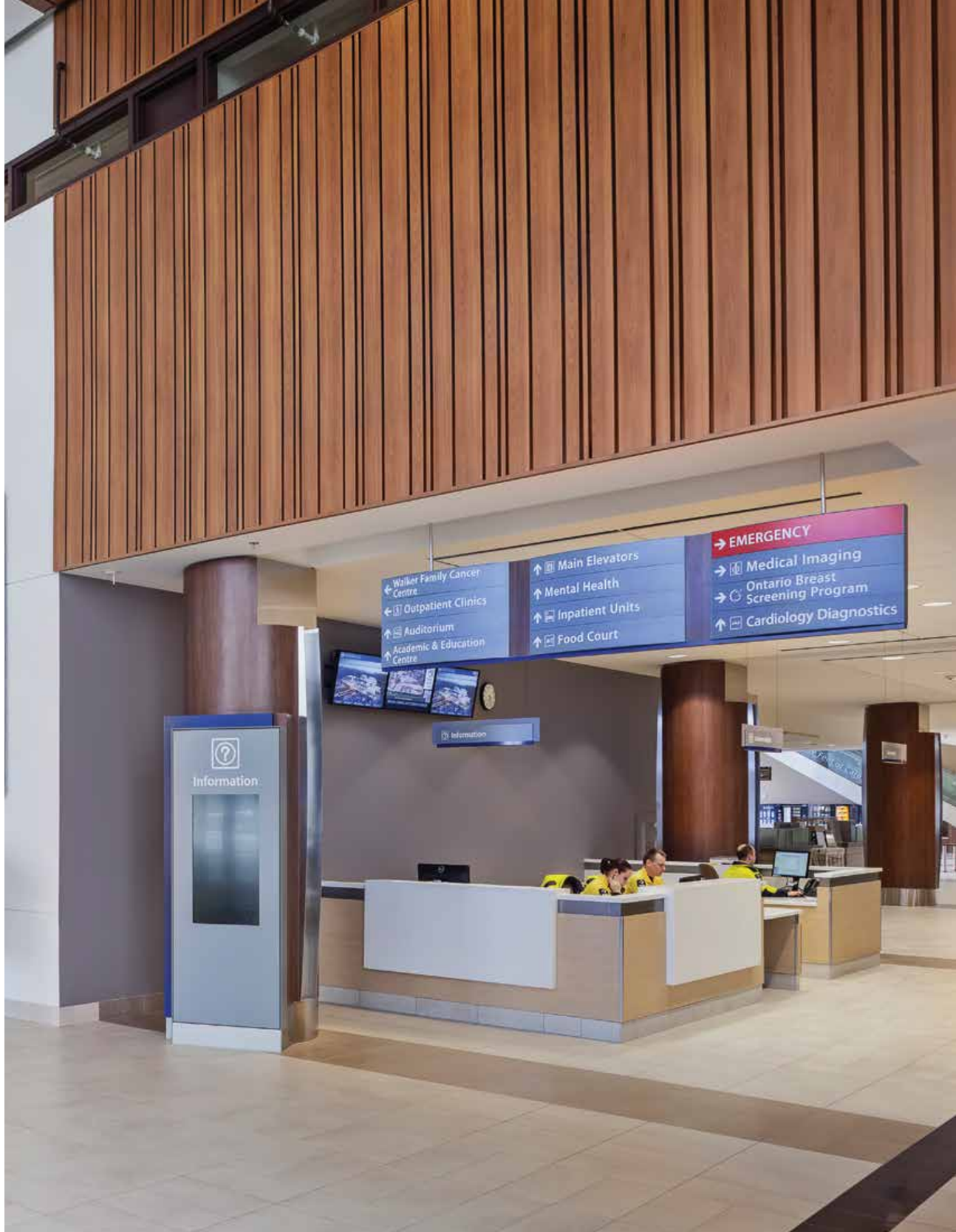


I. Executive Summary

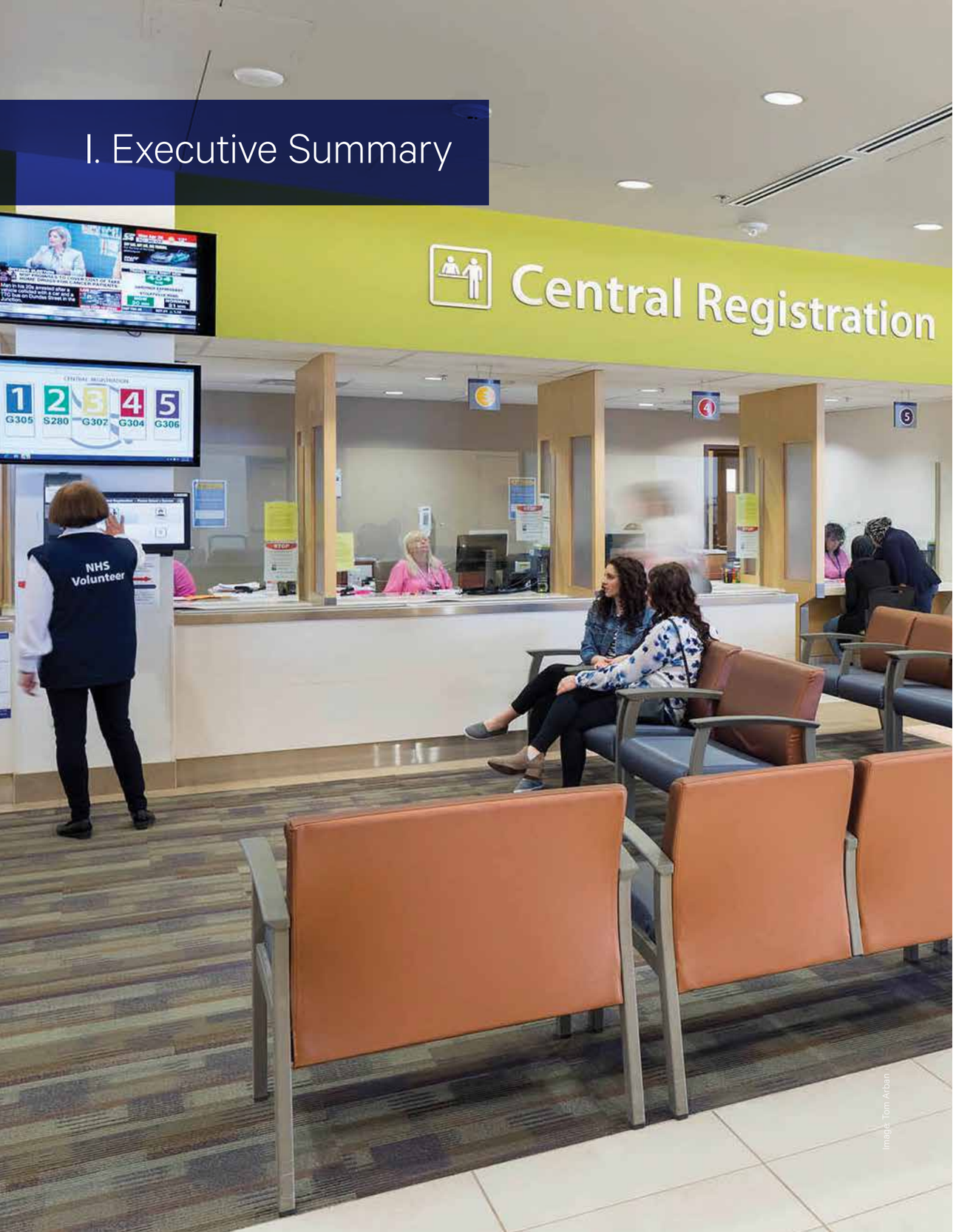


Image: Tom Arban

Background and Rationale

Beginning in 1999, the Niagara Region hospitals embarked on a complex amalgamation plan that would culminate in the integration of infrastructure and programs, streamlining of administrative responsibilities and renaming of the facilities to Niagara Health System (NHS). As the organizational consolidation occurred, a physical transformation began. The physical transformation started with the design and build of the new St. Catharines Site. Opening in the spring of 2013, the new site replaced two legacy facilities, St. Catharines General Hospital and the Ontario Street sites.

Recognizing an opportunity to further support evidence based decision making for healthcare design and understanding how the findings might shape the design of future NHS redevelopments, the leadership team invested in a robust user experience and post occupancy evaluation (POE). The POE, hereafter referred to as the design evaluation, assesses the impact of the St. Catharines Site design on impressions, experience, well-being and health related outcomes for patients, staff, visitors and community.

The design evaluation includes posttest data only and takes place approximately five years after the official opening of the St. Catharines Site. Typically, a design evaluation is comprised of at least two phases of data collection including a pretest wherein data is collected at the site or sites that will be decommissioned and a posttest which occurs approximately one year after the full completion of the new facility.

Even without pretest data to compare outcomes against at the post occupancy stage, it is never too late to execute a design evaluation. The outcomes can be tested against the design intentions and their anticipated impact, and comparison across users (e.g., patient types, staff), departments, and/or spaces and design features of interest. It allows for the discovery of aspects of the design that are successful relative to those that may be less successful and use the resulting data to guide interventions aimed at improving underperforming areas and future healthcare facility design.

The value in executing the design evaluation for Niagara Health transcends the St. Catharines Site. The unique aspect of this posttest only design evaluation is the potential to influence the visioning sessions, the design research process and the overall design for the upcoming redevelopment of the Niagara Falls Site.

CONTEXT OF CARE

Building the St. Catharines Site served as a spark to introduce new patient care services. These include the Walker Family Cancer Centre, enhanced cardiac care services with the Heart Investigations Unit, the first inpatient and outpatient mental health services in the Niagara Region and a family centred unit specializing in women's, babies' and children's health. The additional services were a complement to the existing programs that migrated from the St. Catharines General and Ontario St. Sites including Acute Care, Surgical Care, Kidney Care, Emergency and Urgent Care, Complex Care, Palliative Care, Occupational Therapy, Physiotherapy and Diagnostic Imaging.

The St. Catharines Site delivers acute care for patients needing intensive and urgent levels of care, it also delivers complex care for patients with multiple health conditions who require ongoing medical treatment and therapy. The spectrum of care also includes diverse outpatient patient programming. The St. Catharines Site is at the centre of a coordinated, integrated and expanding healthcare system for the Niagara Region.

DESIGN INTENTIONS

The strategic approach to the design evaluation was based on using the design intentions of the new hospital as the theoretical basis against which to assess outcomes (see references by Alvaro and colleagues from 2013-2017 in the reference list at the end of this report). The design intentions of the St. Catharines Site were identified through a series of interactive, detailed and diverse workshops that were held with various stakeholder groups. Through these sessions the overarching design intentions and anticipated outcomes for the various user groups were identified, as well as, the spaces of greatest significance to the design and the anticipated use of those spaces.

The design intentions of the site are as follows:

- to provide a patient-centred design through the use of simplified way-finding throughout the building, extensive outdoor walking paths and gardens, natural light in every patient room, increased privacy with separate entrances for the community hospital, cancer centre and mental health units, and numerous lounge areas and quiet rooms throughout the facility for patients to spend time with family members and friends
- to provide an abundance of natural light through the strategic placement of floor to ceiling windows and borrowed light to create an uplifting feel, and to use natural materials and colours reminiscent of the wine region that would enhance the connection to community, the escarpment and the vineyards
- to create an animated “Main Street” concourse at grade to foster a sense of community and to provide public amenity space for patients, visitors and staff, including retail and food services

METHODOLOGY

Using a posttest only design evaluation mixed quantitative and qualitative research methods were used to assess the impact of the St. Catharines Site design on patients, staff, visitors and community users.

Quantitative research methodologies are necessary to attribute cause and effect. The quantitative surveys assess the impact of the architectural design on psychosocial well-being, and the perceived health of patients, staff and where possible visitors and community responses were captured using the telephone technology.

Whereas quantitative methodologies enable causal inference, generalizability and replication; qualitative methodologies allow for the contextualization and description of phenomena under study. Naturalistic observation captures how people use and interact with the spaces both inside and outside of the hospital. Moving interviews emulate and understand the patient and staff experience of various spaces in the hospital.

The methods were selected on the basis of: the research questions to be addressed, the constructs to be assessed and the desired conclusions to be made. The selected methods enable the assessment of both anticipated and unanticipated uses as well as the consequences of the building design.

TOP PERFORMING SPACES

Based on the collective interpretation of the data originating from naturalistic observation, participant surveys, and moving interviews, the top performing spaces (in terms of impressions, use, user experience and outcomes) at St. Catharines Sites are the Walker Family Cancer Centre registration area, the main entrance and the entire cafeteria area.

Walker Family Cancer Centre Registration Area. The registration area benefits from its own entrance and elevators eliminating any wayfinding or travel distance barriers and has ample seating. This space has an exceptional balance of objective and abstract design impressions that is accentuated by human factors demonstrated by the welcoming role volunteers play during the registration process.

Main Entrance. Beginning with the exterior upon arrival, continuing past registration and transitioning to the main street corridor, the main entrance provides users with a favourable experience. The exterior is well equipped with seating options and allows for well organized pick up and drop off. As you enter the large foyer the spacious ceilings allow for unobstructed sightlines and the main registration area is only steps away. There can at times be some congestion at the information kiosk and self-pay parking machines, but volunteers quickly intervene to provide assistance. Repeat visitors confidently follow the blue tiles to their end destination.

Cafeteria. The cafeteria is much more than food consumption. When examining the entire cafeteria,

including the outdoor terrace and 2nd floor seating area it becomes clear that the diversity of users and use is what makes this spot so successful. It is both an end destination as well as a transition space for those taking the stairs. It is both a passive space and an active space. Users can frequent the cafeteria to participate in informal meetings or luncheons with coworkers or opt for a quieter section and dine alone or absorb the activity of the passersby. It is an indoor and outdoor space, even during the winter months the glass wall welcomes in natural light and warmth. The cafeteria can be transformed to host hospital wide Wednesday morning huddle up meetings, the terrace can host staff appreciation barbeque lunches and the 2nd floor area often hosts special events.

DESIGN RECOMMENDATIONS

This design evaluation tells a story of where people are going, what they are doing and how they feel. There were very positive impressions, some neutral impressions and there were a few examples of negative impressions.

Design Fluidity

There are numerous high performing areas on site. However, impression ratings and behaviour patterns show that there are areas of concern in how the design flow gets interrupted, and consequently diminishes the user experience. Design fluidity can be described as how the design elements tie into each other with the goal of creating a seamless user experience.

In a building of this size, greater attention needs to be given to travel distance and wayfinding this is where users can experience a disconnect between the spaces in the hospital. Whereas the blue tile on the main floor proves to be an efficient wayfinding guide, other prompts and cues are less effective. Signage for certain public spaces do not even exist and some are inadvertently deterring use.

One of the more noticeable examples of the need to address design fluidity is the corridor widths in the mental health and addictions department relative to the corridor widths in the rest of the facility. The narrower corridors and few automated doors create unnecessary obstacles for mental health patients who also use a mobility device. Future patient centred designs need to consider the physical and mental health of all patients and not view them separately.

The St. Catharines site offers some hoteling or shared work space and the user impression of these work stations are positive. However, the design did not anticipate the amount of mobile staff that would choose to work with greater frequency at the St. Catharines Site. When designing the new Niagara Fall Site, it is prudent to include plans to accommodate increased visits by mobile staff. This may include more shared work stations or dynamic multipurpose rooms that can support mobile staff.

Design fluidity can also be compromised by third party operators or stakeholders. For example, parking operators may consider the provision of passes that allow access to all lots. City services such as bus routes would be well poised to offer reasonably close access to entry points.

Promoting Use Through Design

There are many contributing factors to a successful building design, user experience and outcomes. The main street corridor is associated with positive impressions, diverse users, frequent use, animation and interaction among users. In contrast, despite having some of the highest impression scores of any space in the hospital, spiritual care is among the most infrequently used spaces in the hospital. It is valued but not really used. Moreover, with an increase of private patient rooms there is a corresponding decrease in the use of patient/family lounges.

To be effective, design needs to generate positive impressions, encourage use, enhance user experience and drive outcomes.

Outdoor spaces are plentiful, but awareness is very low. The potential exists to increase their use. Promoting use through design is not as simplistic as more signage and seating. These types of interventions will help, but more sophisticated solutions such as understanding how spaces can impact adjacent areas or how hospital and social programming can be introduced to drive users to an underused space.

Enhancing Connection

The sense of connection responses, particularly when asked about connection to nature, were consistently low.

Future designs may need to consider more obvious colour palettes reminiscent of nature, natural materials and the use of symbols to amplify the connection to nature. Enhancing connections extends beyond connection to nature, there is potential to enhance connection to community and others. The demarcation of staff only areas may have a corollary consequence of contributing to the disconnect experienced by some participants. Whereas the separation of public and private areas may serve to enhance safety, mitigate the spread of infections, and offer the opportunity for a welcomed respite from daily work activities; the separation limits opportunities for comingling among staff, patients, visitors, and community. Moreover, it drastically reduces the serendipitous encounters among staff and other users of the hospital.

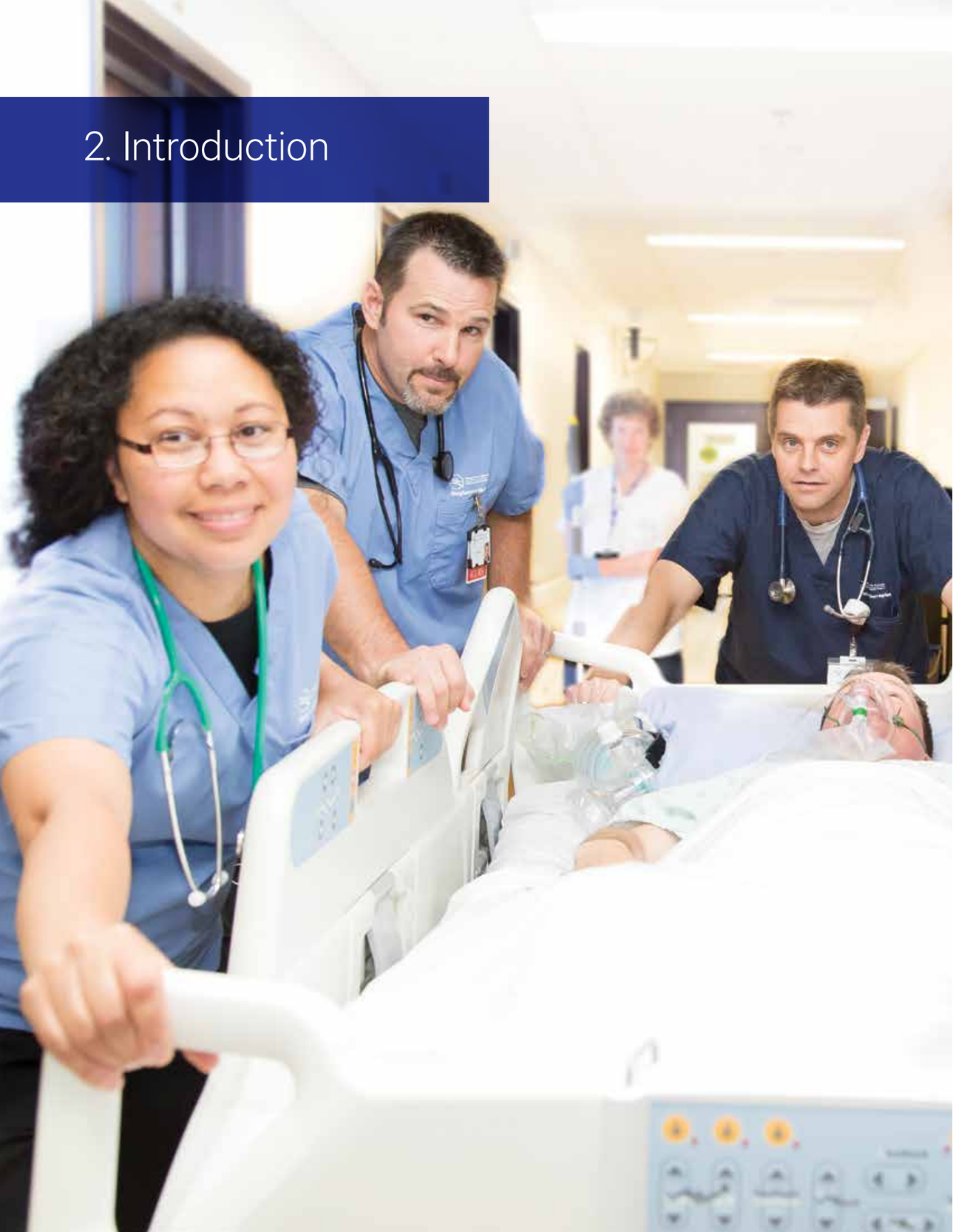
Maximizing meaningful views can be a strategy to promote use through design, but it also helps preserve connections to the surrounding environment. If connection to the outside environment, nature, community and others is important to the overall design aspirations then design elements need to be less subtle and more direct. Stronger symbolism, more meaningful views, blurring of the boundaries between public and private spaces, and the incorporation of services or amenities to entice community use are all examples on how to enhance connections.

CONCLUSION

For many years redevelopment projects were assessed on the basis of whether they were completed on time and within budget. Follow up evaluations focused on the examination of operational performance outcomes and hospital administrative data before and after the redevelopment (where possible). It is encouraging to experience changing tides towards the inclusion of design research and evaluation across all major healthcare redevelopment projects. Responding to the healthcare infrastructure boom in Ontario and the billions of dollars invested in new services and facilities, the Ministry of Health and Long Term Care and healthcare facilities undergoing redevelopments are dedicating time and resources to establish a causal link between design, experience and outcomes via rigorous evaluation.

These efforts contribute to the growing repository of data to support evidence based decision making, serve as a gauge to assess the effectiveness of new healthcare facility designs, and ultimately inform the design of future healthcare facilities to optimize well being, health and create opportunities to thrive.

2. Introduction



Background and Rationale

As time passes, change is unavoidable. Change can manifest itself in a variety of ways - physical, emotional or perceptual. For example, the geographic distance between two locations may never change however their surroundings can change. Communities grow and develop, green spaces become residential and commercial spaces, dirt roads become multilane boulevards and these events change our perception that what was once far is now close.

For several years, the health network in Niagara Region has been responding to the changing landscape and realization that it has out grown its small community roots. The communities of Crystal Beach, Wainfleet, Pelham, Lincoln, Grimsby and Thorold viewed their local hospitals as their own, simply because when they were in need of care that is where they would go. With time, not only did the local landscape change but an increase in the challenges to the healthcare system required a measured response. Changes in patient populations, government resources, and technology led to the creation of the Niagara Health System (NHS). Currently, NHS is a multisite hospital amalgamation consisting of six sites: Douglas Memorial Site in Fort Erie, Niagara on the Lake Site, Greater Niagara General Site in Niagara Falls, Port Colborne Site, St. Catharines Site and Welland Site. Each of the sites have their own history, programming and unique characteristics, together as one entity, these facilities represent the delivery of healthcare services to the entire Niagara Region serving 434,000 residents in 12 municipalities.

Beginning in 1999, under the direction of the Ontario Health Services Restructuring Commission, the majority of the Niagara Region hospitals embarked on a complex amalgamation plan that would culminate in the integration of infrastructure and programs, streamlining of administrative responsibilities and renaming of the facilities to “Niagara Health System”.

Simultaneously, as the organizational consolidation occurred, a physical transformation began. The physical transformation started with the design and build of the new St. Catharines Site. Opening in the spring of 2013, the new site replaced two legacy facilities, St. Catharines General and Ontario Street sites. The new healthcare centre is nearly one million square feet and is a showcase for cutting edge technology that includes many patient centred design features such as simplified wayfinding, outdoor spaces, the use of natural light, multiple entrances for increased privacy and several lounges.

Recognizing an opportunity to further support evidence based decision making for healthcare design and understanding how the findings could help shape the design of future NHS redevelopments, the leadership team invested in a robust user experience and design evaluation focusing on the impact of the St. Catharines Site design on well-being and health related outcomes for patients, staff, visitors and community.

This design evaluation takes place approximately five years after the official opening of the St. Catharines Site. Typically, a user experience and design evaluation has two phases of data collection, pretest where data is collected at the site or sites that will be decommissioned, in this instance that would have been at the St. Catharines General and Ontario Street Sites. The second data collection phase, posttest, occurs approximately one year after full completion of the new facility. Collecting data pre and post construction allows for comparison of the designs of the facilities and attribute any changes in the user experience to the differences in design. Without having the pretest baseline data, the ability to attribute outcomes to design is limited. However, in a posttest only evaluation, outcomes can be compared across user groups and across spaces of interest - capturing differences across user impressions, experience and outcomes as a function of the built environment. In a posttest only evaluation, outcomes

can be compared across user groups and across spaces of interest - capturing differences across user impressions, experience and outcomes as a function of the built environment.

