



**Adaptive Facilities Correlate to Patient Satisfaction.** In the face of constant change and the challenges it poses, some hospitals are pursuing functionally efficient facilities that can adapt to the changing needs of the community and evolving methods of delivering care. Seeking a forgiving interior environment, Bluewater Health chose a reconfigurable solution. Metrics confirmed the benefits.

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Initiating change, adapting to change, anticipating change—in one way or another hospitals are constantly dealing with change and the challenges it poses. In this sense, they’re like any business or organization that must adjust to the times. But hospitals have a more daunting task than maintaining bottom-line viability. The very nature and complexity of their work puts them in a position of singular risk, one where people’s lives can lie in the balance.

Within this context, the ability to accommodate and facilitate change is crucial. Recognizing this, hospitals that are renovating existing facilities or constructing new ones are carefully analyzing the implications—clinical, financial, environmental—of their choices for building, furnishing, and maintaining their environments. They’re looking for ways to align work spaces with work processes, for solutions that mitigate the risk of obsolescence and promote the ability to adapt, quickly and cost effectively.

Some, like Bluewater Health in Sarnia, Ontario, have chosen a reconfigurable solution. Bluewater Health, prior to design development, sought a “forgiving” design solution, one with an ability to transform to accommodate ongoing improvements in process, workflow, infection prevention, environmental sustainability, and the satisfaction and safety of patients and staff members. More specifically, Bluewater wanted the flexibility to be able to:

- Plan and make fast-track changes without compromising patient outcomes
- Meet the changing needs of users without creating the need for additional space
- Respond to the technology needs of today’s healthcare environment and anticipate future needs
- Minimize cost and downtime during future change
- Allow modifications that don’t compromise the integrity of clean environments and infection-prevention control
- Minimize product and construction waste and maximize reuse and recycling of product

Like other hospital organizations that build new facilities or renovate existing ones, Bluewater had two interior options to consider: (1) built-in casework and architectural walls or (2) reconfigurable, reusable casework and demountable walls. It had to assess which offers more advantages and fewer risks, comparing the two in terms of costs and performance, including the ability to accommodate change and environmental sustainability. The stakes were high for the community hospital. It was planning the renovation of 335,000 square feet of an existing five-floor facility and the construction of a new 285,000 square-foot five-floor, 320-bed structure that consolidates two facilities into one.

Bluewater Health’s innovation began before design development with adaptive design as an intentional criterion. It recognized the benefits of selecting a standardized kit of parts, minimal in number but reconfigurable, interchangeable, and suited to support the future. Ultimately, by choosing such an approach, it found its “forgiving” solution. Reconfigurable casework is used in over 80 percent of the facility that would have traditionally been designed with fixed millwork. Over 6,000 lineal feet of demountable walls stand in place of steel-stud and gypsum-board walls. Bluewater

chose reconfigurable casework and walls for its Emergency Department, procedure rooms, treatment rooms, Ambulatory Care, Diagnostic Imaging, Oncology, Dialysis, Lab, Pharmacy, Rehab, Complex Continuing Care, Surgical Suite, inpatient rooms, Nurse Care stations, Intensive Care Unit, Maternal Infant Child, exam rooms, interview rooms, medication rooms, supply rooms, team rooms, and nutrition stations.

### Measuring and Analyzing the Impact

Prior to the doors opening in the new building, Bluewater sought an accounting of the impact that the facility would have on the nurses and staff. In discussions with Bluewater, Herman Miller Healthcare saw the opportunity to study, measure, and analyze this impact. So, with the support of Bluewater management and staff, and the approval of its Ethics Committee, Herman Miller Healthcare sponsored a research project that would explore how the change in the built environment had affected staff in three critical areas: Ambulatory Care, the Intensive Care Unit, and the Emergency Department.

The research would be conducted in two phases and in two places: at the old facility, prior to the move, and at the new facility, three months after move-in. "This was a rare opportunity," says Gail Allen, a registered nurse and clinical strategist for Herman Miller Healthcare. "We weren't sure what it would reveal." Whatever the results, Julie Sless, vice president, Herman Miller Canada, saw the opportunity as mutually beneficial. "It required a relationship based on trust," she says. "We both wanted the best for the staff and we both wanted to learn from this experience."

The hypothesis for the research was that Bluewater Health's adaptive environment would positively impact work process/productivity, staff satisfaction, communication, and staff health and safety – resulting in improved patient care. In both pre- and post-move environments, data was gathered to answer the following questions:

**Work process/productivity.** What physical environment issues and/or barriers inhibit staff from carrying out their predetermined work processes?

