Facilities of the Future

Evidence-Based Decisions for an Innovative South Health Campus

Tracy Wasylak, Shandra Kimpton, Jeff Caird, Ted Braun, Joanne Aimee, and Ken Chiang

Abstract

The South Health Campus (SHC), scheduled to open in 2011, is an academic tertiary healthcare centre that provides a unique opportunity to improve the quality and safety of care through evidence-based design. To achieve this end, a partnership was created between SHC, the Ward of the 21st Century, and the University of Calgary to translate human factors knowledge into the facility design. In order to collect evidence for the new facility, “mock-up rooms” were built for outpatient exam, emergency department, acute care, and intensive care. In each room a series of scenarios was simulated involving healthcare providers, patients, and family members. Evaluation focused on the design and functioning of the rooms, and several hundred recommendations were made regarding access, communication, visibility, and usability. The authors conclude that this initiative created a unique knowledge translation opportunity to improve patient safety and architectural usability through evidence-based design.

Background

Building a new hospital presents a unique opportunity to improve the quality and safety of care through evidence-based design. The South Health Campus (SHC), scheduled to open in 2011, will become a large academic tertiary healthcare centre. As a green field site, the SHC represents a unique opportunity to improve health service delivery and facility design through evidence-informed decisions.

While there is a growing body of evidence to guide health service delivery planning, clinical process improvement, and facility design, in many instances there is a lack of trusted sources of information that provide high quality evidence to inform planning. Evidence, when available, requires appraisal to determine how best to apply it to the local system.


**Evidence-Based Decisions for an Innovative South Health Campus**

**KT Initiative**

To address the identified needs, an applied research partnership between the South Health Campus Project Team, the Ward of the 21st Century (W21C) (www.w21c.org), and the University of Calgary was formed to translate human factors knowledge and expertise into the design of the SHC. In this way, answers to some of the key design questions facing the SHC Project Team could be answered through scientific enquiry by the research partners working in collaboration with decision-makers and clinicians. The objectives of the initial project for this new partnership, the "mock up project," were aimed at answering specific facility design questions while the objectives for the overall initiative were longer term and broader, to include questions pertaining to both facility design and service delivery. The objectives for this initiative are summarized in Table 1.

**Table 1: Summary of Objectives and Desired Impact.**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Desired Impact</th>
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<tr>
<td>1. Using simulated patient care scenarios and human factors analysis,</td>
<td>A process of rapid integrated research led by the W21C human factors team resulted in ‘just in time’ design changes, such as:</td>
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<td>provide evidence to architects, builders, and decision-makers to</td>
<td>• relocation of headwall in inpatient care room</td>
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<td>inform the design of the SHC.</td>
<td>• adapting counter space and workspace for professionals</td>
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<tr>
<td>2. Develop a sustainable knowledge exchange</td>
<td>• redesign of bathroom access and orientation</td>
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<td>relationship (or partnership) between the SHC Project Team (the</td>
<td>Due to the success of this initial project, this process and methodology is now being utilized to help inform the selection of specific technologies and equipment and the evaluation of clinical workflows within an acute care environment.</td>
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<td>decision-makers), clinicians (the users), and the W21C (the</td>
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<td>researchers).</td>
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<td></td>
<td>This initial project allowed stakeholder groups to form and develop a collaborative way to work together to achieve project objectives. As the project progressed, the knowledge exchange relationship matured and resulted in additional projects, one of which has been completed and several more of which are currently being planned.</td>
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<td></td>
<td>The early success has allowed the team to build on each project and move from physical design problems to clinical workflows and technology issues.</td>
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Facilities of the Future

Methodology

Knowledge Exchange Collaboration: A formal organizational structure, including a steering committee and working groups, was established to plan and execute this initial project and with the intent of establishing a sustainable relationship between the W21C and associated researchers and SHC leadership. A formal project charter, developed jointly by all stakeholders, clearly stated the objectives, work plan, and deliverables, along with the roles and responsibilities of the various stakeholders. This helped establish the new relationship as well as plan and deliver the mock-up project.

Mock-Up Project: Human factors, patient simulation, and usability engineering methods were used during the evaluations. A set of mock-up rooms were built at the SHC for the purposes of evaluation and tendering of bids. The four rooms that were evaluated included an outpatient exam room, an emergency department exam room, an acute care inpatient room, and an intensive care unit room. Each room was equipped with four audio and video microphones and cameras, which were used to code beneficial and problematic designs. When the SHC is completed, these four room types will comprise a total of 900 rooms in the new hospital.