Even without pretest data, it is never too late to conduct a design evaluation study. It enables the discovery of what aspects of the design are working for whom and in what context, and opportunities arise through design interventions to improve underperforming areas and optimize outcomes. For Niagara Health System the value in executing an evaluation study transcends the St. Catharines Site as it has the potential to influence the design and shape the process for the upcoming redevelopment of the Niagara Falls Site.

CONTEXT OF CARE

Major redevelopments not only usher in new buildings with modern infrastructure, technology and design but, at the same time, they commonly introduce new models of care delivery, new programs and new services. The St. Catharines Site served as a spark to ignite a series of noteworthy improvements to patient care, including the Walker Family Cancer Centre, enhanced cardiac care services with the Heart Investigations Unit, inpatient and outpatient mental health services that are the first of its kind in Niagara Region and a family centred unit specializing in women's, babies' and children's health.

These additional services are a complement to the existing programs that migrated from the St. Catharines General and Ontario St. Sites including Acute Care, Surgical Care, Kidney Care, Emergency and Urgent Care, Complex Care, Palliative Care, Occupational Therapy, Physiotherapy and Diagnostic Imaging.

The St. Catharines Site delivers acute care for patients needing intensive and urgent levels of care, it also delivers complex care for patients with multiple health conditions

who require ongoing medical treatment and therapy. The spectrum of care also includes diverse outpatient programming. The St. Catharines Site is at the centre of a coordinated, integrated and expanding healthcare system for the Niagara Region.

PARTICIPANT CHARACTERISTICS

For every design evaluation, it is a fundamental requirement to have a representative and sufficient sample size to ensure the reliability and validity of the data as well as the generalizability of the findings. A representative sample, when combined with skillful concept measurement, allows for well-informed inferences and conclusions to be derived from the evidence - the user experience and evaluation data.

Thanks to the close cooperation between the Methologica research team, the hospital's communications staff and the outstanding volunteers at the St. Catharines Site, the participant levels were both balanced and large enough to generate meaningful data. The total number of participants in the survey component of the design evaluation was 1220, of which 189 were patients (111 inpatients and 78 outpatients), 740 were staff (including clinicians, non-clinicians, physicians, trainees, students, and volunteers), 23 were visitors and 268 were members of the surrounding community.

As part of the larger research study, 14 in-depth qualitative interviews were conducted with patients and staff using the moving interview method. The purpose of the interviews was to provide context and a deeper understanding of the patient and staff experience including 'how' and 'why' participants may be feeling or responding to particular spaces in the hospital.

Eligibility for patients to participate in the study was conditional on having the cognitive ability to carry on a conversation and be able to answer questions about themselves, their health, and their use of and experiences with the spaces in the hospital. The final requirement was to confirm their physical and mental ability to participate in an interview that could range from 30 to 45 minutes. If these conditions were met, patients were required to acknowledge their willful participation in the design evaluation, this was accomplished by an informed consent process wherein potential participants were provided with information about the study and, if they agreed to participate in the study, patients signed a consent form prior to engaging in the survey, moving interview or both.

As an acute care hospital, it is next to impossible to describe the typical patient at the St. Catharines Site. Acute care is

Moving Interviews

PARTICIPANTS

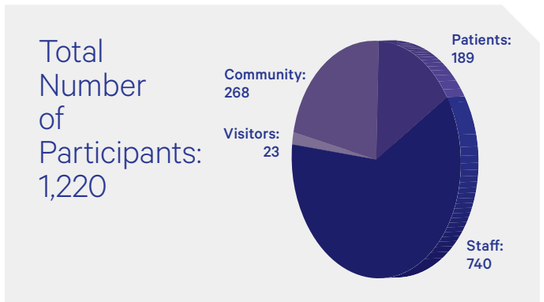
Patients - 6 total (From which Unit)

- Medical Surgery 〉 3
- Mental Health Outpatient 〉 2
- Walker Family Cancer Centre 〉 1

Patients used a variety of mobility devices including: manual wheelchair, crutches and a walker

Staff - 8 total (Occupation)

- Registered Nurse
- Volunteer
- Nurse Practitioner
- Nurse Educator
- Social Worker
- Biomedical Engineer
- Director
- Pharmacist

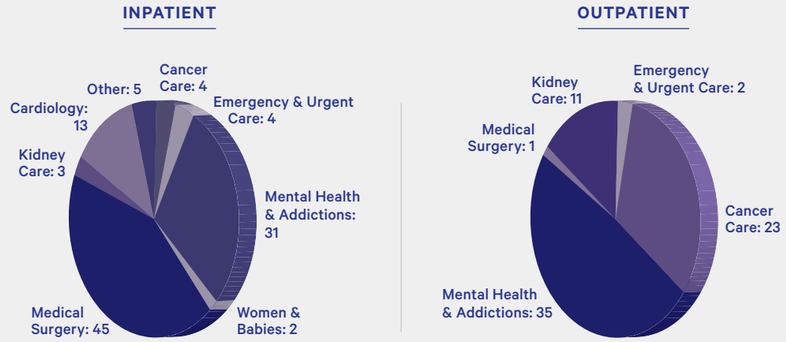


administered to patients who are in need of intensive and urgent levels of treatment; however, many patients present with multiple health conditions and are in need of complex care and ongoing medical treatment and therapy as well. The Walker Family Cancer Centre and the Mental Health and Addictions Centre are just two examples of the robust and diverse outpatient programming available at the St. Catharines Site. The patients who participated in the design evaluation represented an almost even balance between inpatients and outpatients, furthermore, the top three units with the highest number of participants were Mental Health and Addictions, Medical Surgery and Cancer Care.

It is important to highlight the impressive staff respondent numbers as the 740 staff participants represent deep and broad participation levels for a wide range of units and departments.

The sample leans towards more female participants than male, and represents full-time, part-time, permanent and temporary staff.

Patient Participants by Department



To date, this is the largest staff sample size harvested from one location for a design evaluation. The team at the St. Catharines Site deserves great applause for their expressed interest in hospital design. The unparalleled level of staff participation is a valuable resource that needs to be factored in when planning the early staff engagement exercises as it relates to the future design of the Niagara Falls Site. In fact, it is quite possible that staff were highly engaged in participating in the design evaluation due to the potential impact of user experience, impressions and outcome data captured at the St. Catharines Site on the design of the upcoming redevelopment.

DESIGN INTENTIONS

Early stakeholder engagement workshops with the Planning Design and Compliance architects from Cannon Design and the Design Build Finance Maintain architects from B+H Architects and Silver Thomas Hanley – STH in joint venture, proved extremely valuable. These collaborative sessions also included senior leadership, redevelopment officers, program directors and managers from the St. Catharines Site at NHS.

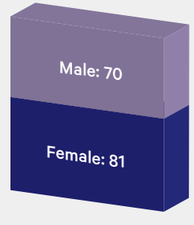
It is important to build a diverse, inclusive and collaborative stakeholder group because their knowledge and expertise helps put into context and explain how decisions were made and their resulting impact on the overall design of the St. Catharines Site. For example, it was during one of these meetings when it was revealed to the research team that the functional program was designed in advance of the selection of the building site, causing some inherent challenges for the design teams.

The strategic approach for this design evaluation was to use the design intentions of the new hospital as the theoretical basis against which to assess outcomes (see references by Alvaro and colleagues from 2013-2017 in the reference list for the establishment of this approach to design evaluation). The design intentions of the St. Catharines Site were identified

Patient Participants

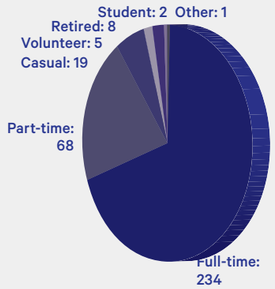
BY ADMISSION STATUS

BY GENDER



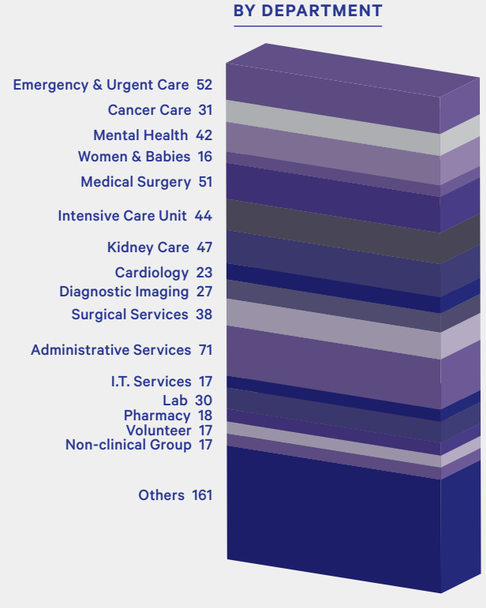
Staff Participants

STAFF TYPE



EMPLOYMENT STATUS

BY DEPARTMENT



Optimizing Participation

- > Staff are a useful resource for organizing, raising awareness and participation
- > Staff are more likely to contribute when believing that they can influence design change
- > Make plans on how to include previously marginalized patient populations
- > Create opportunities for individual and group survey completion
- > Engage with the community if suitable to the building design and anticipated use

through a series of interactive, detailed and diverse workshops that were held with the stakeholder groups. Through these sessions the overarching design intentions and anticipated outcomes for the various user groups were identified, as well as, identifying the spaces of greatest

significance to the design and the anticipated use of those spaces.

SPACES OF SIGNIFICANCE

The design intentions are evident in the spaces that are targeted for the St. Catharines Site design evaluation including points of entry and registration areas, social spaces, outdoor spaces and treatment areas.

The following spaces were considered for inclusion in the design evaluation but based on the stakeholder engagement workshops they were deemed to be lower in terms of priority relative to the other spaces. At any time in the future, targeted follow up studies can be conducted on these spaces:

- Teaching spaces
- Surgical and diagnostic imaging
- Parking lots
- Spaces in use by EMS and Niagara Police

The design intentions and priority spaces, along with the anticipated outcomes all served as guiding principles to develop the evaluation framework and the execution of the design evaluation.

The design intentions of the site are best categorized by the following principles:

- to provide a patient-centred design through the use of simplified way-finding throughout the building, extensive outdoor walking paths and gardens, natural light in every patient room, increased privacy with separate entrances for the community hospital, cancer centre and mental health units, and numerous lounge areas and quiet rooms throughout the facility for patients to spend time with family members and friends
- to provide an abundance of natural light through the strategic placement of floor to ceiling windows and borrowed light to create an uplifting feel and to enhance the connection to community, the escarpment and the vineyards – echoed with the use of natural materials and colours reminiscent of the wine region
- to create an animated “Main Street” concourse at grade to foster a sense of community and to provide improved and expanded public amenity space for patients, visitors and staff, including retail and food services

CAPTURING USER EXPERIENCE AND OUTCOMES

Evaluations are conducted for clinical, operational, functional and mechanical performance, it is therefore logical, that the next step would be to evaluate the design and built environment.

The landscape is evolving and investments in healthcare infrastructure are responding accordingly. Advances in modern medicine have resulted in a patient population that is living longer with multiple health conditions. This has created a demand for more complex care facilities. A transformative approach to mental health has seen billions of dollars pledged for new services and care facilities. Furthermore, cancer diagnoses are on the rise leading to more investments in cancer care facilities.

Is what we are building working? The look and feel of hospitals are changing. Hospitals are being designed and built differently. These new approaches need to be tested to see if the hospital design intentions are achieving the anticipated outcomes. This can be done by capturing the user experience and outcomes for all users.

With the government being the major financier of healthcare redevelopment projects, there is a responsibility to manage public funds with transparency and accountability. By conducting design research evaluations, you can capture the user experience and identify what is working and what is not. These findings will assist in ameliorating underperforming areas and more importantly, educate others to avoid making the same multimillion dollar mistakes in future builds.

THE TRANSFORMATION CONTINUES

The St. Catharines Site represents the newest chapter of a larger narrative that entails the reorganization of healthcare

Optimizing Design Evaluation

- It's never too late to do an evaluation
- Perform a pre and posttest evaluation
- Use the data to influence future designs at Niagara Falls Site and Welland
- Use promising findings to enhance underperforming areas at the St. Catharines Site
- Schedule ongoing evaluations to respond to changing patient needs
- Targeted and small scale evaluations can be beneficial, you don't need to do the entire facility
- Use mixed quantitative and qualitative methods to assess the impact of design on user experience and outcomes
- Custom measures enhance the power of evaluations

in Niagara Region. The story begins in 1999 when the Ontario Health Services Restructuring Commission called for the amalgamation of eight hospitals. Three large community hospitals, three smaller rural hospitals, one specialty complex care hospital and one outpatient rehabilitation centre would be merged into a new entity known as Niagara Health.

This complex merger played out on many fronts from the rebranding exercises that were very public in nature, to the consolidation of boards and foundations, restructuring administrative roles and procedures, and integrating infrastructure and patient programs.

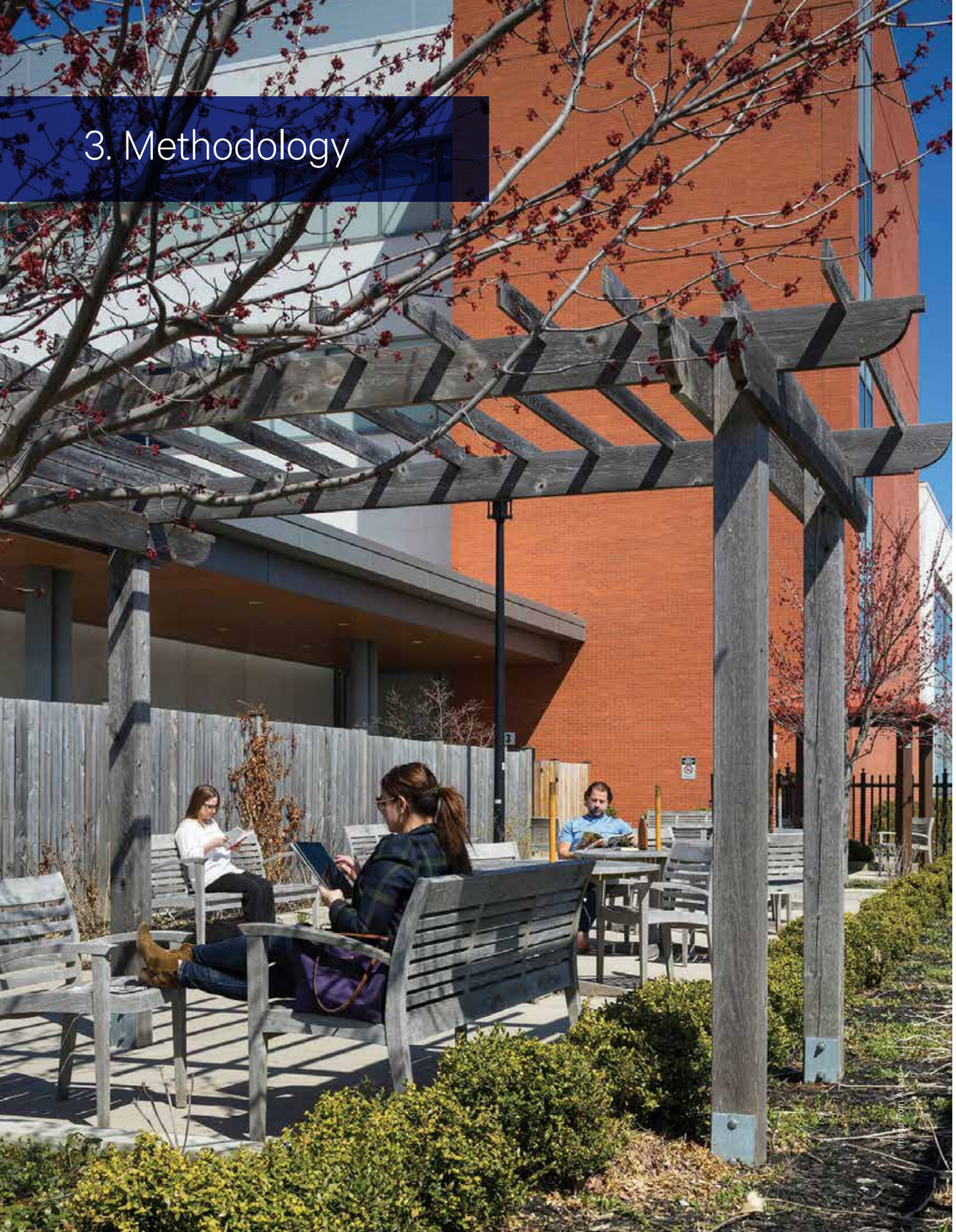
What started as an amalgamation of eight healthcare facilities is currently now a collection of six sites with a plan to further evolve into three locations. The trinity will consist of the existing St. Catharines Hospital, the Niagara Falls Hospital and the Welland Hospital. When the Niagara Falls Hospital is completed patients will have access to emergency and urgent care, laboratory services, ambulatory clinics, full diagnostic imaging, general surgical services, a regional stroke program, seniors' wellness and aging programs, breast screen services, chronic disease management programs, mental health and addiction programs for children, youth and adults, as well as a ground breaking artificial intelligence technology.

Plans for the Welland Hospital have yet to crystalize but they are expected to include emergency services, an ambulatory care clinic as well as complex care and long term beds.

Building and integrating a regional healthcare plan requires balancing many priorities with a seemingly endless number of variables. The findings from this design evaluation can help shape the direction for both future sites in Niagara Falls and Welland. This design evaluation helps NHS leadership understand what design features work best for whom and in what context, it also helps bring clarity to how various spaces in the hospital are being used. The design evaluation reveals what design successes can be repeated and enhanced while bringing attention to design pitfalls that are to be avoided.

> "It is too short sighted simply to believe bigger is better, newer is better, more is better."

3. Methodology



Methodological Approach

NHS is in a unique position; this design evaluation was conducted approximately five years after the opening of the hospital. Ideally, a design evaluation includes a pretest phase with data collection occurring one year before any construction begins and a posttest phase that entails collecting data one year after the official move into the new facility. While this evaluation does not follow the traditional design evaluation timeline, being solely a posttest evaluation, the findings are still extremely valuable and useful as they have the potential to impact the planning stages and the design decisions for the upcoming redevelopment of the Niagara Falls Site.

An advantage to conducting the St. Catharines Site design evaluation almost five years removed from the official opening is that the evaluation occurs in a fully matured facility. Staff are familiar with their surroundings, hospital programming has been fully phased in and the outdoor amenities are fully landscaped and furnished. By conducting the design evaluation at this time it is possible to assess the original design intentions and any modifications that occurred over the years.

RESEARCH METHODS

As a posttest only design evaluation, the overall evaluation design included mixed quantitative and qualitative research methods that assessed the impact of the St. Catharines Site design on patients, staff, visitors and community users.

The methods were selected based on the following: the root of the research questions to be addressed, the construct to be assessed and the desired conclusions to be made. Whereas quantitative methods allow for the attribution of causality and enable generalization, qualitative methods allow for the contextualization and documentation of the lived experience.

The selected methods enable the assessment of both anticipated and unanticipated uses as well as the consequences of the building design.

Methods

- Quantitative computer assisted surveys were crafted to assess perceptions and experience of facility design and well-being among patients and staff.
- Unobtrusive naturalistic observation to enable covert observations of user behavior and interactions within the built environment. Patterns of use, social interactions and activities were captured without disrupting naturally occurring behavior.
- Moving interviews which combine focused interviewing with participant observation. Researchers accompanied participants, both staff and patients on their natural outings and actively explored their physical and social practices by asking questions, listening, and observing.
- Hospital administrative outcomes allowed for the comparison of data from hospital administrative databases from one year prior to the opening of the new facility and for each of the four years post-move into the new facility.

QUANTITATIVE METHODS

Quantitative research methodologies are necessary to attribute cause and effect. The quantitative surveys were conducted to assess the impact of the architectural design on psychosocial well-being and the perceived health of patients, staff, and where possible, visitors. Community responses were captured using the telephone technology.

Surveys

Computer assisted surveys were administered to patients. Taking into account the complexity of the patient population, the patient surveys were conducted in tandem with a researcher. The data was collected via an interview format using a bespoke software platform. The software was selected for its ability to present images, randomize question order, create visual response options, and directly enter the responses into a computer.

Staff completed a web based self-administered survey that was posted on a secure website. This was the only noticeable difference between the two surveys, whereas the staff completed the survey on their own, patients completed the survey with a researcher.

In an effort to be as inclusive as possible a proxy survey was created to allow for the participation of patients who otherwise would not have been able to share their experiences of the hospital design. The ideal proxy is a close family member, loved one or friend who is able to respond on behalf of or from the perspective of the patient. The survey is identical to the patient version with slight wording modifications.

Hospitals play a significant role in community building. Increasingly, healthcare environments are considering the hospital's role in community as encompassing more than the provision of healthcare alone. It was therefore important to incorporate the community perspective and their impressions of the hospital design. Community participation was facilitated using telephone technology known as interactive voice response (IVR). The questions were similar to the staff and patient surveys however, because it was executed

Image: Tom Arban

Naturalistic Observation Zones

OBSERVATION ZONE	SPACE TO BE OBSERVED		
Entrances	> Main entrance • Exterior upon arrival • Pick up and drop off zone • Interior upon immediate entry • Registration and adjacent seating area • Information desk • Discharge waiting area > Staff entrance > Cancer Centre entrance	> Mental Health and Addictions entrance	> Emergency and Urgent Care entrance
Main Street Concourse	> Cafeteria (canteen/servery and Tim Horton's) > Cafeteria seating area	> Outdoor terrace adjacent to the cafeteria > 2nd floor café seating	> Retail areas > Spiritual care centre
Emergency and Urgent Care	> Entrance > Admitting/registration > Seating areas > Triage areas	> Workstations > Treatment areas > Corridors/circulation areas > Diagnostic imaging	(primarily the seating areas and flow from emergency and other areas) > Surgical services (directly observable areas only)
Cancer Care/Oncology	> Registration > Self check-in > Seating areas > Workstations	> Chemotherapy treatment area > Radiation therapy area > Patient and family lounges	> Staff lounges > Healing garden / outdoor terrace > Corridors/circulation areas
Mental Health and Addictions	> Entrance > Registration > Seating areas > Workstations	> Patient rooms > Inpatient unit configuration > Recreation therapy spaces > Activities of daily living room	> Patient and family lounges > Staff lounges > Outdoor courtyards > Corridors/circulation
Women Babies and Children	> Admitting/registration > Workstations > Inpatient unit configuration	> Individual bassinette rooms (if possible) > Patient and family lounges > Staff lounges	> Children's play lounge > Outdoor areas > Corridors/circulation areas
Outdoor Spaces	> Entrance and circulation from the parking areas > Outdoor area adjacent to the staff entrance > Staff terrace	> Terrace adjacent to the cafeteria > Mental health and addictions courtyards and outdoor activity areas	> Healing garden in the cancer centre > Outdoor walking paths
Transition Areas	> Seating areas	> Corridors	> Elevator banks

Image: William Suarez

by audio only it was impossible to replicate the visual components of the survey.

Measures

Given the unique approach to design evaluation in this study, wherein design intentions informed the selection of outcomes to be assessed, several custom measures were created. Custom measures included impressions of the overall building design, the experience of the building, its setting, and designated spaces; affective reactions to various spaces throughout the hospital; sense of connection; and perceived improvement among patients. Measurement scales were crafted to enable the detection of subtle differences in responses.

QUALITATIVE METHODS

Whereas quantitative methodologies enable causal inference, generalizability and replication, qualitative methodologies are used to contextualize and describe the phenomena under study.

Naturalistic observation was used to understand how people use and interact with the spaces both inside and outside of the hospital. Moving interviews were used to emulate and understand the patient and staff experience of various spaces in the hospital.

Naturalistic Observation

Naturalistic observation is a research method that involves observing people in natural settings without their awareness. The covert approach is necessary because people often change their behaviour if they know they are being watched. In naturalistic observation, researchers "blend in" without being noticed and observe the behaviour and social interactions of people in various settings.

In the study naturalistic observation is deployed to better understand how people use and interact in various spaces both inside and outside of the hospital - social spaces, areas for quiet contemplation or rest and outdoor destinations.

Executing natural observation techniques cannot be described as simply "people watching". The selection of spaces and our observations were informed by socio behavioural theories, monitoring expected and unexpected uses of the spaces, and tracking the expected and unexpected users.

In particular, observations focused on patterns of use and behaviour across the spaces targeted for study including but not limited to social interaction, activity type, circulation, wayfinding. When possible, patients, staff and visitors were unobtrusively followed to track the number of times they appeared lost and where they were located in the hospital when this experience occurred, as well as what activities they engaged in along the way. Furthermore, the evaluators traced the users' steps in finding their way to their destination.