**Communication and collaboration.** How do individuals communicate and collaborate? What factors inhibit communication and collaboration? What sources of data are used to inform decisions that are being made? How is mentoring and support achieved?

**Human factors.** What physical environment attributes inhibit staff's ability to work in a safe and comfortable manner to reduce the risk of injury?

The observational research made use of quantitative real-time practice data. It was conducted by Workflow Integrity Network (WIN) using Function Analysis, its proprietary work-sampling methodology, as one of the primary sources of data collection. To measure the effects of change on critical staff activities in the built environment, WIN conducted five days of continuous observation in both the old and new buildings. Equipped with hand held devices, data gatherers "shadowed"

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nurses working in Ambulatory Care, the Intensive Care Unit, and the Emergency Department for their full 12-hour shift each day.

### Initial Positive Responses, But Not Everywhere

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Here's what the research revealed:

**Work process/productivity/workflow.** Productivity of nurses in Ambulatory Care (+3 percent) and the Intensive Care Unit (+6 percent) increased from pre- to post-survey, while in the Emergency Department (-1 percent) it decreased. (Note: Even the smallest changes in productivity have a significant impact according to a Canadian Nurses Association 2009 study of nursing shortages, "by increasing productivity just 1 percent a year, the shortage of 60,000 nurses in Canada could be reduced by close to half by 2022.")

**Staff satisfaction.** Nurses in Ambulatory Care (+22 percent) and the Intensive Care Unit (+17 percent) were satisfied with the new environment. Nurses in the Emergency Department (-2 percent) were not.

**Communication.** Communication with patients represented between 9 and 24 percent of the nurses' time in all three departments. While the physical space accommodated communication and collaboration, patient face time was lower than expected but created a baseline from which to work.

**Human Factors.** Among the most significant findings was that in both pre- and post- environments nurses (1) spent 80 percent of their seated time either leaning forward or perched on the front their chairs and (2) repeatedly had to reach for work-process tools. Virtually no staff members adjusted their chairs for improved back support.

While nurses in Ambulatory Care and the Intensive Care Unit were positively impacted by their new work environments, those in the Emergency Department were less satisfied and less productive than they had been in the old facility. Why this disparity? What wasn't working out in the new Emergency Department environment?

One contributing factor was that the space had been programmed and designed six years prior to move-in, evidence of the prolonged, complex process of building a new hospital. The initial design, for example, hadn't planned for Accudose medication-dispensing machines, which consume a lot of space. Also, the process hadn't provided staff members with a way to visualize the space until they actually moved into it. "It's virtually impossible for a design that is one snapshot in time to

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support an ever-changing environment like healthcare,” says Julie Sless. “Keeping up with the rapid pace of change—in terms of technology, new medical practices and procedures, evolving regulations, shifting patient demographics—is a real design challenge. A lot changes in six years.”

### **Dealing with Issues in the Emergency Department**

Recognizing this, and looking to identify specific issues and solutions at Bluewater, Sless, Gail Allen, and Janet Zeigler, Herman Miller Healthcare director of Healthcare Consulting, worked closely with the staff and management of the Emergency Department. “We knew that our people in Emergency were struggling with their space,” says Lisa Regan, director of Transition Planning at Bluewater Health. They spent hours and hours looking at staff flow and patient flow, especially in triage.” As they did, they saw firsthand that the design of the triage and registration space was tight, hindering accessibility, and compromising privacy and patient confidentiality. They also saw that the medication preparation space and work space at the care station for the high- and low-acuity areas in the Emergency Department was vulnerable to congestion and distraction during busy times.

In response, the Herman Miller team and dealer partner Facility Resources, began to explore ways to reconfigure the space that would address the issues. “The process was all about solving problems and mitigating risk,” says Julie Sless. It was also about directly involving the staff members who were working in these areas. “I think getting input from staff was really key,” says Lisa Regan. “You really need to live in your space and understand your space before you start making changes.”

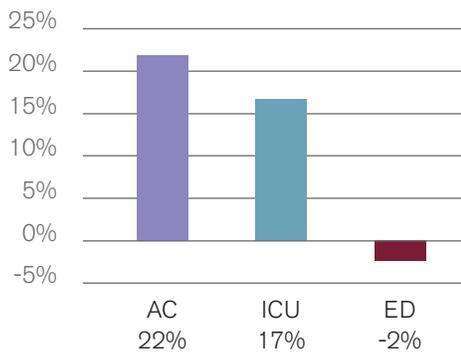
Working with Regan and Emergency Department managers, the Herman Miller team began creating various options for the staff to consider. To visualize the redesigns, three-dimensional renderings were created using Z-Axis, a proprietary design tool that helped staff members see how the space will support work processes. The renderings were shared with staff for their input. “We would make changes and post new drawings for approval,” says Lisa Regan. “This process took about six months, but we wanted to get it right.” They did so by dealing with the issues that were being uncovered, including workflow, medication preparation space, distractions, and patient safety and confidentiality. So, with buy-in from Bluewater leadership, management, and staff, the Emergency Department was redesigned after a thorough process of observation, programming, visualization, and approval.