For each of the rooms, several patient scenarios were simulated to stress the design of each room by having patients, family, and healthcare providers interact with integrated medical equipment, aspects of the room, and one another. All necessary equipment was included within each of the mock-up rooms so as to nearly replicate functioning spaces. Scenarios were run with simulators such as the METI ECS Stan and Baby Ryan and with standardized patients or actors. Citizens and healthcare professionals volunteered to participate in the evaluations and included patients, doctors, nurses, respiratory technicians, and physiotherapists. The scenarios that were run included a code blue situation, a central line insertion, a patent lift, a patient admission, a pediatric lumbar puncture, and a chest tube insertion. After each scenario was completed, participants were engaged to critique aspects of the room that were advantageous and those that conflicted with the work activities in the scenario. The emphasis of the evaluation was on the design and functioning of the room and not on the performance of the healthcare professionals, which is an important element of the evaluation protocol. The feedback resulting from these conversations, coupled with the analysis of the video of each scenario, were used to make recommendations for changes in design.

These recommendations were vetted through a steering committee, consisting of members of the SHC Project Team and the Research Team. This approach provided excellent communication between the collaborating partners and facilitated quick decision-making and translation to the design team for making changes.

Audience

The intended audience for these results are decision-makers who are responsible for designing and building (or renovating) health care facilities, “the users” (patients, families, and clinicians) and researchers who work in a wide variety of areas related to facility design and health services delivery. This project demonstrates the value of a collaborative relationship between these groups.

Frequently, decision-makers and researchers struggle to find ways of working together effectively to achieve their respective goals. A variety of approaches to link research to action have been proposed. One model is led by research producers/purveyors “pushing” knowledge to the users, while the “user-pull model” involves decision-makers reaching into the research world to extract information. A third model, the “integrated” approach, involves a partnership between the users and researchers. Our early experience with the knowledge exchange relationship between the SHC Project Team and the W21C, along with its associated researchers, is a feasible model for others seeking evidence to improve healthcare.
KT Strategy

The knowledge exchange relationship inherently engages decision-makers and researchers while the design of specific projects, such as the mock-up project, engages patients, families, and clinicians. Our experience suggests that engagement throughout the process is important. From the point at which the research question is defined through the analysis and application of the results, all stakeholders add value.

Results

The mock-up phase of the research has been completed and was deemed a success. Audio and video data was collected for each scenario, was coded into a set of categories by a number of researchers, then recommendations for design change were proposed. The categories included access issues, collision with equipment, communication issues, visibility, clutter, congestion, and usability issues, among others. Across the four rooms, several hundred recommendations were made and were weighted according to supportive evidence.

Subsequently, the recommendations for each room were reviewed together with architects, builders, and decision-makers to determine which could be implemented immediately (71) and which others required additional follow-up. Some recommendations, such as changes to the acute care patient bathroom and the intensive care unit steel support structure, were made within a week of each evaluation to meet the construction schedule. This approach had a substantial impact on both design and engagement.
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Key Messages

The collaborative partnership between the W21C and the SHC project team creates a unique knowledge translation opportunity in which the decision-makers, the researchers, and the clinical providers work collaboratively throughout the research process to achieve a mutually beneficial research and clinical agenda.

The human factors and patient simulation methods used to evaluate the rooms represent a new means to determine patient safety and architectural usability of healthcare environments under tight time constraints. The methodology used to evaluate the SHC can also be used to acquire evidence to inform health system and facility planning. An interventional operating room, intensive care unit room designs, and long term care facilities have also been evaluated using the methods developed during the course of this project.

Acknowledgements

We are grateful to the capital construction team at Ellis Don for numerous accommodations during the course of these evaluations. We wish to thank all of the individuals who organized and coordinated the evaluations of the mock-ups. In addition, we are grateful to the many citizens and healthcare professionals who participated in and contributed to the evaluations.

About the Authors

Tracy Wasylak is the operating Vice President in charge of the South Health Campus (SHC) Project. Dr. Ted Braun has been a Senior Vice President with the SHC from its inception through design and operational planning. Shandra Kimpton, Administrative Director, Ward of the 21st Century (W21C), is a member of the SHC Clinical Design Team and instrumental in the development of the knowledge exchange relationship. Dr. Jeff Caird is a Professor in the Department of Psychology and an Adjunct Professor in the Faculty of Kinesiology and the Department of Anesthesia, University of Calgary and is the Director of the Healthcare Human Factors and Simulation Laboratory located in the W21C Research and Innovation Centre. Dr. Caird has worked closely with the SHC Team to provide his human factors expertise and to support the knowledge exchange relationship. Joanne Aimee is a consultant who provides project management office support. Ken Chiang is responsible for the Capital Construction Project and instrumental in building the mock-up simulation rooms at the SHC.

References