Moving Interviews

As part of the larger research study, 14 in depth qualitative interviews were conducted with 6 patients and 8 staff using the moving interview method. The purpose of the moving interview was to provide context and a deeper understanding of the patient and staff experience including 'how' and 'why' participants may be feeling or responding to particular spaces in the hospital.

The moving interview combines in-depth interviewing with participant observation so that researchers accompany participants on their natural outings and actively explore the physical and social practices by asking questions, listening, and observing (Kusenback, 2009). This method, which can be described as interviewing on the fly in the midst of daily living guided tours, has been shown to be effective for studying the implications of surroundings on health and well-being. The Methologica team first applied this method in the Bridgepoint Active Healthcare pretest posttest evaluation and it has become an essential method across all evaluation projects.

The approach was initially adapted from the go-along interview (Carpiano, 2009) but it was later uniquely tailored by Dr. Paula Gardner for use in capturing the user experience of the built environment in tandem with other qualitative and quantitative methods (see references by Dr. Alvaro and colleagues from 2013-2017 listed at the end of this report).

In this study focusing on the impact of facility design on health, the moving interview method was used to explore how, and in what ways, does architectural design influence the health and well-being of patients and staff and what elements of facility design are most significant to the user experience. Visual (photographs), textual (field notes) and auditory (audio recording) data were used during the moving interview method. The images provided visual documentation of the contexts and actions of the everyday life of participants.

Patient Moving Interviews

Patient moving interviews consisted of a hospital journey that began in the patient's room or central meeting place (i.e., cafeteria) and followed self-identified travel routes to key places of interest for the evaluation including private, public and transitory spaces within the hospital. The mode of travel (e.g., walking or wheelchair) and the site(s) visited (e.g., cafeteria or outdoor terrace) were decided by the participants. Patients were asked to take us to a favourite or most-used space in the hospital. Data collection focused on patient's impressions, experiences and knowledge of these places with attention to the design intentions of the facility, ease of navigation and wayfinding, patient mobility needs, barriers, and supports, and finally their overall experience of the facility design.

Staff Moving Interviews

Staff moving interviews involved a journey as they engage in their work and negotiate spaces that are integral to their role. In essence, it was a form of shadowing with selected prompts

to understand staff impressions, experiences and knowledge of spaces of greatest importance to their workday with particular attention to the design intentions of the facility, how the design facilitates and/or hinders their performance and function in the workplace and, lastly their overall experience of the facility design.

HOSPITAL ADMINISTRATIVE OUTCOMES: PRE AND POST OCCUPANCY

A common approach to design evaluation involves the comparison of data from hospital administrative databases before and after the redevelopment (i.e. pre and post move to the new facility). This method limits the ability to attribute observed outcomes to differences in facility design. The direct link can be established through a unique case control method and custom survey data. This approach was presented to hospital leadership and the Ministry of Health and Long Term Care however, it was not permitted due to hospital data policies. Clinical and administrative data sources were used to examine differences in functional health and organizational efficiency outcomes related to patients and staff.

Information from patient, staff and organizational administrative databases were obtained from the Niagara Health and compared beginning from one year prior to the move into the new facility (2012) and across each of the subsequent years up to 2017. Measures included functional health outcomes, organizational efficiency, satisfaction and quality outcomes for patients and staff. Among the measures included were: satisfaction, WSIB incidents, hires, turnover, vacancy rates, time to fill positions, age distribution of staff. Overall organizational outcomes included: patient length of stay, transfers (unit and bed), hand hygiene, infection control rates, operating room volumes, operating room utilization, emergency utilization, and emergency department

4. User impressions

Overall Impressions of the Hospital Design

Overall impressions of the hospital design were assessed on the basis of concepts that align with the design intentions. Using a semantic differential scale ranging from 1 to 10 where lower numbers represent negative impressions and higher numbers represent favourable impressions, participants were asked to rate their impressions of the hospital design on the following attributes: a place of wellness, accessibility, wayfinding, safety, inspiration, hope, welcoming, connection to nature, community, and others.

When comparing the overall impressions (i.e., average impression ratings across all attributes) of the hospital design among the different user groups, patients scored the highest – demonstrating significantly more favourable impressions of the hospital design relative to visitors, staff and community. Given that the predominant design intention was to create a patient centred environment and facility, this is arguably one of the most convincing outcomes to validate the design.

Upon further examination of the data, the root causes for elevated patient impression ratings of the hospital design are not necessarily as anticipated. Two of the key components to the patient centred design were simplified wayfinding and a perimeter of outdoor pathways and gardens. Oddly, although the patient impressions were positive (above 5 out of 10) ease of navigation and finding one's way were the second lowest scores. Ease of navigation and finding one's way only topped connected to nature which was the lowest score relative to all other impression ratings.

Impressions of the hospital design that resonated the strongest among patients were safety, welcoming, hopeful and accessible.

Whereas staff responses always register a few points below, their responses essentially mirrored patient scores. The most favourable impressions of the hospital design among staff were safety, welcoming, hopeful and accessible but staff actually had negative impressions (less than 5 out of 10) for wayfinding, they found it difficult to find their way and felt more disconnected from nature.

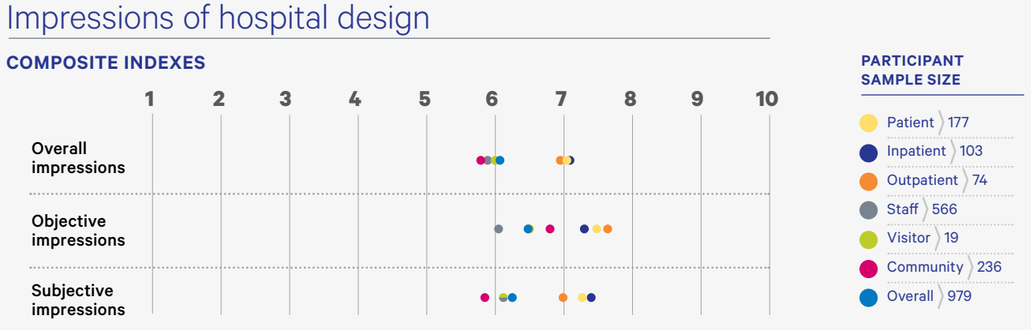
When the overall impressions are further distilled into two sub categories: **objective impressions** - *accessibility, wayfinding, safety, perceived distances to elevator and destination* and **subjective impressions** - *inspiring, content, pride, calm, brave, hope, connectedness and welcoming*, outpatients score higher than inpatients in objective impressions. Subjective impressions show higher scores for inpatients. Inpatients and outpatients score much higher on both objective and subjective impressions of the hospital design than staff. Interestingly, when compared to all user groups, staff score the lowest in objective impressions and community score the lowest in subjective impressions.

An additional feature of the patient centred design was to provide increased privacy – as manifested through separate entrances for staff, cancer care, mental health and addictions and the emergency department. It was hypothesized that the separate entrances would contribute to an overall ease of navigation and wayfinding. With separate entrances, registration areas and treatment spaces, the cancer centre and the mental health and addiction wings can be isolated and evaluated independently. It also serves as an excellent case study of the two areas as they are compatible for comparison.

When comparing the overall impressions of the hospital design, cancer care patients demonstrated the highest scores, significantly higher than mental health patients. Cancer care patients have more favourable impressions of the hospital design across all attributes relative to mental health and addictions patients. Impressions of the hospital as a place of wellness (vs. illness) and connected to nature (vs. disconnected) are less discrepant across cancer care and mental health and addictions. Connection to nature emerged as the lowest score across all patient units.

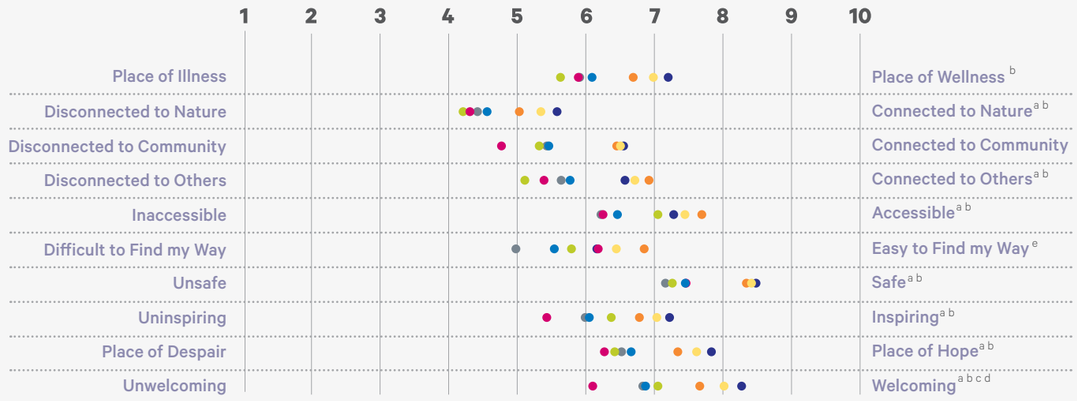
The most noticeable discrepancies between impressions of the hospital design among cancer care and mental health

Impressions of hospital design



Across each composite index, patient impressions are significantly higher than staff impressions and community impressions ($p<.05$). Objective impressions are slightly more favourable for community relative to staff. There is a trend (but not statistically significant) for inpatients to have favourable subjective impressions than outpatients.

Impressions of hospital design[a]



The following statistically significant differences were observed: a. Patient impressions are significantly more favourable than staff impressions across all attributes ($p<.05$). b. Patient impressions are more favourable than community c. Inpatient impressions are more favourable than outpatient d. Staff impressions are more favourable than community e. Community impressions are more favourable than staff

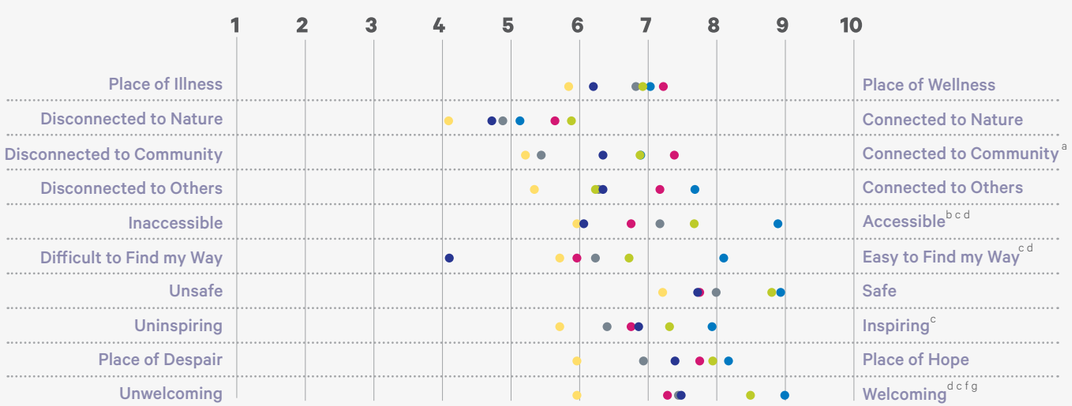
and addictions patients are noted in their impressions of wayfinding (easy to find my way), accessibility and welcoming – with cancer care patients reporting more favourable impressions than mental health and addictions patients.

Medical surgery patients express more favourable impressions of safety, welcoming and hope. Conversely, and consistent with all other patient units, their least favourable impressions are the extent to which they feel connected to nature.

The impressive staff participation numbers generated a bountiful sample size that enabled a thorough analysis of staff impressions of the hospital design from several departments. For overall impressions of the hospital design, non-clinical staff (comprised of staff from food, retail, maintenance and parking services) have the highest scores followed by administrative services. The lowest impressions are reported by staff from cardiology and the intensive care unit.

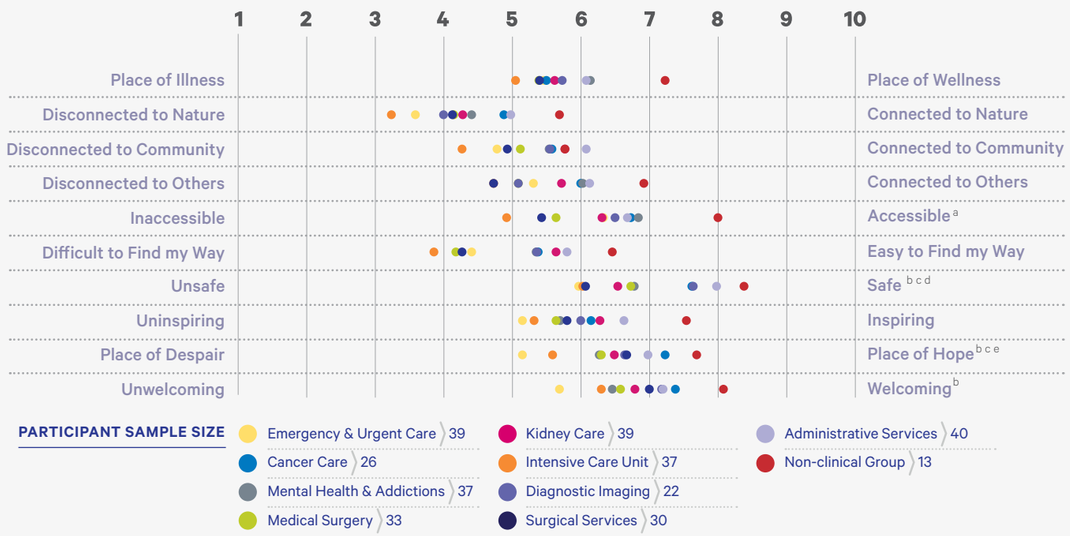
The largest differences across departments are revealed in impressions of safety and hope. With respect to safety, non-clinical staff have the most favourable impressions – with an average rating of 8.38. In contrast, the least favourable impressions are reported by staff from emergency and urgent care (5.97), the intensive care unit (6.03), cardiology (6.06)

Impressions of the hospital design by patient unit



Where noted with the letters a,b,c,d,e,f,g the following statistically significant differences (p<.05) are observed:
a. Medical Surgery and Kidney Care and Outpatient impressions are more favourable than Mental Health b. Cancer Care patient impressions are more favourable than Emergency & Urgent Care c. Cancer Care patient impressions are more favourable than Mental Health d. Cancer Care patient impressions are more favourable than patient impressions in departments classfied as Others e. Mental Health and Medical Surgery patient impressions are more favourable than patient impressions in departments classified as Others f. Cancer Care patient impressions are more favourable than Kidney Care and Outpatients g. Medical Surgery patient impressions are more favourable than Emergency & Urgent Care

Impressions of hospital design by staff department



Where noted with the letters a,b,c,d and e the following statistically significant differences (p<.05) are observed:
a. Non-clinical staff have more favourable impressions than the Intensive Care Unit staff b. Non-clinical staff have more favourable impressions than the Emergency & Urgent Care staff c. Administrative Services staff have more favourable impressions than the Emergency & Urgent Care staff d. Administrative Services staff have more favourable impressions than the Intensive Care Unit and Surgical Services staff e. Cancer Care staff have more favourable impressions than Emergency & Urgent Care staff

and surgical services (6.07; with no statistically significant differences across these departments).

The two departments who see the hospital design as most hopeful were non-clinical units (7.69) and cancer care (7.23). In contrast, the two departments who view the hospital design as least hopeful were emergency and urgent care (5.15) and the intensive care unit (5.59).

Similar to the patient scores, staff responses are lowest when asked how connected they feel with nature.

SENSE OF CONNECTION

In March 2000, Niagara Health emerged from the full amalgamation of eight hospitals – three large community hospitals, three small rural hospitals, one specialty complex care hospital and one outpatient rehabilitation centre. With so many facilities spread throughout Niagara Region it was easy to recognize the interweaving of care delivery and community.

The new St. Catharines Site represented a change in how care would be delivered in Niagara Region. The new St.

Optimizing Design Impressions

- Enhance the real connection to the natural landscape, vineyards, escarpment and surrounding areas
- For those with prolonged stays in the hospital, subjective design elements are more relevant
- For shorter stays or visits, objective design elements are more relevant

Catharines Site replaced two facilities - St. Catharines General and Ontario Street Sites – as a consequence it was much larger than previous facilities - with almost one million square feet and the introduction of new regional services. As an homage to the past, one of the overarching design intentions was to preserve or replicate that community feel in the new St. Catharines Site.

Using a bespoke visual analogue scale depicting four levels of connection between themselves and the target context (nature, community, others) where 1 represents being very disconnected and 4 represents being very connected on a scale ranging from 1 to 4, participants were asked to select the image that most accurately depicts their level of connection. The closer they are to the setting in the selected image, the greater their sense of connection.

Results reveal that outpatients feel most connected to others, followed by inpatients, staff and visitors. When assessing connection to community, inpatients feel most connected followed by outpatients, visitors and staff.

The lowest scores for all users is their perceived connection to nature. Despite having access to some meaningful views of the lush green landscape surrounding the hospital and

the incorporation of a colour palette inspired by the local vineyards and escarpment, the design features that were intended to enhance the connection to nature do not resonate with the users.

Sense of connection*

PARTICIPANT SAMPLE SIZE

Patient	173	Outpatient	71	Visitor	18
Inpatient	102	Staff	527	Overall	718

*Sense of connection to nature, community, and overall connection was significantly greater for patients relative to staff."

5. User Experience and Spaces

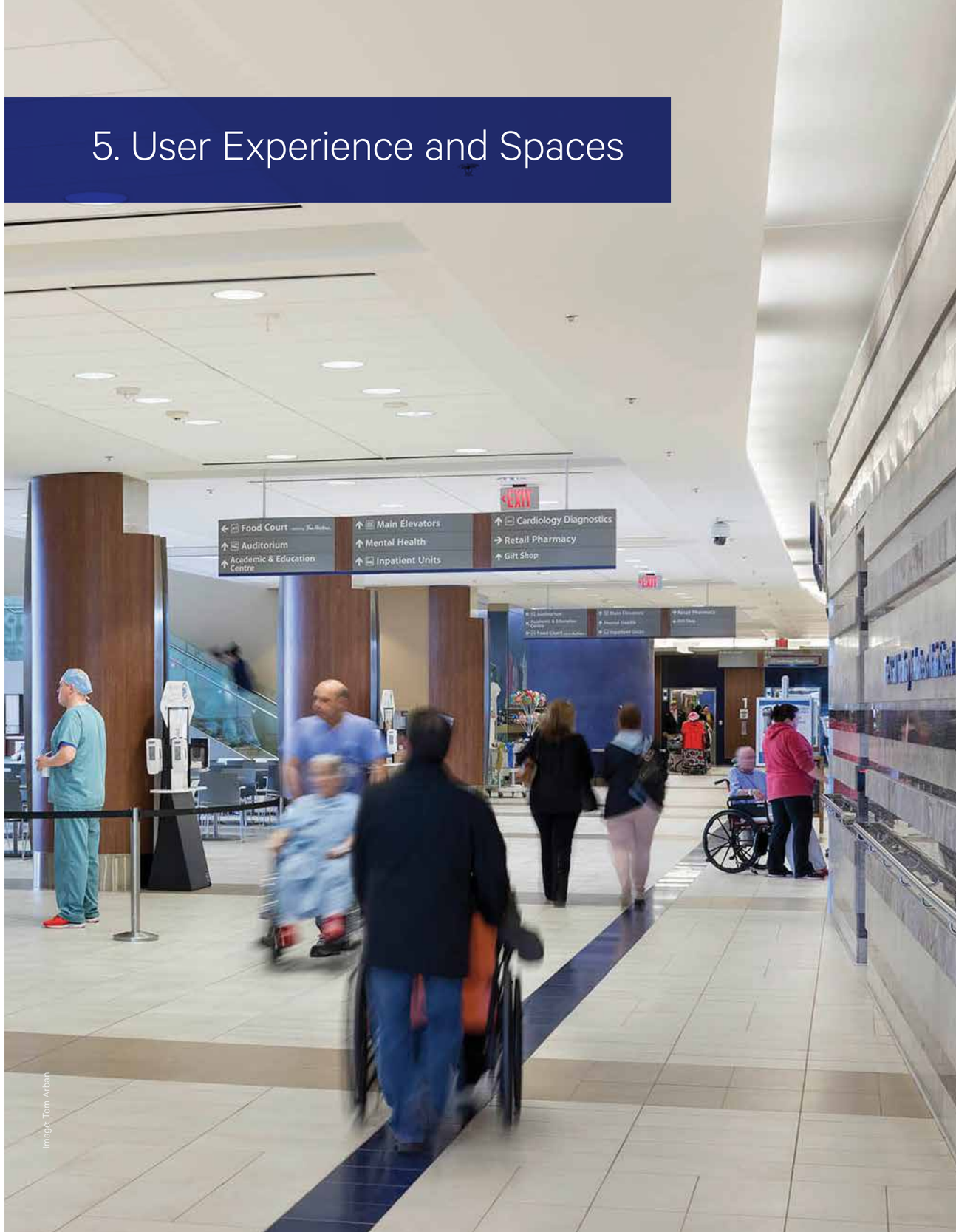


Image: Tom Arban

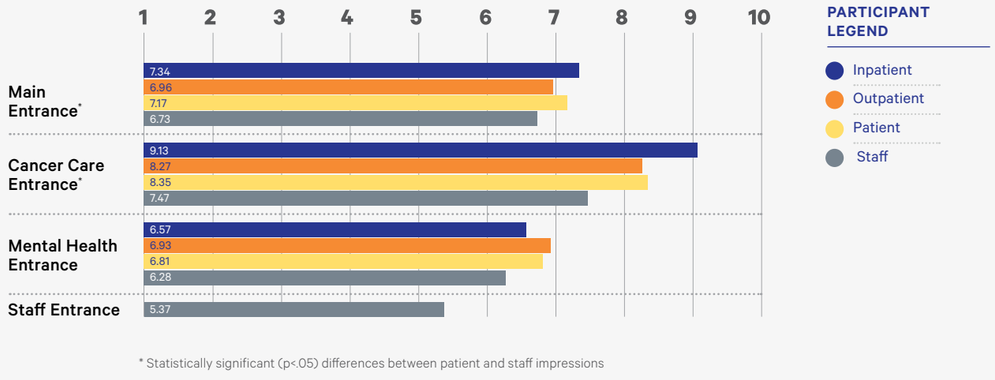
Use and Impressions of Spaces

Once a building site is selected and a master plan has been developed, functional programming takes its place as the first stage in the design process. During this time physicians, staff, and groups representing patients and families are invited to provide their input on the design and function of the programs and services that will be available in the new facility. This includes patient flow, volume workflows, space requirements and adjacencies. Whereas it is unconventional for most healthcare redevelopment projects, the functional program for the St. Catharines Site was completed prior to securing a building site. As a consequence, it was impossible to consider how the program areas might be affected by and or interact with the eventual site and surrounding environment.

Healthcare facilities are more than just a collection of patient rooms, clinical spaces and functional programming areas. There are many other locations throughout the healthcare facility such as points of entry, social spaces and outdoor areas. While these areas are often incorporated into the design, the lion's share of a redevelopment project budget is with good reason typically allocated to areas which serve a very specific and well defined functional role in the delivery of care. Interestingly, environmental psychology, community health and the World Health Organization recognize the built environment as a key determinant of health. Perhaps more directly relevant, the Bridgepoint Active Healthcare pretest posttest design evaluation was the first of its kind to demonstrate the ancillary impact of impressions and experience of non clinical spaces on well-being and health related outcomes (Alvaro, Kostovski, Wilkinson, & Gardner, 2015; Alvaro, Wilkinson, Gallant, Kostovski, & Gardner, 2016).

With foresight and recognition of the role that ancillary spaces play in contributing to the overall healing environment, considerable resources were devoted to creating secondary spaces to complement and enhance the patient centred design philosophy that inspired the design of the St. Catharines Site.

Impressions of entrances



* Statistically significant (p<.05) differences between patient and staff impressions

Similar to the overall impressions of the hospital design described earlier, impressions of specific spaces in the hospital were assessed on the basis of concepts that align with the overall design intentions. Using a semantic differential scale ranging from 1 to 10 where lower numbers represent negative impressions and higher numbers represent favourable impressions, participants were asked to rate their impressions of the spaces on the following attributes: a place of wellness, accessibility, wayfinding, safety, inspiration, feelings of content, pride, calmness, bravery, hope, welcoming, connection to nature, community, others, an open space, and proximity to the elevator or destination.

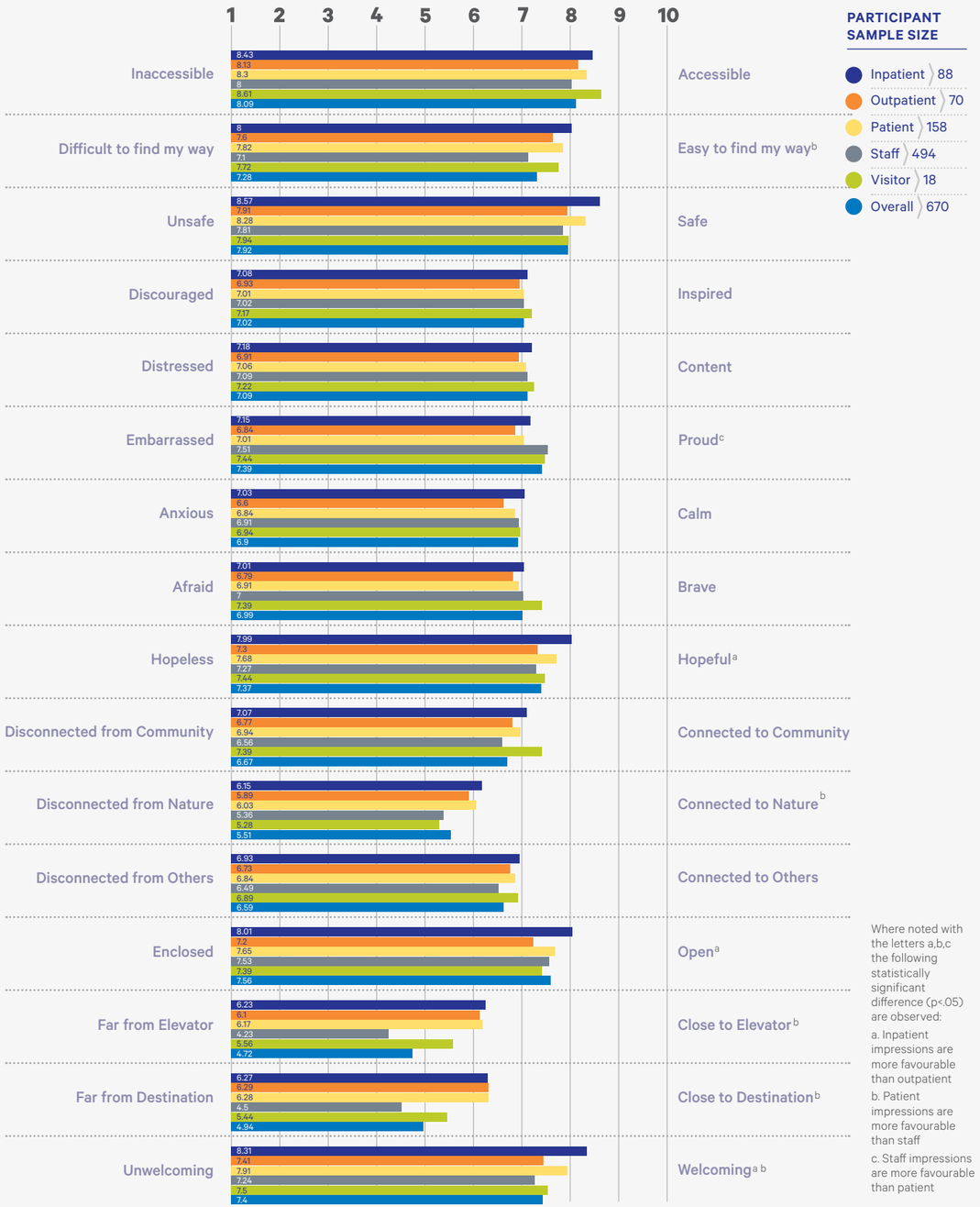
ENTRANCES AND REGISTRATION

Patient privacy was an integral design consideration. The enhancement of patient privacy was to be accomplished through a series of separate entrances and registration areas targeting specific user groups. In total, the St. Catharines Site features five distinct points of entry: the main entrance, staff entrance, cancer centre entrance, mental health and addictions entrance, and the emergency and urgent care entrance.

Main entrance

The design intentions were to create an obvious, prominent, immediately accessible and welcoming public entrance as the main point of arrival. Attention to scale allowed for the adjacent outpatient areas to be immediately accessible from

Impressions of the main entrance



Where noted with the letters a,b,c the following statistically significant difference ($p<.05$) are observed:

a. Inpatient impressions are more favourable than outpatient

b. Patient impressions are more favourable than staff

c. Staff impressions are more favourable than patient

the entrance. The open concept arrival allowed for vast sightlines to the public amenities including retail services and the cafeteria. Furthermore, the main elevator bank located at the end of the corridor was visible allowing for access to inpatient units. The objectives were to reduce stress and anxiety, provide clear navigation and circulation paths to other areas of the hospital.

An abundance of natural light permeates the entrance and illuminates the adjacent areas. The intention was to create an uplifting space that maintains the connection to community. The use of natural materials and colours reminiscent of the wine region, escarpment and vineyards was an attempt to bring outdoor elements inside.

The most frequent users of the main entrance are staff followed by outpatients, and inpatients. Despite using the entrance with less frequency than the other two groups inpatients have more favourable impressions of the entrance than staff and outpatients. The impressions that resonate the strongest with inpatients are safe (8.57), accessible (8.43) and welcoming (8.31). These same impressions resonate the strongest with outpatients too, but in a slightly different ranking, accessible (8.13), safe (7.91) and welcoming (7.41).

The user experience data from the main entrance reveals that this space is successful. The aspirations of creating an accessible, welcoming and prominent entry point for all users has materialized and is supported by the evidence. There are some areas for concern as the placement of the parking self pay machines are directly across from the wayfinding and information kiosk. Often the queue for payment blends with the opposing queue of individuals requesting assistance from volunteers at the kiosk. As a consequence, a bottle neck is created and is further congested by individuals passing through from the main entrance doors to the main street corridor as well as those engaged in casual conversation.

To facilitate a more efficient flow of people, volunteers are positioned in front of the kiosk and initiate conversation with those who look confused upon entry or exit. To further alleviate the congestion at this junction, the self pay machines could be relocated closer to the discharge waiting area or in the main registration area where the foundation is currently set up for lottery ticket sales.

Image: Melanie Elliott

Staff entrance

Throughout the hospital, a deliberate decision was made to create a separation between public and staff only areas. To this end, staff enter at the area farthest from the main entrance. The staff entrance is positioned at the back of the “Main Street” corridor and adjacent to an exclusive staff parking lot.

For safety and security reasons the original staff entrance (door 35) has been decommissioned and as a result staff are using an entry point located only a few steps away (door 32). Although very close in proximity the two staff entrances do have some design differences that are noticeable as you enter. This may account for the negative impressions. Staff find the entrance to be unwelcoming (4.16), they feel disconnected to community, nature and others, and they feel discouraged (4.97). Arguably, even their more favourable

scores are not that strong of an endorsement of the staff entrance. Their more favourable impressions are practical or functional in nature. They feel that it is close to the main elevator bay (6.31), it is accessible with an ease of navigation (6.22) and it is safe (6.09).

It should therefore come to no surprise that staff use other entry points with more frequency than their own dedicated entrance. This could be a response to their unfavourable impressions of the design. For example, when comparing the lowest impressions of the staff entrance with the impressions of the main entrance we see noticeable differences. Staff find the main entrance to be welcoming (7.24) and inspired (7.02), they also find it to be accessible (8.00) and safe (7.81). However, their motivation to use the main entrance with greater frequency could be for practical reasons, it may be closer to their workstation.

Additional points of entry were created catering to different patient populations. The intention was that not only would these patient specific entrances increase privacy but they would improve wayfinding, patient ambulation and shorten travel distances.

Walker family cancer centre entrance

A contrasting exterior façade distinguishes the Walker Family

Cancer Centre from the main hospital. The entrance to the cancer centre offers privacy and it was intended to be a welcoming home-like environment promoted through the use of design elements such as wood flooring, a fireplace, colours inspired by nature, floor to ceiling windows and an inviting space intended to foster hope.

Relative to all other entrances, the cancer centre has the most favourable overall impressions. The scores are significantly high, patients see the entrance as being accessible (9.30), safe (8.91) and welcoming (8.83), the lowest score is connected to nature (7.22). Staff impressions are a little lower, but still generally high compared to other spaces in the hospital, the top three impressions are accessible, safe (8.10) and easy to find my way (8.00). For both user groups the lowest score is connected to nature, patients (7.22) and staff (5.55). The lower connected to nature scores is a reoccurring trend that appears across user groups and spaces.

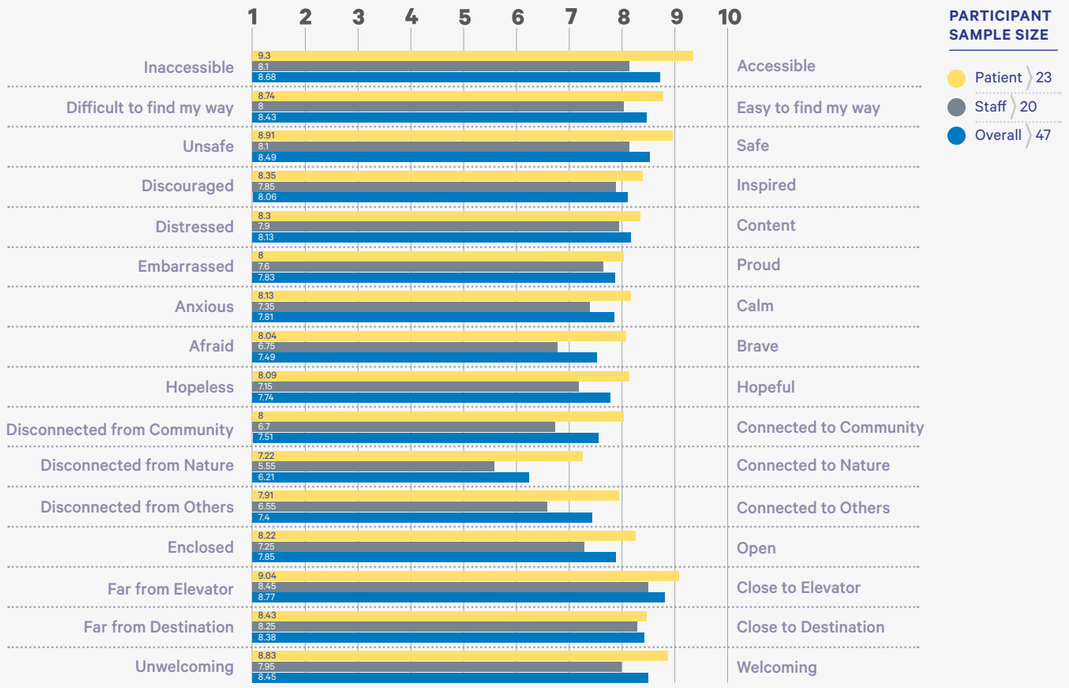
Impressions of the cancer centre entrance are so positive that it would be sensible to use this design and the human experience aspects as inspiration for future entrances.

The multilevel cancer centre has its own set of elevators. As a consequence, the high patient and staff impressions of the proximity of the elevator to the entrance and to their destination can be directly attributed to this design feature. The corresponding ratings are much lower for users of the main entrance who are required to walk the length of the main street corridor before they arrive at the elevator bay.

Mental health and addictions entrance

To offer enhanced privacy and a separation from the activity of the main hospital and other program areas, the mental health and addictions entrance is accessible via a separate parking lot. Similar to the cancer centre entrance, the intention was to create a welcoming, non-threatening and home like environment. The entrance features wood flooring,

Impressions of the cancer care entrance



large windows, a quiet seating area and a distinct registration area separated from entrances to the treatment, recreation and therapy areas.

The most favourable inpatient impressions of the entrance are safe (8.13), ease of navigation (7.63) and hope (7.56) with accessible (7.38) and welcoming (7.31) following suit. The most noteworthy outpatient impressions are accessible (7.82), safe (7.76), hope (7.73) and brave (7.18). It is refreshing to see such positive scores for being hopeful and brave, two very important characteristics that have been shown to impact patient responsiveness to treatment.

This entrance is tucked away on the south side of the hospital and by design it is far less animated than the other entrances whose activity is bolstered by the larger parking lots and sheer volume of patients and visitors who use those entrances. The mental health entrance is quieter and surrounded by green fields and the outdoor pathway that encircles the hospital. It can be so quiet that at times you can

hear in the distance bird cannons being deployed to scare away birds from preying on crops.

Although the mental health and addictions entrance impressions of accessibility were high, patients do on occasion encounter serious challenges accessing the entrance. During our moving interviews an outpatient revealed that their parking pass is only valid in lots A and B, they cannot get a pass to have discounted rates for the mental health lot. They either pay the regular rate to park in the mental health parking lot or pay a reduced rate to park in the other lots and embark on a much longer walk to the mental health entrance.

"The day passes only work for parking lots A and B, and not for the mental handicap parking lot. They should work for all of them. If I have to walk that far, I must bring my walker. And then I need to stop twice in between. But if the day passes worked for this one, it wouldn't be such an issue."

When they were asked why they don't use the main entrance when they park in lot A or B. The response had more to do with wayfinding than travel distance. They felt that either walking indoors via the main entrance or walking outdoors to the mental health entrance was more or less the same distance. The difference is that they were unfamiliar on how to access the mental health unit from the interior, on the few occasions where they tried they got confused, lost their way, and showed up late for their appointment.

"I can't find my way to get to where I need to go. So, you're better off trying to park out there and walk in this way when you know where you're going. Otherwise I'd be late."

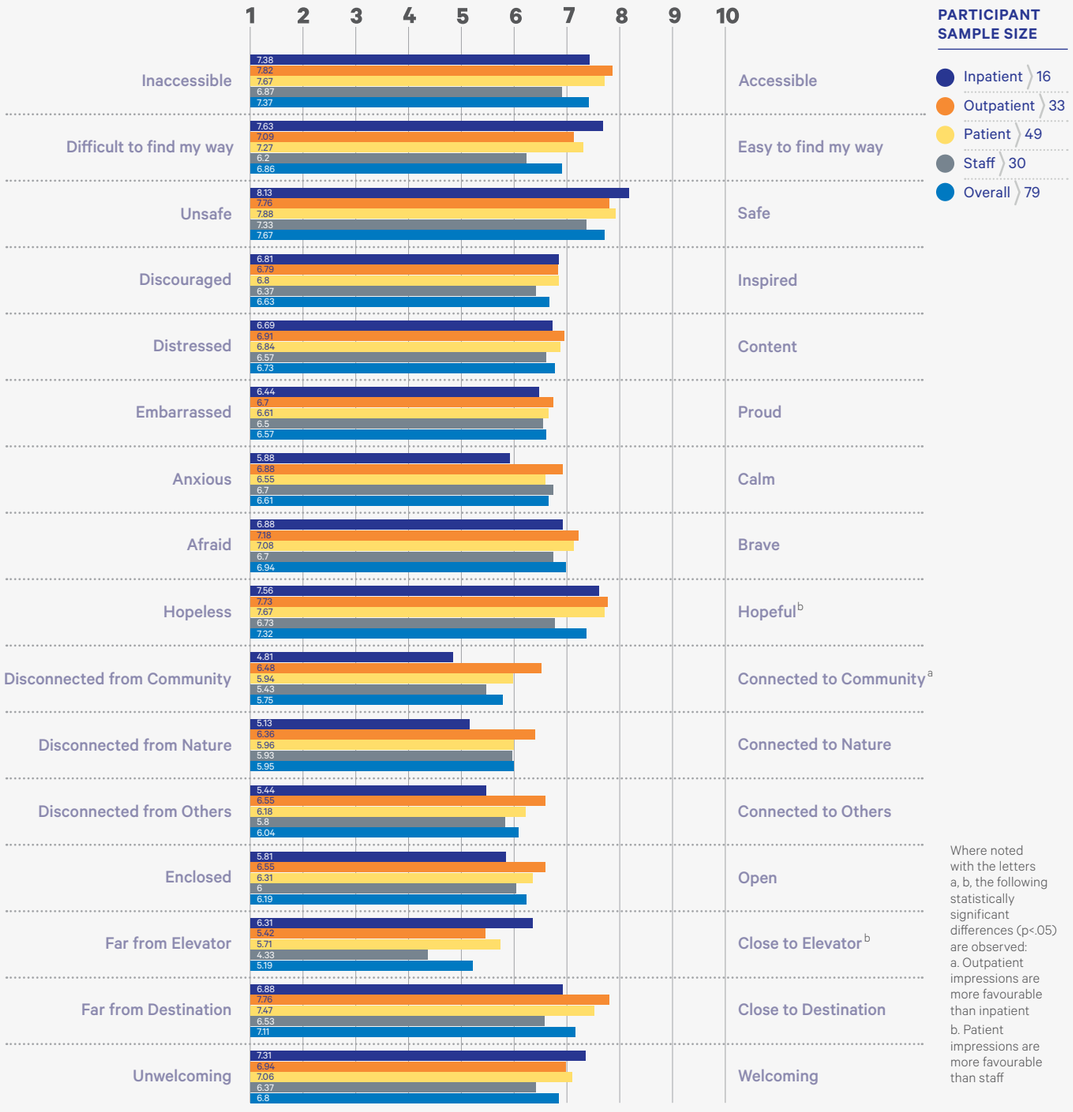
Finding available parking in the mental health lot irrespective of using a parking pass can be challenging. It is the smallest lot and during naturalistic observations it was discovered that staff park in this lot too further limiting the available spots for outpatients.

Emergency and urgent care entrance

Practicality, functionality, and efficiency were the key drivers for the entrance to emergency. Upon entry, there is a clearly defined triage and registration station, abundant seating and clear signage to promote wayfinding and patient flow. Floor to ceiling windows offer natural light but also act as a

Image: Melanie Elliott

Impressions of the mental health entrance



Where noted with the letters a, b, the following statistically significant differences ($p<.05$) are observed:
a. Outpatient impressions are more favourable than inpatient
b. Patient impressions are more favourable than staff

cue for orientation on the site. Due to the patient population requiring immediate care it was very difficult to harvest enough information about this entrance to do a proper evaluation. As a result, this entrance has been excluded from the design evaluation.

Registration areas

The St. Catharines Site has three large scale registration areas: cancer care, mental health and main registration. All three are located on the ground floor and are accessible using their own dedicated entrance. The cancer care and mental health registration areas are situated immediately after passing through respective entrances, the main registration area requires a little more navigation, but it can be found directly across from the wayfinding and information kiosk.

The design similarities include ample seating, staff positioned behind glass and colourfully painted walls (green, purple, orange). However, there are some differences too, for example when outpatients interact with staff at the main and cancer registrations they sit in front of a small glass partition. Conversely, mental health outpatients are required to interact with staff standing up and whereas there are small glass partitions in the other two areas, in mental health staff are in a different room and communication is conducted via a window.

The process of how patients register is also significantly different. Our naturalistic observations reveal that at the main and cancer care registration areas volunteers play an active roll in welcoming and assisting with the registration process, including obtaining a ticket from the dispenser and asking patients to take a seat until they are called. These two conditions are not part of the mental health registration process.

Image: Tom Arban

Image: Tom Arban

Consequently, it may be difficult to conclude that the difference in user impressions is the direct result of the design. When comparing the overall impressions of the registration areas cancer care has the highest impressions followed by the main entrance and mental health.

SOCIAL SPACES

The finding that “people go where people are” has been widely documented by social psychologists and urbanists alike. People seek out the company of others. As if by instinct, we are drawn to others and to animated spaces. This is no different in a hospital setting. Published research shows that the opportunity to explore and have access to a wide variety of spaces enhances patients’ psychosocial well-being.

Variety can be created through the multiplicity of the space. Is it a fixed space or can it be animated in different ways with the use of temporary dividers, movable tables and other furniture? Variety can also be created with the availability of different spaces, indoor or outdoor, active or passive, large or small, public or private, patient specific or mixed use. The availability of choice leads to a better match with the varied patient needs and interests.

Social spaces play an integral role in the hospital design, they help shape the character and spirit of the building.

Registration Area Comparative Chart

	Cancer Care	Main Registration	Mental Health
Welcoming	8.68	7.83	7.41
Open	8.32	7.91	6.98
Inspired	8.45	7.48	7.02
Content	8.23	7.34	6.89
Proud	7.95	7.28	6.48
Brave	6.64	7.3	6.93

These spaces facilitate co-mingling between the different user groups and provide alternative locations to work, extend therapy sessions and of course socialize.

The main street corridor

The Main Street corridor was deliberately designed to create a sense of community, this was to be accomplished by introducing a cluster of public amenities replicating an old town square. The “Main Street” concourse flows from the main entrance to expanded public amenity spaces, including an animated cafeteria featuring a canteen, an open concept seating area with views to the outdoor terrace and concourse activity, a pharmacy, gift shop, spiritual care, and a second floor café seating area overlooking the “Main Street” concourse. It is both a destination and a bustling transition space with a lot of activity and animation.

The response to the main street concept is very positive; the overall impressions for staff, inpatients and outpatients are all over 7. With a more detailed examination of certain impressions the data shows that this space is achieving its design intentions for all user groups with very favourable

Image: Tom Arban

impressions of accessibility, ease of navigation, open and welcoming. Even the primary object of creating a sense of community has been achieved as the connection to community scores are high for all user groups.

With the exception of connected to nature which are showing low scores throughout the hospital, the only areas for improvement for the Main Street concourse are the perceived travel distance to the elevators and to their final destination. This was not only revealed through the survey data, but it was echoed in our moving interviews with patients and staff.

"The elevators should not be down there, that's a long walk for somebody with a walker, cane or in a cast."

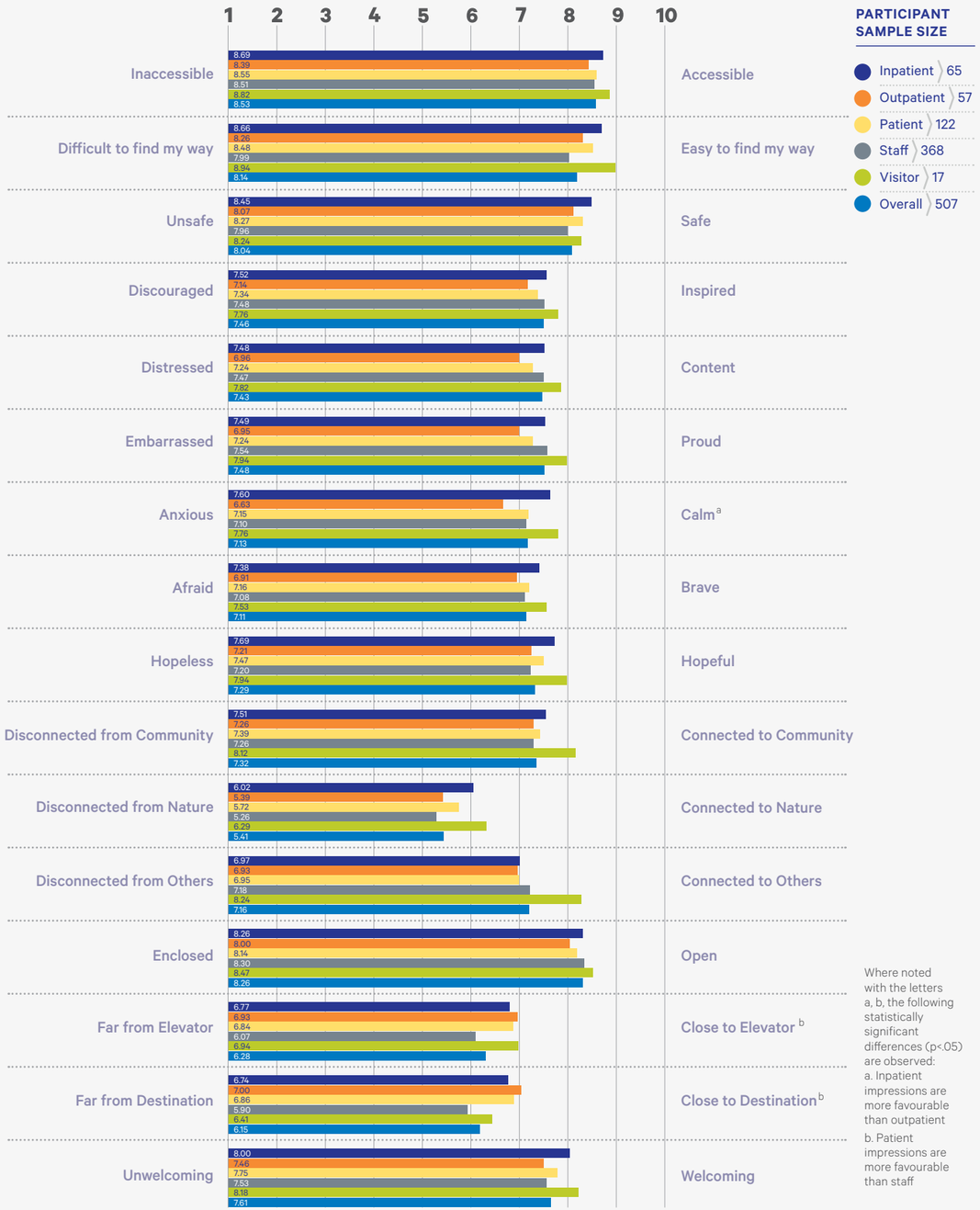
During our moving interview staff expressed that the travel distances play a factor on how they spend their breaks. Depending on what unit they are on, the journey from their work station to the Tim Horton's can take as long as 10 minutes with a return being another 10 minutes, that is a combined travel time of 20 minutes and still does not include time spent waiting in line. This makes it challenging for some staff to enjoy the hospital amenities as they simply do not have enough time.

An inpatient expressed similar concerns about the travel distance to the central hub of the Main Street concourse. The most pressing concern was that the trek was intimidating, for patients with limited ambulation or for those who require a mobility device they may not have confidence in their ability to arrive at their intended destination.

"People like it, but it's a congested area and it's not close to the patients. If somebody wants to come down and get a coffee or anything else, they've got to go all the way out there."

For outpatients and visitors their journey to the elevators could begin from the parking lot or even further from the

Impressions of the main street corridor



bus stop, the critique that the voyage to the elevators can be a trying one does have some merit. While it is impossible to move the elevator bay, it is a learning opportunity for future hospital designs.

"Now that I have a walker, the longer commute makes it hard to get around especially when I get dropped off at the bus stop."

Cafeteria

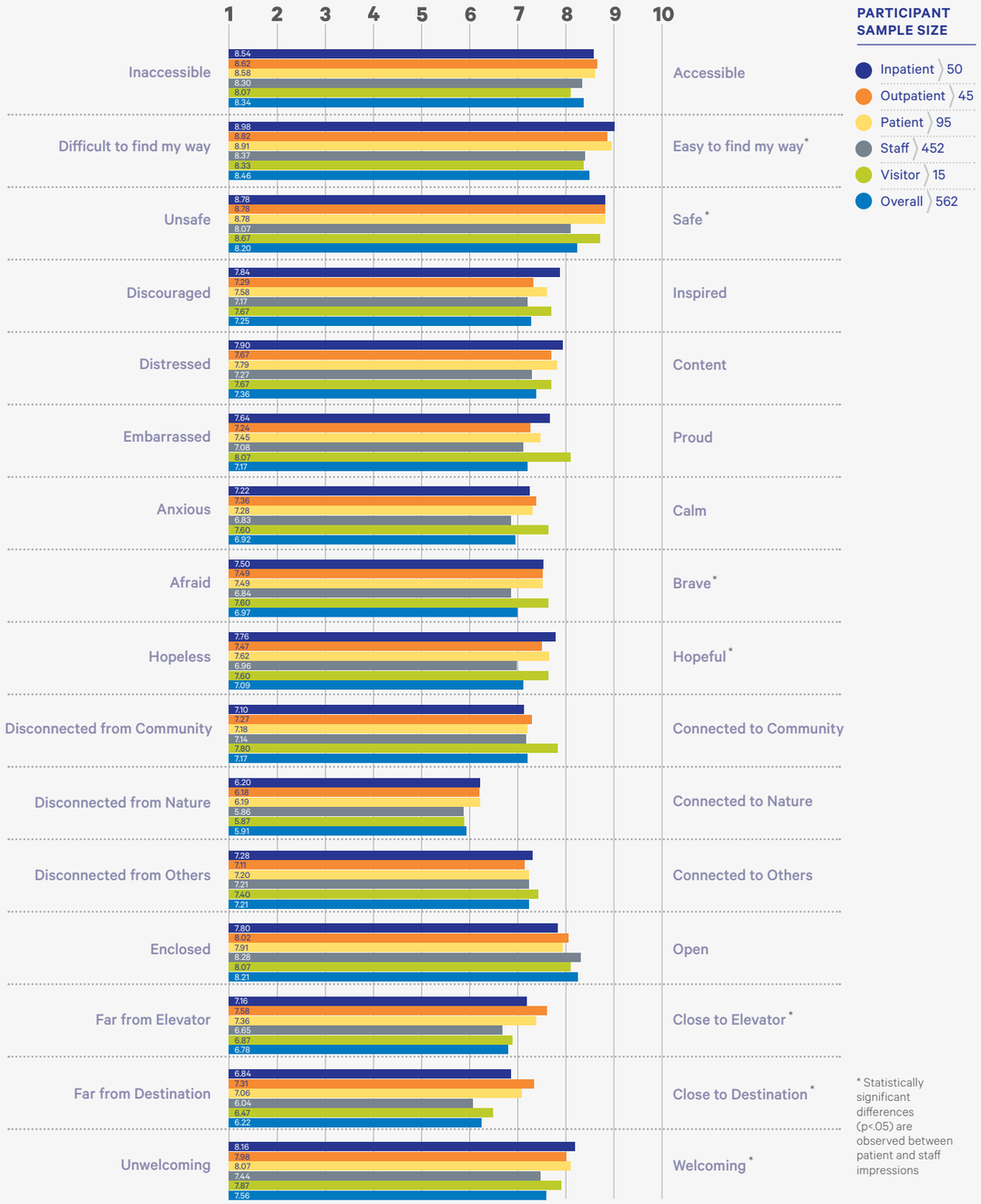
The cafeteria is located at the centre of the Main Street concourse and is surrounded by an active transition space, an outdoor terrace, the food service hall and stairwell leading up to the second floor seating area. The cafeteria plays a role beyond simple food consumption, it can be a comingling space for different user groups, a location for informal team meetings or hospital-wide huddle up sessions, an impromptu workstation and/or an opportunity to passively interact or observe passersby.

The social space with the most favourable impressions is unquestionably the cafeteria. All user groups, patients, staff and visitors have very favourable impressions of the space. Particularly when discussing the impressions most closely related to inclusiveness. For all user groups, the scores for ease of navigation, safe and accessible are 8 or above, followed by open and welcoming with scores around 8 or just under.

The inclusiveness of the space and these scores reinforce the notion that the cafeteria is a space for active and passive users. It is a place where you can go by yourself and yet not feel alone, naturalistic observation data revealed that people congregate in groups but many choose to segregate themselves. Individuals who are alone typically sit on the high top chairs by the window, when they are not eating they spend their time either on their phones, enjoying the view of the outdoors or observing others.

In a peculiar twist, although the accessible scores are very

Impressions of the cafeteria



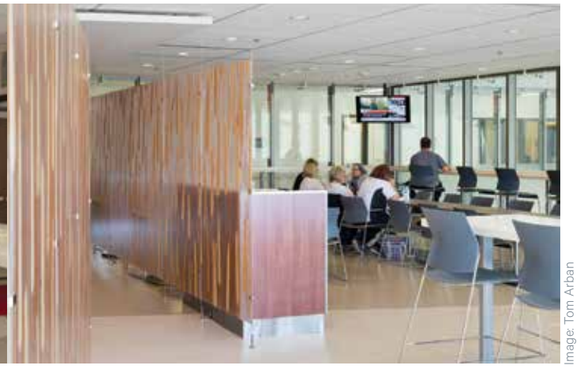


Image: Tom Arban

high, naturalistic observations uncovered examples of how the cafeteria can at times feel inaccessible. Arguably, in response to how busy the cafeteria can be during peak times the tables and chairs are arranged in a manner to maximize seating capacity. However, the number of chairs increase congestion and create obstacles for patients with mobility devices making it difficult for them to sit at the table. During busy and off peak times, more often than not, the only seating option for patients with mobility devices is to sit at the end of the tables.

2nd floor cafeteria seating area

Whereas the cafeteria serves as a venue for multiple user groups, the 2nd floor cafeteria seating area in practice, is predominantly a space used by staff. It is a more intimate space where staff are either alone or gather in small groups. The space is used throughout the day with the peak period being around lunch time. Staff who choose to sit here for lunch typically arrive with a ready made meal from home.

"If I'm feeling like I want to have some time to myself I'll come up here, because it's a little calmer. It's kind of nice to like people watch from the top."

During off peak times it is a break area for staff who wish to watch television and enjoy the views of either the outdoors or activity below in the cafeteria. It also serves as a workstation for staff and a study area for medical students. Furthermore, this space is both an end destination as well as a transition area. The decorative hanging glass wall creates privacy for those in the seating area and serves to delineate a pathway for those passing between the first and second floors.

The most endearing aspect of the 2nd floor cafeteria area is its versatility. It can quickly be transformed into an event

space to host celebrations as monumental as the 5th anniversary of the St. Catharines Site as well as receptions or luncheons that correspond to any programming occurring in the nearby auditorium.

Patient/family lounge

At the time of completion, the St. Catharines Site had the largest percentage of private rooms of any other hospital in Ontario. While the research on patient rooms continue, there is limited research on the adjacent areas that are impacted with the increase of private rooms. When patient rooms consisted of multiple patients the nearby lounge served as a refuge from what was occurring in the patient room and provided some privacy when meeting with family members and visitors.

With an increase in private rooms it is being observed that the frequency of use for patient/family lounges is decreasing. By having a room all to themselves there is no need to relocate to a more intimate or private space. Furthermore, the larger room provides sufficient enough space to meet with family and visitors. The lounges at St. Catharines Site do not have windows, are void of natural light and are relatively small compared to other rooms that can serve the same purpose. It is not the most enticing of rooms and may be one of the reasons for its lack of use.

Data from this it is being observed and others conducted by Methologica show a trend that when patients leave their room they are looking for a change of environment. If their room doesn't have a meaningful view they seek one out, if their room is lacking animation or entertainment they visit a bustling and

busy space. Usually this requires leaving the unit.

It is expected that the future of hospital designs will include more and more private rooms. As a result, we need to further the discussion on how this impacts adjacencies. Will there be a need for on unit lounges for patients and families? Real estate on units is at a premium, could this space be better allocated towards larger staff lounges, bigger workstations or more storage?

Staff Lounge

There is no uniform layout to the staff lounges it all depends on the unit where they are located. Staff see the lounges as being safe, easy to find and accessible, however, they also feel enclosed, and disconnected to nature and the community while in the lounge.

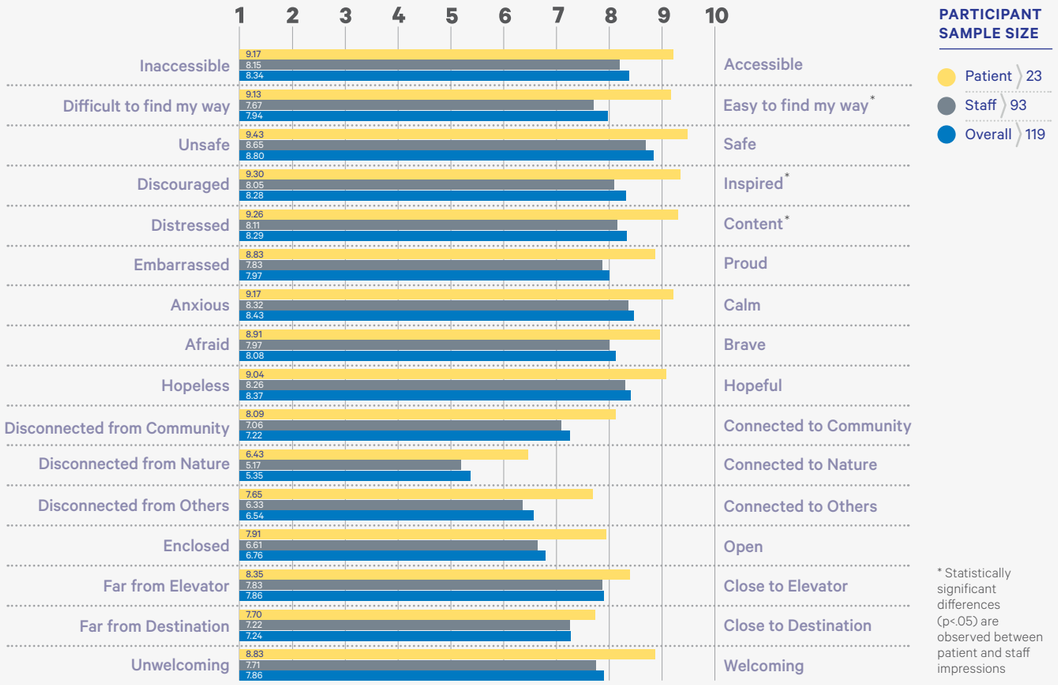
> "To innovate, we need to think differently and challenge the status quo, perhaps there is no longer a need for on unit patient and family lounges."

The moving interviews revealed that the staff lounges are deficient in their ability to provide a space for reprieve. On multiple occasions staff expressed their desire to find an escape from the high stress environment of the units. The current lounges do not provide a rest haven for staff, some are small, windowless and lack comfortable seating that would facilitate a calm, soothing and replenishing break.

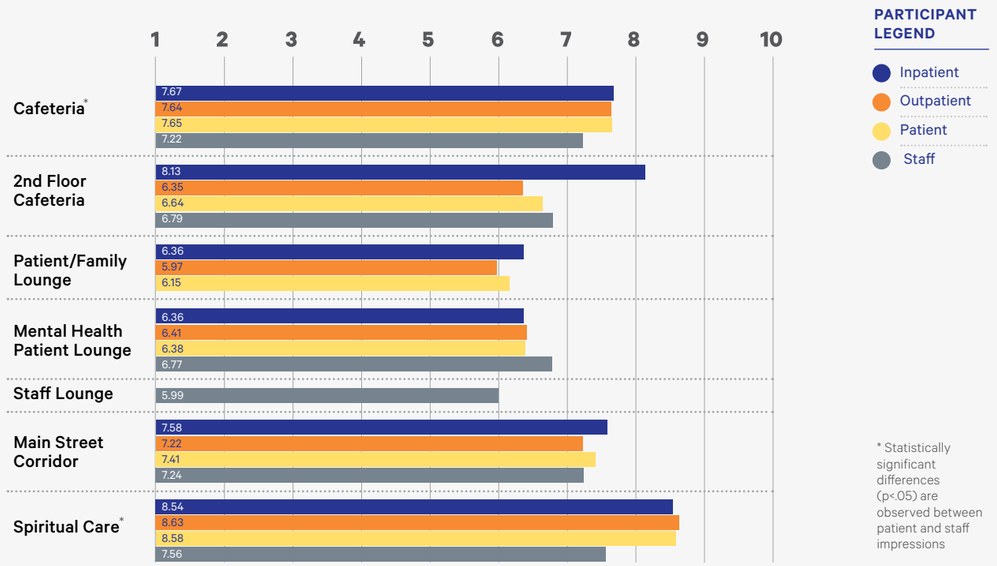
The staff lounge performs well on functional impressions, it is safe, accessible and easy to find. But a real concern for staff is that they feel that they are in an enclosed space and would much prefer something open with meaningful views.

"We like to sit where it's wide open. You don't get as claustrophobic and you get to see what's going on outside. You have to get away from your work area for your breaks.

Impressions of spiritual care



Impressions of social spaces

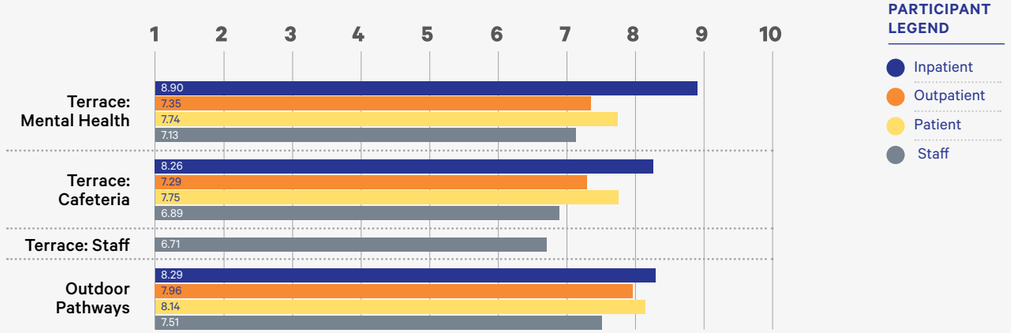


You don't want to be here all the time. It's all part of making you a little happier in your job."

Spiritual Care

As part of the Main Street corridor spiritual care was identified as being one of the spaces of importance. The data revealed some very surprising results, whereas the impression scores are very high the frequency of use is very low. For those who use the space they have very high abstract impressions, the highest relative to other spaces included in the evaluation, yet at the same time it is one of the lesser used spaces.

Impressions of outdoor spaces



Similar to how Methologica research shows diminished use across multiple projects of the patient/family lounge a similar trend is appearing for spiritual care spaces. Users have favourable impressions but simply do not use it on a consistent basis.

OUTDOOR SPACES

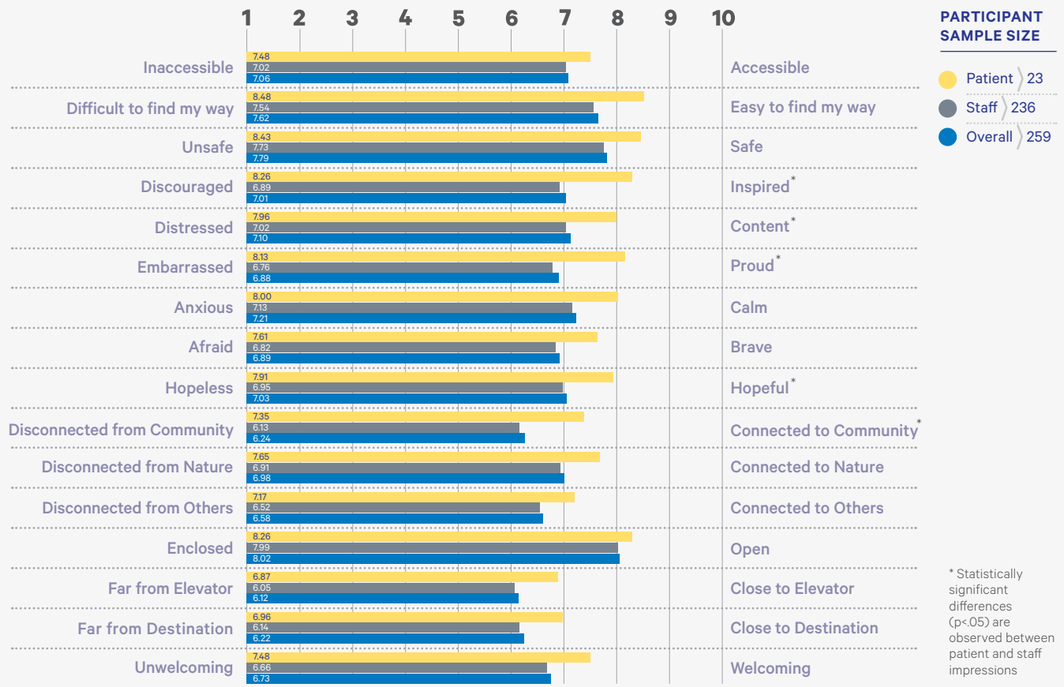
Many of the St. Catharines Site design intentions focused on how to bring the outdoors inside. Conscious efforts were made to usher in natural light, either through large windows in the corridors, skylights over work stations in the emergency department or the glass wall in the cafeteria. Other attempts to bring the outside in, encompassed the use of natural materials and colours that were inspired by neighbouring vineyards and the escarpment. Finally, patient rooms and certain waiting areas were accentuated with meaningful views of the surrounding areas.

The design intentions also looked to provide patients, staff and visitors with active and passive outdoor spaces. The amount and variety of outdoor space are positive aspects of the hospital design. Outdoor areas are used as break spaces providing staff with a change of scenery from their daily routine. When staff and patients have the time and ability to frequent them they are more relaxed and content. When outdoor spaces are designed effectively they have the potential to become some of the most favoured areas in the hospital.

Main entrance exterior

There is an abundance of activity outside the main entrance; people are being picked up, dropped off or walking to and from the parking lot. Additionally, there is a noticeable amount of passive activity occurring. The area is well furnished with numerous benches and the large canopy allows for sunny and shaded seating options. During the summer months, the large planter boxes

Impressions of the cafeteria terrace



provide lush greens and vibrant colours.

Located between the main entrance, the emergency department entrance and across the parking lots this outdoor space is well known to patients, staff and visitors. Naturalistic observation data revealed that during favourable weather conditions patients and staff use this space for a quick break from their normal routine. Staff can be found consuming a beverage, while patients sometimes accompanied by a caregiver will spend a little bit of time enjoying the weather, flowers and watching passersby. Depending on their personal preference outpatients can be found waiting on a bench either in the sun or under the canopy waiting for their ride.

Cafeteria terrace

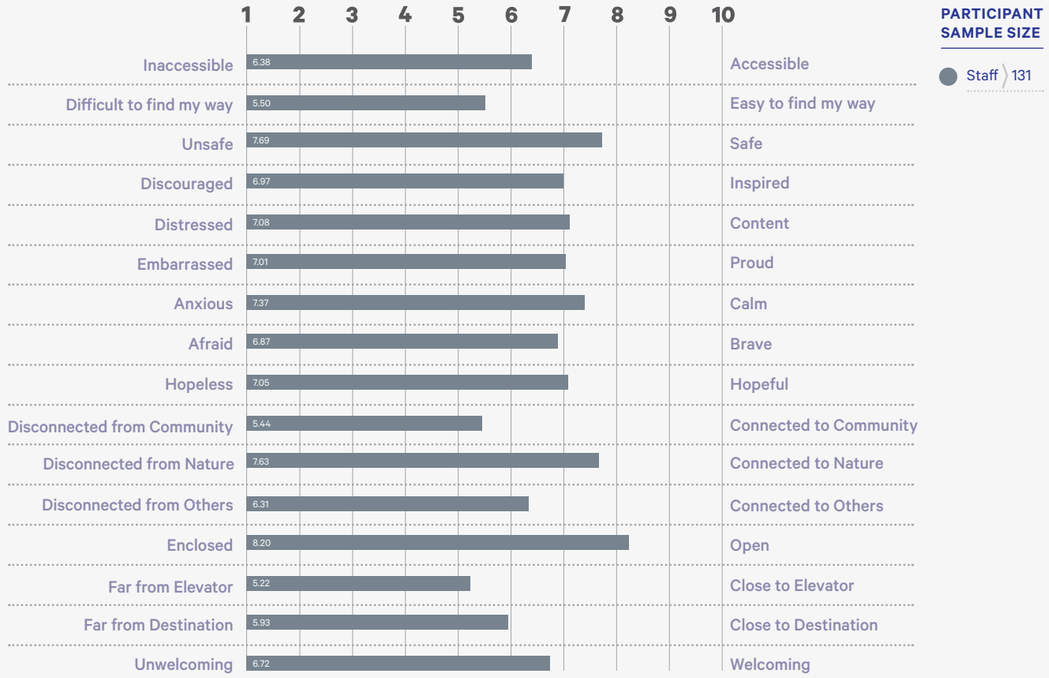
The most prominent outdoor space is the cafeteria terrace. Located right beside the cafeteria, the outdoor terrace is accessible through two doors. It is approximately the same size as the indoor seating area but the seating options are much more limited, consisting of six picnic tables and two benches. Staff and patient overall impressions are generally positive with some specific impressions such as open, calm and content scoring higher than what was recorded for other spaces in the hospital.

Despite having positive impression scores, it is an under used space that is predominantly used by staff only. The limited use could be a result of environmental reasons as it is difficult to find any shaded areas, moreover, increasing the seating options could also be a positive change to drive more users to the space.

Confusing signage is also a deterrent. Both sets of doors are adorned with a red light sensor than can be interpreted as being an alarm and signs that read “EMERGENCY EXIT UNLOCKED BY ALARMS”. If a patient or visitor has an interest in going outside, but then reads the sign and notices

Image: Melanie Elliott

Impressions of the staff terrace



that no one else is outside, they may be fearful of triggering an alarm and less likely to open the door to go outside.

Cancer care healing garden

While it is visible from the parking lot, awareness and access are two obstacles limiting the use of the healing garden. This is a space that has all of the elements that are missing from the cafeteria terrace, there is a variety of seating options as well as sunny and shaded areas. We even see a more diverse set of users with more patients and visitors in the garden than in the cafeteria terrace. Notwithstanding all of these positive attributes the frequency of use is low.

Contributing factors to its limited use can be traced back to signage. Our moving interview revealed that very few people know how to access the healing garden from inside the hospital; in fact, one participant didn’t even know it existed. For those determined enough to find it, their last hurdle is overcoming a set of doors that have the same emergency exit sign on them as the doors in the cafeteria

terrace. Once you've exited from those doors re-entry is only facilitated with a staff pass, non-staff are required to use the main entrance.

Wayfinding signs or cues guiding people to the healing garden would help increase its use, particularly as you approach those final doors reassuring people that they are headed in the right direction.

Staff terrace

Located on the third floor, the staff terrace overlooks green fields, distant residential areas, as well as the parking lot adjacent to the emergency department entrance. The most favourable staff impressions of the terrace are open (8.20), safe (7.69) and connected to nature (7.63). Whereas, it is typically one of the least favourable impressions for most of the other spaces in the hospital, it is uplifting that for this particular space connected to nature does rank very high amongst the other impressions.

Some of the challenges that staff face when using the terrace is its location. Staff impressions identified the terrace as being far from the elevator, and not particularly close to their workstation. Staff also expressed that it isn't that easy to find.

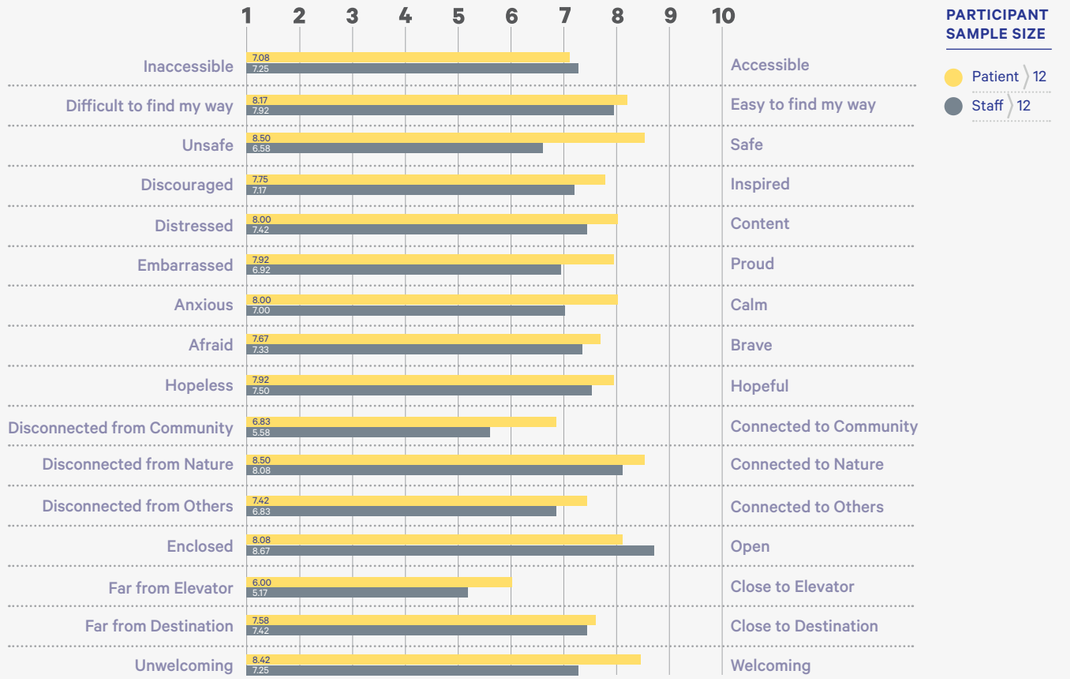
Typically, staff use the space to have lunch or enjoy a quick break in the sunshine. Very little activity occurs in the morning or evening, the peak time is during the lunch hour when staff have longer breaks. Of course, during the pleasant days, staff seek out the sun and are regularly moving tables into the sunshine and in some instances have been known to bring their own chairs.

Mental health terrace

The largest outdoor area on site is the mental health terrace. Its large footprint allows for a diversity of use from very active spaces like the basketball court to passive spaces like the seating area under the pergola. It is also the greenest outdoor space, colourful flowerbeds, trees and shrubs are all incorporated into the design and is further amplified by the views to the surrounding gardens and fields.

However, the size and layout of the terrace has revealed some flaws with the design that has in turn impacted outdoor programming and use. Incidents of elopement have been recorded with patients scaling the fence and some even causing physical harm to themselves. Sightlines have also proved to be an issue. There are areas of the terrace that are not visible from the inside. As a result, patients who are outside must be accompanied by staff.

Impressions of the mental health terrace

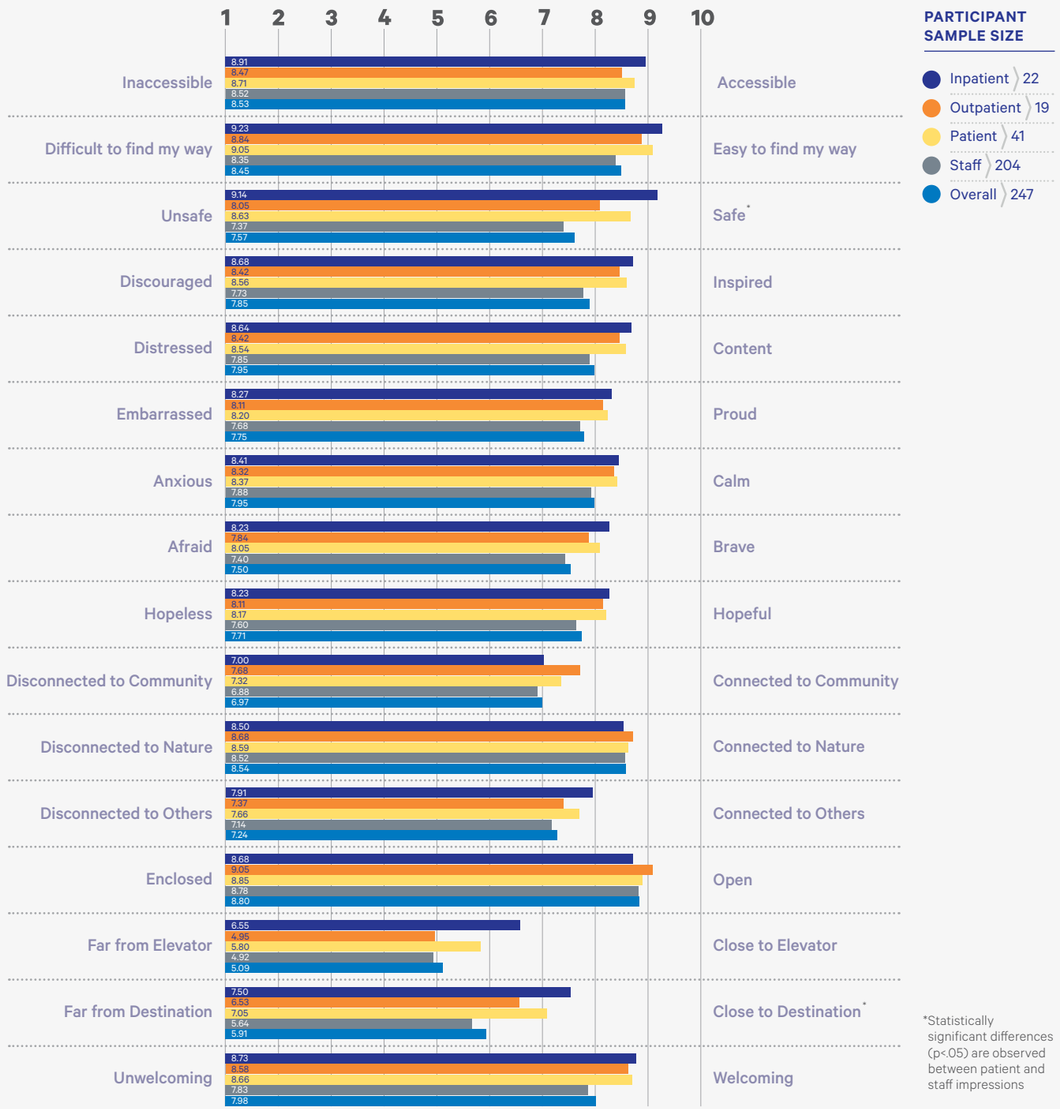


With fencing heights and sightlines remaining unresolved, staff have responded by limiting access and use of the terrace. This is a tremendous resource with great potential, hopefully improvements can be made to address the deficiencies allowing for increased use.

Outdoor pathways

The St. Catharines Site includes a unique feature of being able to walk its entire perimeter by using the outdoor

Impressions of the outdoor pathways



*Statistically significant differences ($p<.05$) are observed between patient and staff impressions

pathways. The walkway is supported by a series of canopies and benches, a labyrinth and two terraces, it is a perfect example of a transition space that can also be an end destination. Patients who may not have the physical ability to walk the entire pathway may only use it to get to the first or second bench. Similarly, staff who may not have enough time on their break may choose to only visit the terrace or find some shade under the canopy.

When comparing overall impressions of the outdoor pathways, patients have higher impressions relative to staff. They both are very positive impressions, patients registering 8.14 and staff 7.51. It is no surprise that open, connected to nature and welcoming are high scores for both user groups. Scores related to feeling calm and content are elevated.

There is great potential for all of the outdoor spaces at St. Catharines Site, for those who use the spaces impressions are high, however, investments need to be made to increase the frequency of use for these spaces. Raising awareness would be the natural first step in trying to boost frequency of use, for example, there is no signage indicating where the staff terrace is, nor is there any signage for the healing garden. Moreover, the outdoor spaces and amenities are not even listed on the hospital site maps.

Time and travel distance are two very real factors hindering use. Whereas, we cannot relocate the outdoor spaces, treatment areas and work stations to reduce travel times, modifications can be made to signage and furnishings that could direct and entice greater use. It may also be appropriate to consider sharing under used space that was specifically intended for one user group with others. For example, opening up the mental health terrace to other users. Staff may be enticed to use the space because of convenience and proximity or wanting to spend their lunch break being active and playing basketball.

Optimizing Outdoor Areas

- An awareness campaign will increase use of all outdoor spaces
- Variety in location, size and functionality provide users with plenty of choice
- The inclusion of soft furnishings, all seasons landscaping, as well as shade and sun options are drivers of use
- Users would benefit from inclusive outdoor spaces that are safe and accessible for all
- Meaningful views are not necessarily just of nature, active and vista views can also be rewarding

TREATMENT AREAS

When designing a hospital there is an artform to creating a balanced interplay between some of the more social and

public spaces with the clinical, functional and treatment areas. When executed properly, the final product should be greater than the sum of its parts. The St. Catharines Site offers a wide range of services and thus, it was required to narrow the focus of what would be included in the design evaluation. During the planning stages, several workshops with hospital leadership and architects were utilized to, amongst other things, prioritize areas for inclusion. As a result, the inpatient unit configuration, care desks, the mental health therapy room, the chemotherapy treatment area and the patient room were selected and included in the design evaluation.

Inpatient unit configuration

Recent trends in how inpatient units are organized have largely followed two models, either racetrack or hub and spoke. The inpatient unit configuration at the St. Catharines Site is neither, it is a collection of pods organized in triangular clusters. As a primary working environment for many staff their impressions on connected to others and ease of navigation were some of the lowest scores recorded for this space. Data collected from moving interviews help contextualize these findings. Staff explained that because everything is angled it is very easy to lose your orientation and get confused. Intersections within the unit can be points of confusion making it difficult to intuitively find your way.

Image: Tom Arban

"Because they made everything look like angles, it is very confusing. People really get lost here, even staff even."

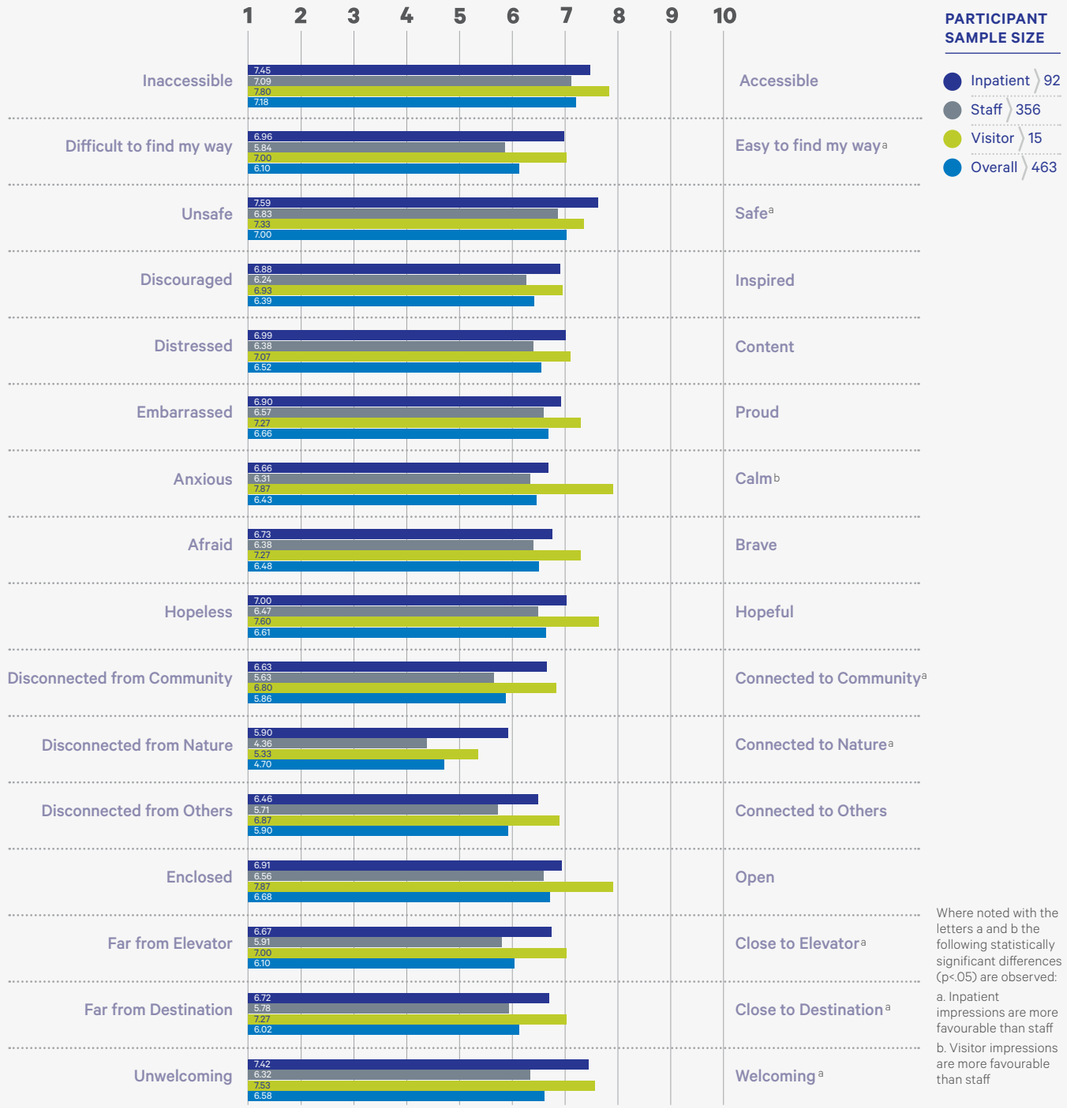
Patients have more favourable impressions relative to staff with their highest impressions being safe, accessible and welcoming. The survey data shows that patients compared to staff do not have as much difficulty finding their way while on the unit. This may be attributed to several factors including but not limited to patients being less likely to navigate the hallways on their own or spending most of their time in close proximity to their room.

Care desk station

Typical units have multiple care desks strategically positioned throughout the area, the most visible care desk is located right at the front of the unit with hallways featured on either side, the additional much smaller care desks are situated at the ends of the hallway and points in between. The two most favourable impressions that staff have about their care desk station is that it is accessible (7.75) and safe (7.15).

An interesting subplot was revealed during the moving

Impressions of the inpatient unit configuration

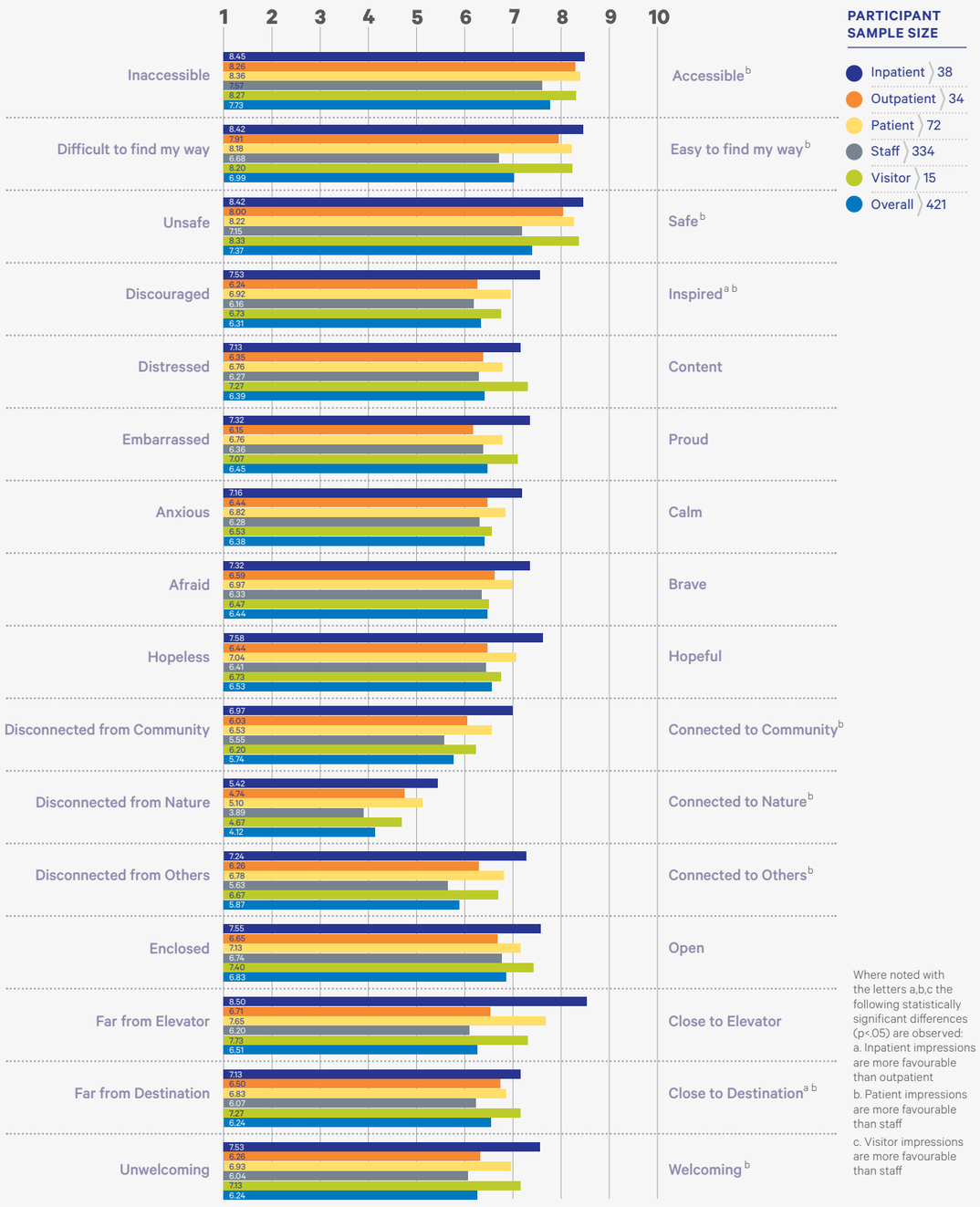


Where noted with the letters a and b the following statistically significant differences ($p<.05$) are observed:

a. Inpatient impressions are more favourable than staff

b. Visitor impressions are more favourable than staff

Impressions of the care desk



Where noted with the letters a,b,c the following statistically significant differences ($p<.05$) are observed:
a. Inpatient impressions are more favourable than outpatient
b. Patient impressions are more favourable than staff
c. Visitor impressions are more favourable than staff

interviews, some staff expressed concerns with the secondary care stations located further within the unit. These care desks were not part of the original plans, it was decided that although they would be a smaller work station the philosophy was that an added small work station was better than consolidating staff at the main workstation. As a result, these care desks are spaced apart, however, that distance makes it difficult for nurses to see each other. Some have shared that at times, particularly during the night shifts that they feel isolated, vulnerable and anxious.

"The pods are like the points of a diamond. My one concern about that is because at nighttime, there are usually only 4 nurses, one at each pod. They're isolated alone in the corner and no one can see if something is happening."

Mental health therapy room

Three of the more significant findings are that patients feel safe, hopeful and inspired when receiving treatment in the therapy room. Three excellent outcomes for any mental health setting. Staff feel equally as safe and hopeful but feel more calm than inspired when delivering care.

Chemotherapy treatment area

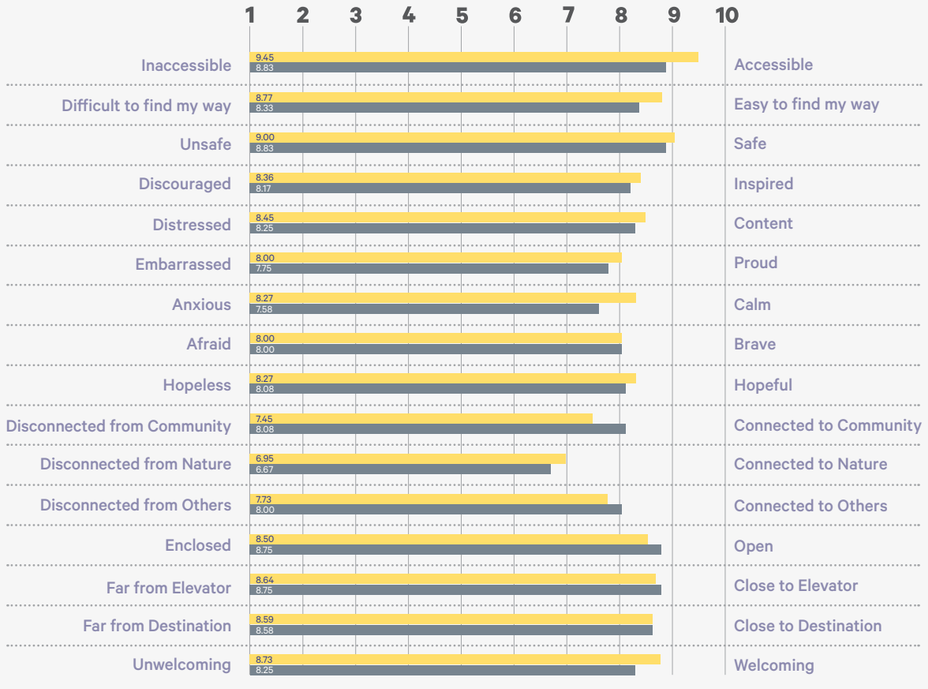
Overlooking the parking lot, the chemotherapy treatment area is located on the second floor of the Walker Family Cancer Centre. Courtesy of the floor to ceiling windows, it is bright and filled with sunlight. It also incorporates natural wood tones for the floors and cabinets. It is a space that features a distinct look deliberately designed to be different than other treatment areas in the hospital.

The overall impressions of the chemotherapy treatment area for both patients and staff are very positive with most impressions scoring 8 or above. Perhaps due in part to having its own entrance and elevator bay, impressions related to function such as accessible, ease of navigation and close to destination are elevated for both patients and staff.

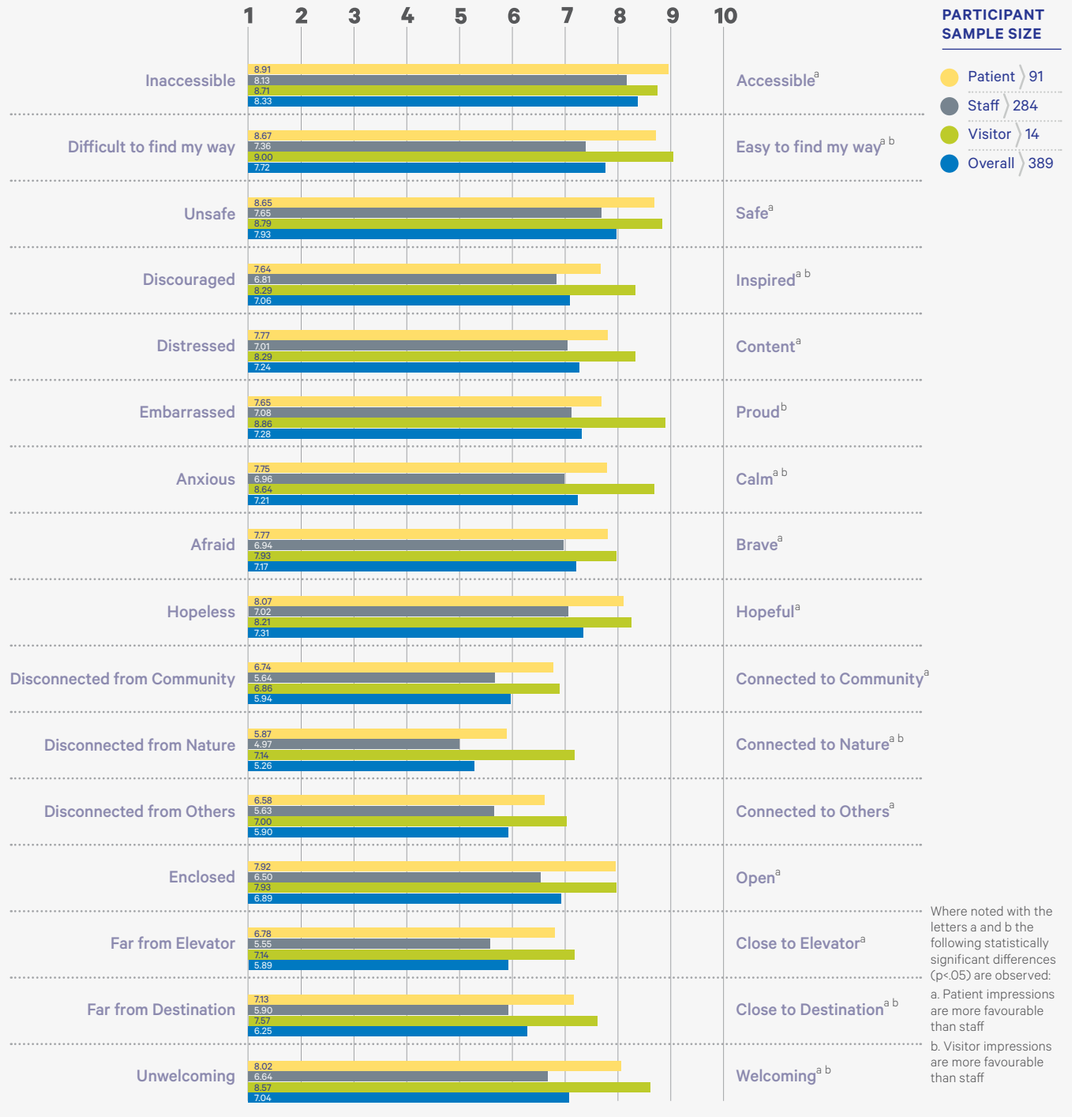
"The part that's really well done is the chemotherapy area. Absolutely wonderful. It's well set up, very comforting for patients, and there's also room to bring in relatives for support."

With respect to some of the softer impressions, when in the treatment area patients respond positively to inspired,

Impressions of chemotherapy treatment area



Impressions of patient room



Where noted with the letters a and b the following statistically significant differences ($p<.05$) are observed:

a. Patient impressions are more favourable than staff

b. Visitor impressions are more favourable than staff

Optimizing Unit Designs

- Minimize decisions upon entry by providing clear points of arrival with direct sightlines to the destination
- Due to the number and size of private rooms, patient and family lounges are under used, future interventions may consider transforming this space
- Increased social interaction and connection to nature can be improved in the ward room by furnishing the area by the window and designating it as a visiting space
- Where ever possible care desk stations and staff lounges should be similar in size, layout and equipment
- Personalization of the patient room restores a sense of agency

content and calm. Similarly, staff have high impressions for inspired, connected to the community and hopeful.

Patient Room

Physical accessibility is a determinant of the patient, staff and visitor experience. The hospital was designed with strong consideration to accessibility, at the time of completion the St. Catharines Site had the highest percentage of private patient rooms than any other hospital in Ontario. Accessibility in patient rooms is improved through personalization of bed height and position, easy access to the call button and the ability to control some environmental conditions such as lighting.

The highest impression that patients have for their room is accessible (8.91), followed by easy to find my way (8.67) and safe (8.65). Hopeful (8.07) and welcoming (8.02) are the only other impressions rated above 8.

As a patient your daily routine is very structured, meals are delivered at set times and therapy sessions typically occur everyday at the same time. Anything that allows patients to have some control and provides them with a sense of autonomy will impact their well-being. It can be something as rudimentary as being able to arrange the furniture in their room, nevertheless, these opportunities allow for the preservation of their identity and self expression.

The visitor response to the patient room produced some remarkable findings, their overall impressions are higher than patients and staff. Some of the more fascinating visitor impressions are proud (8.86), safe (8.79), calm (8.64) and welcoming (8.57). These findings reinforce the need to re-examine the role of patient/family lounges. Private rooms can now accommodate more visitors, the evidence shows that visitors have very positive impressions of the room making it less likely that patients and their visitors would relocate to the less desirable patient/family lounge.

6. User Experience and Outcomes

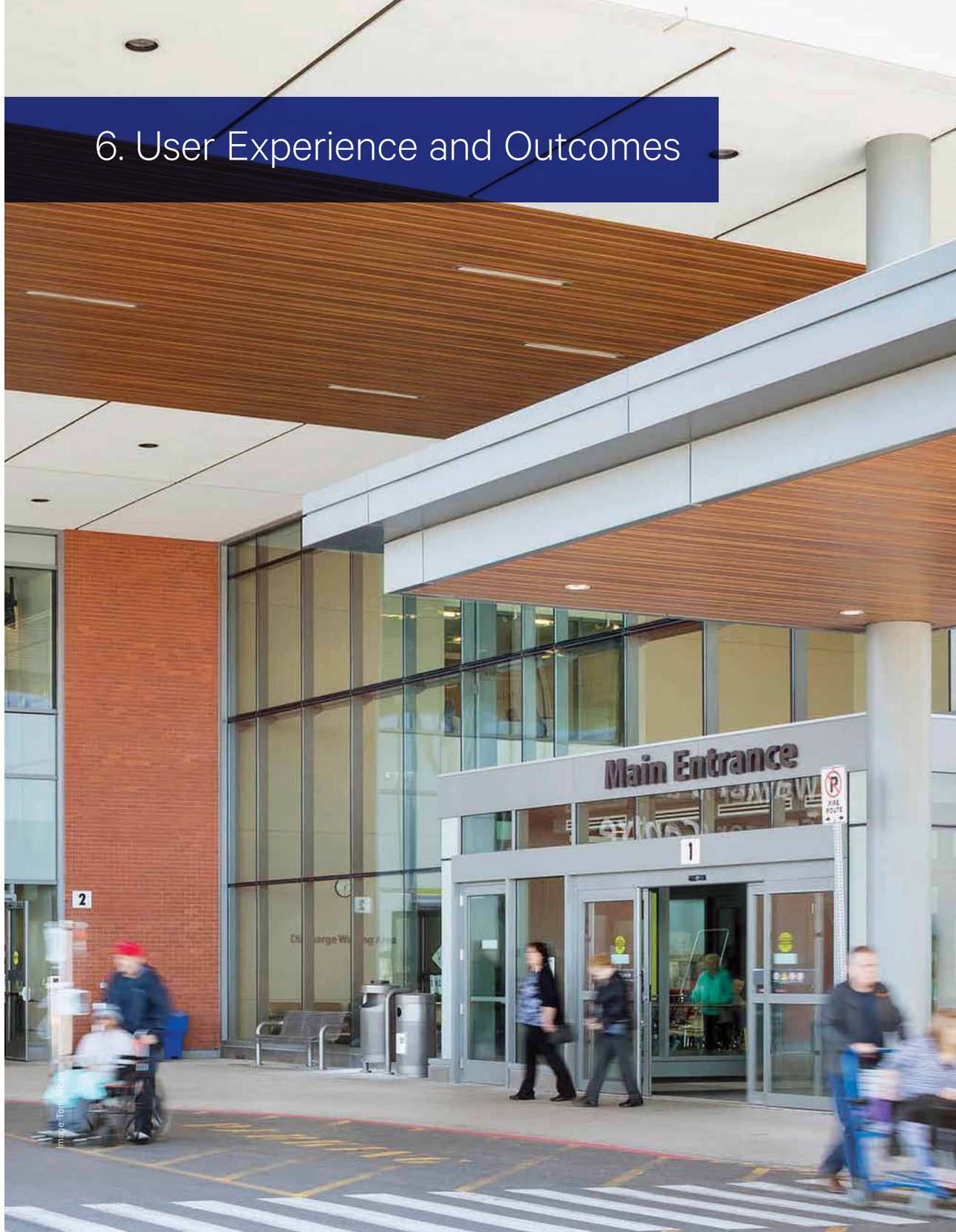


Image: Tom Arban

User Experience and Outcomes

Regardless of where we are, knowingly or unknowingly, our surroundings influence our emotions, our behavior and our well-being. Whether we are at home, enjoying our neighbourhoods, experiencing nature, at a performance or sporting event, waiting for a flight or for a loved one to arrive at the airport or, at the hospital, we continuously respond to what is happening and where it is happening. The design of the built environment impacts how we feel, how we interact with others and it effects what we do.

This chapter explores the user experience at the St. Catharines Site. The pattern of findings reveals how the hospital design impacts the way people perceive the building as facilitating their movement and activity throughout the facility, supporting their well being, and enabling staff to carry out their work. Moreover, the findings highlight how impressions and user experience of the building design positively contribute to well being related outcomes.

PERCEIVED TRAVEL DISTANCE

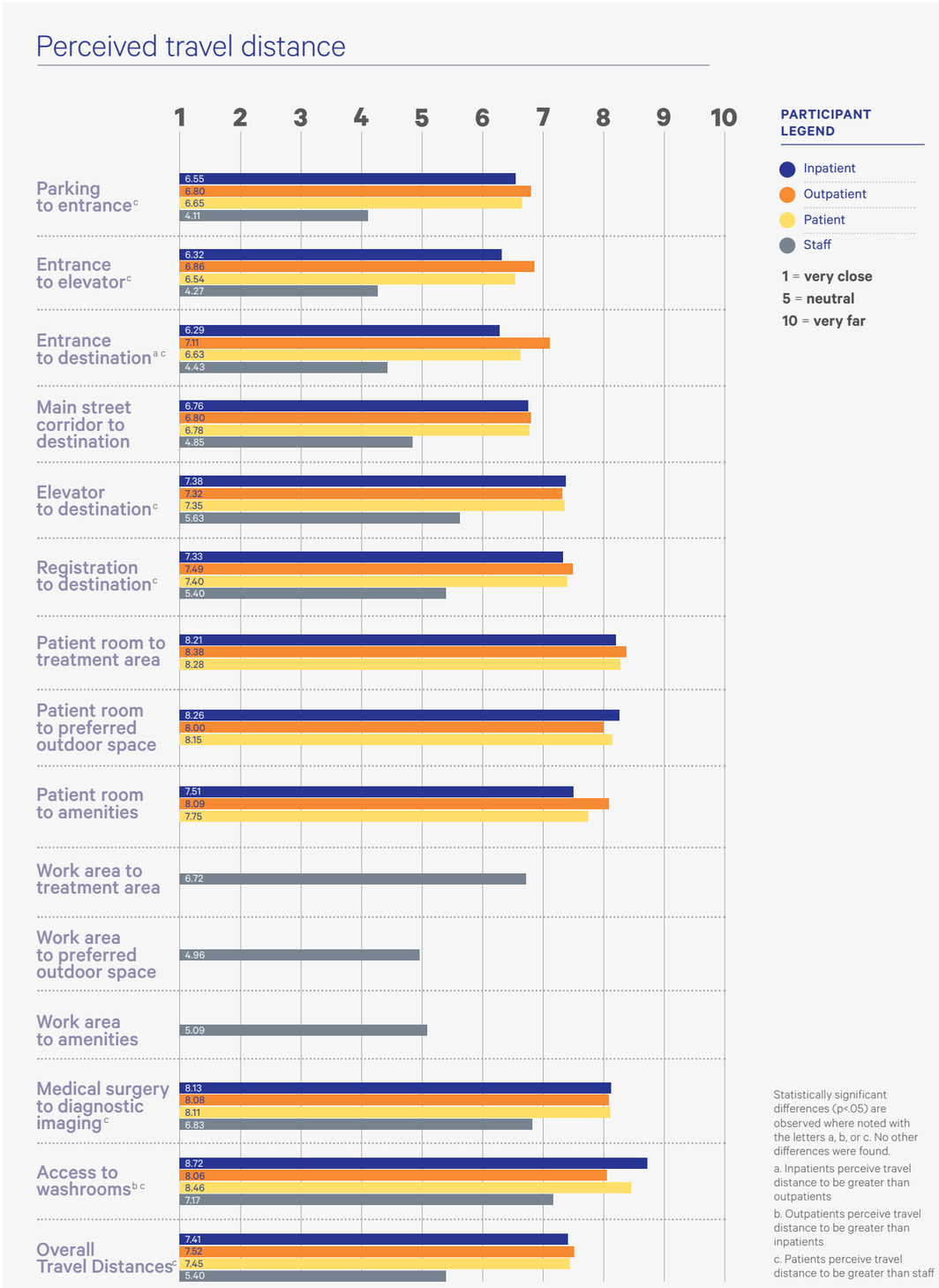
Over and above providing the Niagara Region with a new healthcare facility, the completion of the St. Catharines Site marked the introduction of new regional services such as cancer care, cardiac catheterization and long term mental health. With the size of the facility being approximately one million square feet, these new services and many others were now possible. However, a facility of this size can also present challenges to identify where various departments are located, access different areas of the hospital and affect the amount of time to navigate the site and arrive at the desired destination.

Participants were asked to rate the perceived travel distance to and from various destinations at the hospital (entrance, parking, elevator, Main Street corridor, patient room, treatment area, preferred outdoor space, work area, amenities, medical surgery, diagnostic imaging, and washrooms) on a scale ranging from 1 (very close) to 10 (very far). The average perceived travel distance across all destinations among patients were above 6 (i.e. above the midpoint). Thus, both inpatients and outpatients perceive that their travel distance is somewhat far rather than close. There are two statistically significant differences between the perceived travel distances for inpatients relative to outpatients. First, outpatients perceive the travel distance from the entrance to their destination as farther (7.11) relative to inpatient impressions (6.29). Second, when comparing inpatient and outpatient perceptions of travel distance to the washrooms, inpatients perceive their travel distance to be greater (8.72) than outpatients (8.06).

Both inpatients (8.26) and outpatients (8.00), perceive the distance to their preferred outdoor spaces as being one of the greatest distances compared to all other travel distances they were asked to evaluate. The perceived travel distance from the registration area to their destination was rated as the second highest distance for inpatients (7.33) and outpatients (7.49).

Patients and staff expressed noticeably different impressions of travel distances across the hospital. Interestingly, staff perceive many travel distances as being close relative to far. The separate staff entrance appears to be practical and convenient as parking to entrance (4.11), entrance to elevator (4.27) and entrance to destination (4.43) were rated as more proximal relative to other travel distances. Travel distance does not appear to be a perceived barrier for staff as most of their ratings are neutral –perceived as neither close nor far – as evident in perceived travel distances from the work area to amenities (5.09), the work area to the preferred outdoor space (4.96) and the main street corridor to their destination (4.85).

The quantitative data reveals that perceived distance may be a barrier to use to a greater extent for patients relative to staff. However, as revealed during the moving interviews,



staff tend to consider the distances when their day to day activities are made salient. For example, nurses rearrange the timing of their breaks to account for the travel time needed to purchase items from the cafeteria or Tim Horton's.

In such a large building the placement and proximity of spaces is crucial. Investments can be made in social spaces, retail areas or outdoor areas however, if people don't have the time or physical ability to venture out and frequent these spaces, they will go unused.

WAYFINDING

One of the fundamental design elements of the St. Catharines Site was to integrate simplified wayfinding into the overall patient centred design of the facility. Navigation cues can be derived from directional signs, but an effective wayfinding system is more than the strategic placement of placards. There are a variety of ways to guide users through a space, indicators can include colour patterns, ceiling heights, use of light and flooring finishes.

The most prominent and useful wayfinding tool is the blue tiled line that begins at the main entrance and extends through the main street corridor all the way to the elevator bay. It continues on the second floor originating at the elevator bay passing by the auditorium, 2nd floor cafeteria seating area, the surgery waiting room and concludes at the entrance to the executive offices.

In a hospital of this size, with considerable travel distances the blue line is a simple and effective tool for both patients and visitors. It provides a sense of independence enabling users to autonomously navigate their way through the site, while simultaneously relieving congestion at the wayfinding and information kiosk.

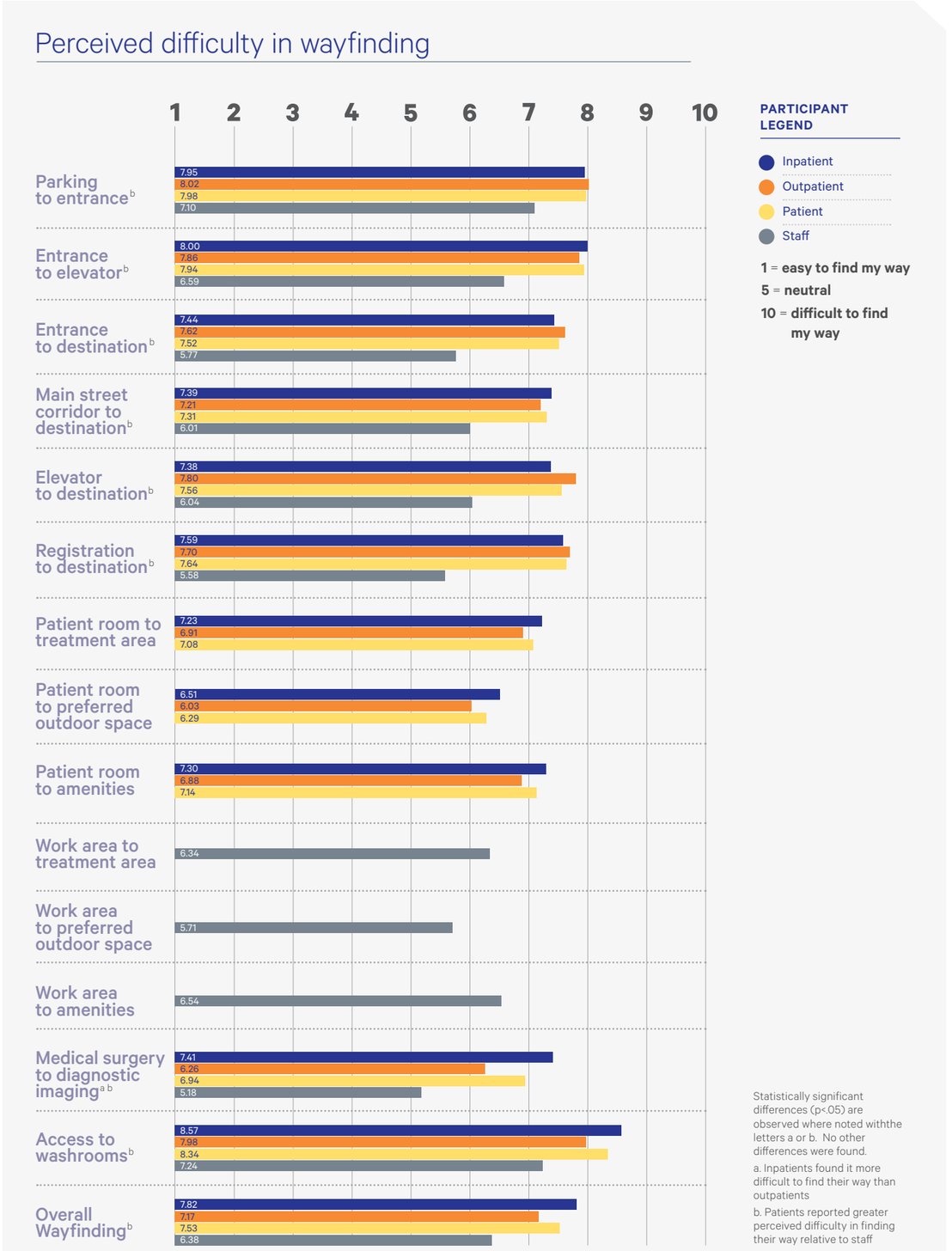
Wayfinding is a system with prompts and indicators, while the blue line and the natural landscape are effective tools, there are elements of the system that can be improved.

Participants were asked to rate their ability to find their way to and from the same destinations they previously rated in terms of perceived travel distance on a scale ranging from 1 (easy to find my way) to 10 (difficult to find my way). The survey data shows that patients have difficulty finding their way (overall wayfinding score 8.34), the most difficult being able to find washrooms (8.34), parking to the entrance (7.89) and entrance to the elevator (7.94). Finding their preferred outdoor space is somewhat easier (6.29), yet still a little difficult.

Relative to patients, staff have a fewer complications moving throughout the hospital but still encounter some challenges. Certain staff scores hover around neutral but surprisingly staff did not say that it is easy to find their way to and from any of the destinations they were asked to rate - all the scores are above 5 (the neutral point). The overall wayfinding score across all destinations for staff is 7.53.

Sources of confusion and frustration can be found with ineffective signage, both in placement and content. During naturalistic observations and moving interviews many temporary, ad hoc or homemade signs were noticed. Staff place additional signage at locations where patients and visitors most commonly lose their orientation. Unfamiliar nomenclature is an additional factor contributing to patient and visitor difficulties, they don't understand what they are reading. The technical terms that are used on the signs can be very different from the colloquial language used by the general public. The maternity ward resonates with users whereas, the women and babies unit is less intuitive.

The unique inpatient unit configuration is another area of confusion. Upon arrival, a visitor or patient is confronted with an immediate need to decide whether to go right or left. The two hallways are painted differently but that wayfinding indicator is not supported by any directional signs with



Optimizing Wayfinding and Design for Mobility

- Simplified and consistent nomenclature supported by symbols and images would limit confusion and frustration
- Introduce wayfinding cues at logical transition points throughout the hospital
- For public spaces ensure that signage promotes use, access to some spaces is hindered by conflicting emergency signs
- Access points and doors are to be placed and positioned in locations that complement natural movement and patterns of behavior
- Direct wayfinding prompts such as colours and floor finishes, as expressed in the tiled blue line can be effective in a building of this scale
- Consistent and standardized corridor widths are essential throughout the hospital, outpatient mental health areas are narrower and have less automated doors
- As experienced in the Main Street corridor tiled flooring and grout lines can be a hinderance for wheelchaired users and deprive them of the full enjoyment of the facility

appropriate room numbers. Wayfinding on the inpatient unit configuration relies heavily on colours, the patient and public corridors are colourfully painted, conversely, the linking staff corridors are painted using neutral tones deliberately chosen not to attract anyone other than staff. Unfortunately, this colour strategy is underperforming and needs to be strengthened with other cues.

MOBILITY

When leaving their room for rehabilitation, therapy or for tests, patients are either portered or accompanied by a therapist. However, in due course using a wheelchair, walker or a cane, patients develop the strength, curiosity and willingness to leave their rooms. A patient's confidence in their ability to ambulate without complications influences where they go and how often.

In an adaptation of an existing measure (Fleiss-Douer et al., 2011), patients were asked to rate the extent to which a series of statements best describe how confident they are concerning their mobility (1 = not at all to 10 = extremely; higher scores represent greater self efficacy). There is no statistical difference when comparing mobility confidence between inpatients and outpatients. The patient population at St. Catharines is very confident in their mobility with all scores registering above 7.51, the overall patient mobility score is 8.01. But it would be premature to say that there aren't any substantial mobility challenges in the hospital.

There is a lack of design consistency throughout the facility, specifically when you compare the mental health outpatient unit with the rest of the hospital. The hallways are narrower and there are fewer accessible doors. The design of this unit fails to acknowledge that comorbidities between mental and physical health exist. Patients with mental and physical health ailments struggle in these confined spaces.

Generally, flooring finishes are easy to clean, visually appealing and serve as a wayfinding prompt. The moving interviews revealed that the tiling on the main floor has

Images: Tom Arban

caused some unforeseen outcomes. Due to the grout lines, patients in wheelchairs can experience great pain and discomfort. The repeated bumps and vibrations are unavoidable on the main street corridor and the distress can be severe. This barrier deprives some wheelchairs users the ability to enjoy one of the most prominent design elements of the hospital.

MANAGING HEALTH CONDITIONS

Patients were also asked to rate the extent to which a series of statements best describe how confident they are concerning their ability to manage their health conditions (1 = not at all to 10 = extremely; higher scores represent greater self efficacy). The patient population is demonstrating great confidence in their ability to manage their health conditions. They are inspired, comfortable and optimistic. Relative to all the responses, patients score the lowest (7.94), when asked how comfortable they are leaving their room without assistance. It is remarkable that the lowest score remains quite positive. The highest patient score in this category is feeling inspired to improve their health (8.66).

Self efficacy in managing health conditions

	n	M
I am inspired to improve my health (to "get better")	152	8.66
I am inspired to improve my health (to "get better")	152	8.11
I am optimistic about my recovery	152	8.25
I am comfortable interacting with others*	152	8.42
I am comfortable leaving my room without assistance*	152	7.94
I can manage activities of daily living (e.g., eating, bathing, dressing, toileting)*	152	8.58

*There are no significant differences between inpatients vs outpatients. There is a trend, for inpatient ratings to be higher that outpatient ratings on attributes marked with an *

Workplace interactions

	n	M
Team Meetings	340	3.22
Communication among staff from different professional backgrounds	340	3.22
Opportunities for interaction among staff	340	3.26
Opportunities for interactions among patients and visitors	340	3.3
Contact with practitioners	340	3.19
Contact with patients	339	3.46
Contact with visitors	339	3.38
Opportunities for professional development / career advancement	340	2.89
Interprofessional Collaboration	338	4.31

Although there are some design inconsistencies in mental health and the unpleasant experience for some wheelchair patients on the tiled floor, overall, the patient centred design of the site has empowered patients to feel tremendously confident with incredible self efficacy scores in mobility and managing health conditions. Being less reliant on others and maintaining your independence are crucial factors in responding to treatment and can only expedite the recovery process.

COMMUNITY USE

Often overlooked is the role that hospitals play in community building. Over and above being a place to receive care, the hospital is a major local employer, the beneficiary of countless community organized fundraising efforts and it can be a provider of community programming. Increased community use can validate the design intention of maintaining that community feel, increase density and animation, and have the potential to boost the performance of onsite retail partners.

Telephone technology was used to obtain insights on community use, 250 community members were asked a series of questions on the spaces that they visit and what the reasons are for their visit. The telephone survey confirmed that community users frequent the hospital and their activity can be categorized into three actions, social, consumption and change of scenery.

It is not surprising that visits serve as a driver of community use. The data shows that community members visit both patients and staff. They meet in a variety of locations, for example the patient room, the cafeteria terrace, Tim Horton's and the 2nd floor cafeteria. Consumption is the main activity for community users with purchases being transacted at the pharmacy, the cafeteria and Tim Horton's. When frequenting the outdoor spaces, the cafeteria terrace or pathways community users are motivated by a desire for a change of scenery and to take a break.

There are impediments in overcoming an individual's innate instinct not to frequent a hospital if they aren't required to. It is encouraging that at the St. Catharines Site members of the community are visiting others and extending their stay by experiencing the amenities and making retail purchases. As plans are being considered for the new Niagara Falls Site it would be a worthwhile exercise to consider how to further increase community use either through free WiFi, public gardens or a more diverse range of retail options and services.

ANCILLARY OUTCOMES OF POSITIVE IMPRESSIONS AND EXPERIENCE

Design has the power to shape our actions and experiences. By documenting those responses, we can understand when we feel better, feel more connected and feel more inspired. Consequently, when we enjoy the environment that we are in we stay longer, make quality social connections, enjoy the amenities and reap the benefits of good design. In this section we will discuss how positive impressions and experience of design contributes to well being related outcomes.

We have already discussed the complications that users experience with travel distances and wayfinding. In a hospital of this size people perceive the distance between locations to be too far and getting there can be confusing and frustrating. But that is not the case for everyone. Patients who see the hospital as being welcoming and hopeful and have positive impressions of the main entrance, main registration area and the main street corridor do not have an issue with travel distances.

Similarly, staff, who see the hospital as being a place of wellness, inspiring, hopeful, accessible and welcoming, and have favourable impressions of the main entrance and registration area, as well as the staff amenities including entrance, lounge and terrace, as well as the main street corridor and adjacencies such as the cafeteria and 2nd floor cafeteria, along with the outdoor spaces do not have an issue with travel distances or wayfinding.

Patients already have very high self-efficacy scores in both mobility and managing their health conditions. But for those who see the hospital as being accessible, easy to navigate and generally have positive objective impressions of the site, their confidence levels of self-efficacy in mobility are even higher. Furthermore, if patients have favourable impressions of their room and the cafeteria, as well as having positive overall impressions of the hospital then they have even more confidence in their ability to manage their own health conditions.

When completing the survey, patients were asked to compare their current overall physical and mental health to before they were admitted. The results show that nothing had changed, and patients felt the same as before they were admitted. However, patients who see the hospital as being a place of wellness and have favourable impressions of the main registration area as well as the inpatient unit configuration do feel an improvement in their health compared to before they were admitted.

It is hard to find examples where people work in isolation. Teamwork and interprofessional collaboration are the standard in how care is delivered. During the surveys, staff were asked to rate the extent to which the facility design allows for interaction amongst staff, teamwork and collaboration on several dimensions (including team meetings, communication among staff from different professional backgrounds, interaction with patients and visitors, contact with patients, contact with practitioners, professional development) on a scale ranging from 1 (not at all) to 5 (extremely well).

Staff feel that the design enables interprofessional collaboration (4.31) and identifies that the design is less effective in supporting communication among staff from different professional backgrounds (3.15). Nonetheless, staff who have favourable impressions of their work areas such as the physiotherapy gym, patient room, care desk stations and the inpatient unit configurations as well as having favourable impressions of the ancillary spaces in the hospital such as the main entrance and registration, main street corridor, the cafeteria and outdoor spaces have even more favourable impressions on how the design enables interprofessional collaboration.

"It's kind of nice to be with the whole team and to bounce ideas with her too about patients that we both follow."

Design elements are key features that enable the realization of the design intentions. At the St. Catharines Site the prominent design elements are the main entrance and registration area, main street corridor, cafeteria, patient room and inpatient unit configuration. Patients and staff who have positive impressions of these design elements have greater overall satisfaction with their experience at the hospital.

STAFF EXPERIENCE AND SHARED WORK SPACE

Niagara Health is a multi-site healthcare network consisting of six sites. For many individuals their roles and responsibilities are not fixed to one location, they are mobile and work at multiple facilities. The St. Catharines Site is the newest of the six, after opening, it experienced with greater

frequency an unanticipated number of mobile workers choosing to work at the site. As a result, there is a lack of hoteling space in the hospital, the limited number of flexible workstations forces staff to improvise and create their own space in meeting rooms, the library or any available space that they can commandeer.

For staff fortunate enough to use the swing offices the response is very positive. The shared office space that is used by multiple staff from various units within the St. Catharines Site or from other sites are functional and effective. Designated swing offices for mobile employees improves efficiency in their work and offers staff hoteling for the day an increased sense of belonging to the hospital community.

Hospital leadership and designers of the Niagara Falls Site should take into account the increased draw and curiosity that accompanies a brand new build. Therefore, they should expect an increase in the number of mobile staff working at the Niagara Falls Site.

> "We've found common ground and we've got some things that we end up working on together."

HOSPITAL ADMINISTRATIVE OUTCOMES: PRE AND POST REDEVELOPMENT

Administrative data between 2012 to 2017 were retrieved from the St. Catharines Site to examine whether there were any changes in hospital metrics, such as numbers of patient transfers and use of surgery rooms, before and after the hospital was redeveloped in March 2013. To serve this purpose, data from the year 2012/13 was used as a baseline.

Changes were seen in several metrics in the Emergency Department (ED) since the year 2013/14. Specifically, after 2013/14, there was a slight decline in the total length of stay for admitted patients and a sharp decline in the total length of stay for not-admitted patients in ED, with the latter metric remaining stable in subsequent years. However, the time between triage and decision to admit patients increased since 2013/14. In addition, there was a decreased number of ED visits between 2012/13 and 2013/14, but this number returned to baseline in 2014/15 and steadily increased in subsequent years.

Acute average length of stay in medical departments (e.g., nephrology, oncology) showed a slight decline after

2013/14, and remained stable after. Length of stay of alternate level of care (patients who have passed the acute care phase of their treatment but remain in an acute care bed) showed a continual increase from 2012 to 2017.

For obstetrical metrics, percentage of medical induction and epidural anaesthetic use during labour showed a graduate decrease since 2012/13. Percentage of Caesarean sections

Optimizing Design & User Experience

- Points of entry decisions are not based on patient treatment alone, convenience and accessibility are motivating factors
- Create design opportunities for people to interact actively or passively
- Density and animation can provide users with an opportunity to rejuvenate
- Colocation is not just about function, the strategic cluster of amenities and services in the Main Street corridor creates a sense of community
- New placement and style of cafeteria furniture would enhance inclusiveness and accessibility for patients with mobility devices
- Successful versatile spaces such as the 2nd floor cafeteria is a function of adjacencies, flow of users and sightlines
- Moments of personal reflection and meditation can occur in any inspirational destination and not just in a revered but underused spiritual care room

also showed a steady decline after 2012/13, but an increase again in 2016/17. In addition, cases of obstetrical trauma during instrument assisted vaginal deliveries showed an increase in the year 2013/14 in comparison to 2012/13 but returned to baseline in the next year.

In terms of use of operation rooms, hospital records showed an increase in scheduled hours and operation room closure hours due to statutory holidays after 2013/14. Since 2012, there was a graduate increase in volumes of use of operation rooms in otolaryngology, vascular, plastics and cardiology. Volumes of use of operation rooms in gynecology and urology showed a peak in 2013, but these numbers have declined in subsequent years.

There were also changes in infection control. Hospital acquired incident rate of Clostridium Difficile Associated Disease (CDI) peaked in 2011/12, and showed a steady decline, which eventually lowered to provincial average in 2013/14. Cases of bacteraemia infection of Methicillin Resistant Staphylococcus Aureus (MRSA) showed a peak in 2013/14, and steadily declined since 2014/15. On the other hand, incident rate of hospital acquired colonized cases of MRSA showed a sharp decline in 2013/14 and remained stable in subsequent years.

Metrics on patient transfer and hand hygiene adherence remained stable throughout the fiscal years examined for this report.

Lastly, a few indicators from the Human Resources department were examined. Notably, number of new hires showed a peak in 2013/14, and a reduction between 2014 and 2016, but another peak again in 2016/17. Turnover rate showed an increase in 2013/14 in comparison to 2012/13, but sharply declined the year after. Average headcounts increased steadily since 2012/13. Vacancy counts showed the lowest count in 2013/14 but returned to baseline (2012/13) in the next year. In terms of Workplace Safety Insurance Board (WSIB) incident counts, although the number of non-lost time incidents showed a steady increase after 2014, number of lost time incidents showed a decline between 2014 and 2016.

LIMITATIONS

The above trends are descriptive and are not based on statistical testing. Although there are changes in several hospital metrics before and after the hospital was redeveloped, it should be mindful that other factors could also contribute to changes in these rates. Nevertheless, the above trends could provide a richer context related to the happenings in the St. Catharines Site during the redevelopment.

7. Design Recommendations

From Design to Reality

The principal motivation behind the design intentions of the St. Catharines Site hospital was to provide a patient centred design. The intended goal was that the collection of the design elements would reduce anxiety through simplified wayfinding, preserve patient dignity through the increased privacy of separate entrances and rooms, maintain a connection to the outside environment and create an animated public space to foster community.

This design evaluation revealed user impressions of the spaces throughout the hospital, it also tells a story of what they are doing in those spaces and how they feel when they are in those spaces. There were very positive impressions, some neutral impressions and there were a few examples of negative impressions.

DESIGN FLUIDITY

There are numerous high performing areas on site, with the top spaces being the Walker Family Cancer Centre registration area, the complete main entrance experience beginning with the exterior and up to the main street corridor and finally, the combined lower and upper levels of the cafeteria. However, behaviour patterns show that there are areas of concern in how the design flow gets interrupted, and consequently diminishes the user experience.

Design fluidity can be described as how the design elements tie into each other with the goal of creating a seamless user experience.

In a building of this size travel distance is a legitimate concern, it is further exacerbated with the placement of the main elevators at the far end of the ground floor. Future designs may want to consider a more centralized location for the main elevator bay.

With increased travel distances, a greater importance is placed on an effective wayfinding system. Whereas the blue tile on the main floor proves to be an efficient wayfinding guide, other prompts and cues are less effective. Signage for certain public spaces do not even exist (the cancer healing garden) and some are inadvertently deterring use (signs on the doors leading to the cafeteria terrace).

One of the more noticeable examples of the need to address design fluidity is the corridor widths in the mental health and addictions department relative to the corridor widths in the rest of the facility. The narrower corridors and few automated doors create unnecessary obstacles for mental health patients who also use a mobility device. Future patient centred designs need to consider the physical and mental health of all patients and not view them separately.

The St. Catharines Site is one of six facilities that comprise Niagara Health System, with certain staff working at multiple locations. When designing a new hospital that is a part of a regional or multi-site system, considerations should be made as to how the facility will interact with the other locations. Interoperability, the ability of staff to operate in conjunction with each other is essential to properly perform their duties. The St. Catharines Site does offer some hoteling or shared work space and the user impression of these work stations are positive.

> “There is no problem. They’ll tell you to follow the blue line. You’ve got direction and you go. Nobody can go wrong with that.”

However, the design did not anticipate the amount of mobile staff that would choose to work with greater frequency at the St. Catharines Site. When designing the new Niagara Fall Site, it is prudent to include plans to accommodate increased visits by mobile staff. This could include more shared work stations or dynamic multipurpose rooms that can support mobile staff.

Design fluidity can also be compromised by third party operators or stakeholders. Part of the redevelopment process should entail obtaining assurances that upon completion stakeholders will commit to honouring and complementing the design. For example, parking operators should provide passes to all lots and city services such as bus routes should offer reasonably close access to entry points.

PROMOTING USE THROUGH DESIGN

Humans are social beings and our environment shapes what we do and how we interact with each other. One of the design intentions was to create an animated public amenity space that would enable interactions among all user groups. The main street corridor is very successful in this regard, unfortunately, there are some spaces with equally great potential but they are less successful.

There are many contributing factors to building a successful design or space. The main street corridor is associated with positive impressions, diverse users, frequent use, animation and interaction among users. In contrast, despite having some of the highest impression scores of any space in the hospital, spiritual care is among the most infrequently used spaces in the hospital. It is highly valued but not really used and the cause is unclear. Is it taboo to consider omitting such spaces from the healthcare environment? In an attempt to be inclusive for all religions and forms of spirituality, has it become too spiritual for some and not spiritual enough for others? Moreover, with an increase of private patient rooms there is a corresponding decrease in the use of patient/family lounges. Yet underused spaces like spiritual care and patient/family lounges continue to be a part of new hospital designs.

To be effective, design needs to generate positive impressions, encourage use, enhance user experience and drive outcomes.

Design decisions should not be automatic or guaranteed simply because a space has been a staple in past hospital designs. Future healthcare facility design decisions would benefit from a bold step in questioning what can be done better to optimize outcomes. As an example, the current data suggests the replacement of spiritual care and patient/family lounges with a comfortable, quiet open room with meaningful views to support moments of self-reflection and enhanced staff lounges, respectively.

Options for outdoor spaces are plentiful but there are ways to promote the use of certain spaces through design interventions. The healing garden and the cafeteria terrace are two spaces with limited use. The healing garden is colourful, well furnished with sunny and shaded seating options. However, awareness of the space is considerably low. Conversely, awareness of the cafeteria terrace is high even though seating options are limited and there is limited green space. Promoting use through design is not as simplistic as more signage and seating, these interventions will help, but it includes more sophisticated solutions such as understanding how spaces can impact adjacent areas or how hospital and social programming can be introduced to drive users to an underused space.

ENHANCING CONNECTION

One of the design intentions was to maintain a connection to the outside environment, nature and community. This was to be achieved by bringing people outside to one of the outdoor destinations as well as by bringing the outdoors

inside using natural light and using materials and colours reminiscent of the wine region, escarpment and vineyards. However, the sense of connection responses particularly connected to nature were consistently low.

Future designs may need to consider more obvious colour palettes, materials and the use of symbols to heighten the connection to nature. This could also assist with wayfinding and ease of navigation. Currently users are experiencing challenges relating to the nomenclature used on the signs. Colours and symbols would not only help overcome complex nomenclature but could also address language barriers.

Enhancing connections extends beyond connection to nature, there is potential to enhance connection to community and others. The demarcation of staff only areas may have a corollary consequence of contributing to the disconnect experienced by some participants. Whereas the separation of public and private areas may serve to enhance safety, mitigate the spread of infections, and offer the opportunity for a welcomed respite from daily work activities; the separation limits opportunities for comingling among staff, patients, visitors, and community. Moreover, it drastically reduces the serendipitous encounters among staff and other users of the hospital.

Maximizing meaningful views can be a strategy to promote use through design, but it also helps preserve connections to the surrounding environment. The views do not need to be of nature, they simply need to be meaningful. Recent Methologica studies have shown that views of parks, construction sites, distant vistas and city architecture have resulted in positive impressions, enhanced user experience and boosted sense of connection – consequently, contributing to increased well being and health related outcomes along with satisfaction among patients and staff.

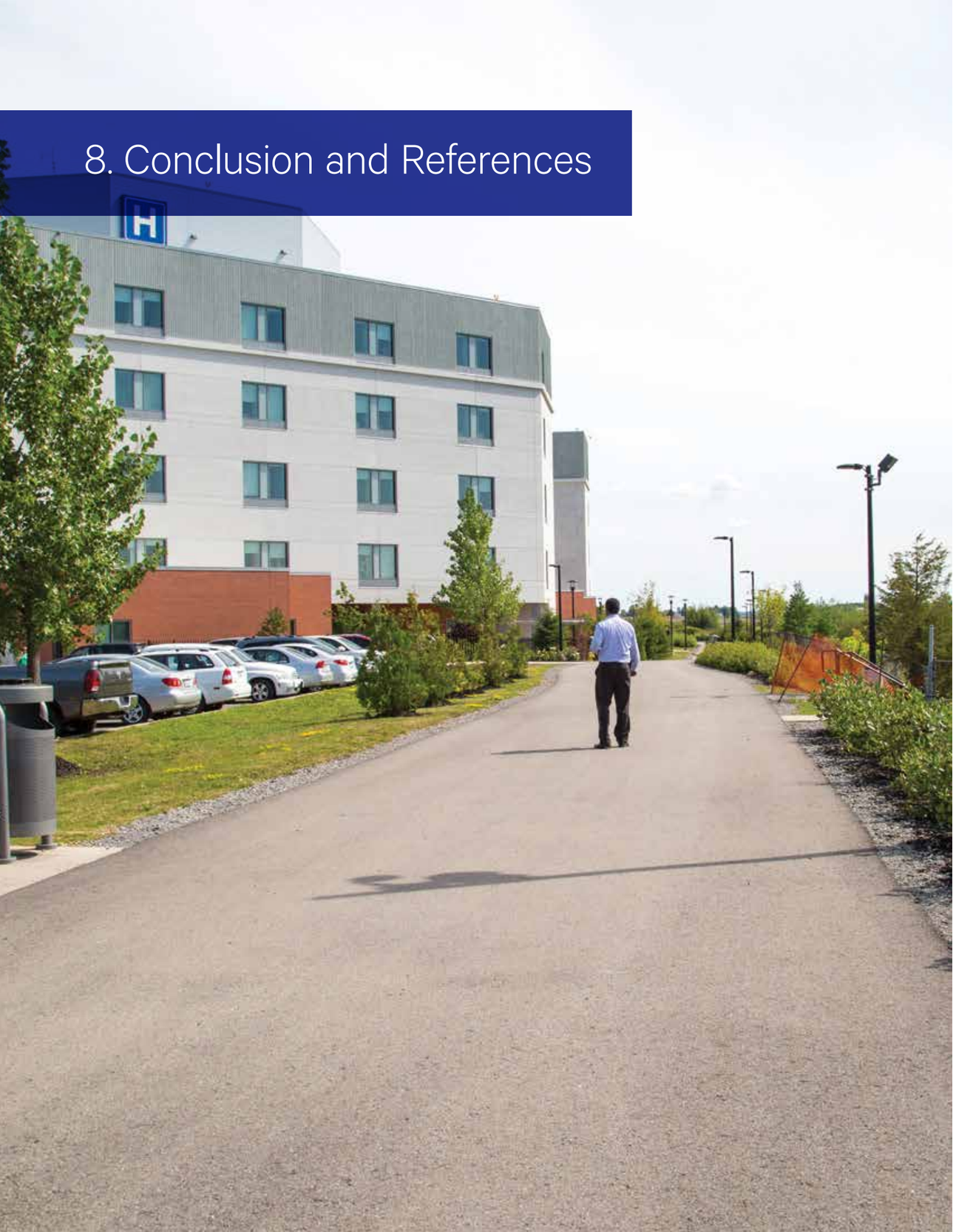
If connection to the outside environment, nature, community and others is important to the overall design aspirations then design elements need to be less subtle and more direct. Stronger symbolism, more meaningful views, blurring of the boundaries between public and private spaces, and the incorporation of services or amenities to entice community use are all examples on how to enhance connections.

Although made from brick, glass and mortar hospitals are not static. They are dynamic and organic entities filled with exceptional people committed to making a difference. Interventions can be made to support underperforming areas and further enhance high performing areas. Design is a powerful tool and contributes to health outcomes and overall well being.

If people respond positively to the design of the built environment travel distances appear shorter, getting to your destination appears easier and your time spent in those spaces appear more rewarding.

Image: Tom Arban

8. Conclusion and References



Conclusion

Population health trends are evolving and so are the corresponding patient care delivery and environment needs. The current acute care model and healthcare facility design can no longer be the default for care delivery. A uniquely defining feature of the St. Catharines Site is that it is, essentially, four healthcare facilities in one – an acute care hospital, an outpatient day hospital, a cancer centre and a mental health facility. It represents the changing landscape of healthcare that is comprised of integrated inter-professional teams, specialized hospitals and regional community care.

Niagara Health System also demonstrates that it is never too late to perform a design evaluation. Typically, design evaluations are conducted one year after moving into the new facility, this one coincides with the 5th year anniversary. Niagara Health opted for the evaluation of the St. Catharines Site as an opportunity to compare the user experience against the original design intentions and understand how the facility has matured and changed over the five years. Moreover, they showed foresight in positioning this experience to enrich the design process and optimize outcomes for the upcoming Niagara Falls Site redevelopment.

This design evaluation identified both hits and misses in the hospital design, understanding what worked, for whom, and in what context is just as important and understanding what did not work. Not only do design evaluations provide inspiration for future projects, they help optimize operations at the site under evaluation.

Through design evaluation research we are able to contribute to the growing library that supports evidence based decision making and consistently gauge the effectiveness of new healthcare facility designs.

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About the authors

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Dr. Celeste Alvaro is the Principal and Founder of Methologica, an applied design research and evaluation firm that specializes in assessing how the design of the built environment impacts human behavior, social interaction and well-being. As an experimental social psychologist, Celeste provides research and evaluation expertise on architecture teams and leads the pre and post occupancy evaluation of capital redevelopment projects that extend to a variety of settings. Celeste's research is focused on the application of well-established quantitative and qualitative research methods and measurement techniques in innovative ways to understand the direct and indirect effects of the built environment on users in both her academic and consulting roles. Celeste's signature approach involves the creation and execution of scalable programs of research and evaluation. It begins with establishing and engaging collaborative teams including leading international researchers, architects, designers, and stakeholders then continues with an animated group of field researchers conducting data collection and analysis.

Deyan Kostovski, AMA

Communications Strategist, Methologica

Deyan is a communications strategist with an expertise in developing knowledge translation campaigns, concept design initiatives and community outreach. He is active throughout the project opening with stakeholder engagement and visioning sessions, liaising with the infield research teams and concluding by distilling and sharing the findings that are most relevant to the different stakeholders that are involved in the project. Deyan's stakeholder relations skills have been used to manage key relationships with the Ontario Ministry of Health and Long Term Care, the Canadian Standards Association, Partnerships BC, Ministry of Health in British Columbia, regional health authorities, project partners and architecture firms.

Melanie Elliott, MA

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Melanie is passionate about community health. She uses place-based methods to understand the user experience and applies that knowledge to improve lives and well-being. Her role on the team encompasses participation in early development workshops, liaising with the redevelopment teams and onsite management, preparation of ethics protocols, coordination of in-field researchers and evaluators, administration of both quantitative surveys and qualitative interviews as well as analysis of qualitative data. Melanie is the team lead for the moving interviews. This method combines in-depth interviewing with participant observation wherein the researchers accompany participants on their natural outings and actively explore their physical and social interactions with the built environment by asking questions, listening and observing.

Brenda Wong, PhD

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Dr. Brenda Wong holds a Ph.D. in experimental psychology from Ryerson University with expertise in statistical analysis, program evaluation and a specialization in aging and cognition. Her work has been published in Gerontologist and Journal of Cross-Cultural Psychology. Brenda was involved in all phases of the St. Catharines Site Niagara Health design and user experience research and post occupancy evaluation. Brenda has been actively involved in the preparation of research materials and data collection protocols, software programming and testing, research coordination, patient and staff recruitment and administration of quantitative surveys in individual and group sessions, execution and analysis of naturalistic observation, descriptive and inferential statistical data analysis.

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Notes