Six months after their redesign, staff from the Emergency Department (high-acuity, low-acuity, and triage) participated in follow-up surveys where they voiced their perceptions about their newly designed, newly reconfigured work areas.

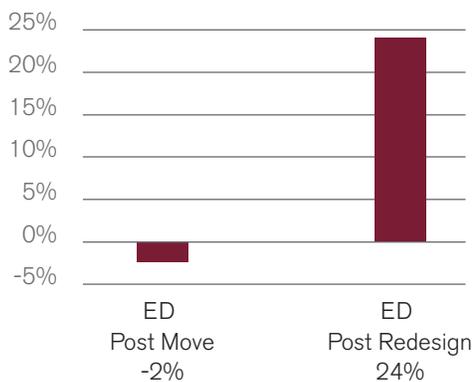
### **Positive Changes in Perception, Satisfaction**

These survey results reflected a major change in staff satisfaction in the Emergency Department, which rose from -2 percent prior to the intervention to +24 percent

### Staff Satisfaction Pre to Post-Move 2010



### Staff Satisfaction Post-Move Redesign 2012



after the reconfigurations. The survey identified positive changes in the staff's perception of:

- Characteristics of the new design and space use
- Access and organization of supplies and medications
- Team effectiveness and satisfaction based on staff members' feeling that they're valued and making a contribution to patient satisfaction

"Hospitals must be proactive to ensure that patients are having a positive experience," says Barbara Balik, RN, Ed.D., of the Institute for Healthcare Improvement.

"Research shows that one of the best ways to improve your patients' experiences is to make sure your employees are engaged and satisfied with their work experience." Several studies have shown that nurses' negative perceptions of individual physical environment features (including access to supplies and equipment, nursing unit layout, window view, and room size) are related to lower job satisfaction.

"As our follow-up survey shows," says Julie Sless, "staff satisfaction depends, in part, on how positively they perceive their own effectiveness in treating patients. The more satisfied the staff, the more well served the patient. The environment and the tools it provides are key to this positive correlation."

Human factors were also addressed in the research. Both pre- and post-move observations indicated that nurses spend 40 percent of their time sitting and 60 percent of their time standing/walking/running. As noted earlier, nurses were found to spend 80 percent of their seated time either leaning forward or perched on the front their chairs, and they repeatedly had to reach for work-process tools. The problem that some nurses had with monitor maneuvering was mitigated with intuitively adjustable monitor arms. The implications of the unsupported ways that nurses were sitting in their chairs were evident. In terms of back injuries, the nursing profession ranks number one; it ranks number two in non-fatal work-related injuries. Nurses need all the support they can get, but virtually none of those in Ambulatory Care, the Intensive Care Unit, and the Emergency Department adjusted their chairs for improved back support. "It is critically important that nurses have access to chairs that support them without requiring a lot of adjustments," says Julie Sless. "Seating should provide passive ergonomics with as much intuitive back support as possible to help reduce the risk of musculoskeletal disorders and back injury."

While numerous survey tools focus on improving staff satisfaction, the NRC Picker survey measures performance from the patient's point of view. Post-move, the Emergency Department NRC Picker patient surveys regarding "physical environment" was 75 percent patient satisfaction compared to an Ontario average of 84 percent. After the redesign in 2012, the NRC Picker survey indicated patient satisfaction scores of 95 percent.

### Making Changes—Easily, Sustainably, Cost-effectively

Throughout the redesign process at Bluewater, did the reconfigurable solutions that it had in place make it easier to implement these changes? "Most definitely,"

says Lisa Regan. "It's hard to plan for what the future is going to hold, but adaptive environments give you the flexibility to deal with ongoing changes—in technology, accessibility legislations, and how we operate. We made these changes with very little disruption and with nothing going to the landfill." She notes that using reconfigurable products during the redesign minimized noise, dust, downtime, and the risk of infection. "We weren't creating havoc by tearing things down." Traditional construction would have made these changes extremely difficult because of the disruption to patient care.

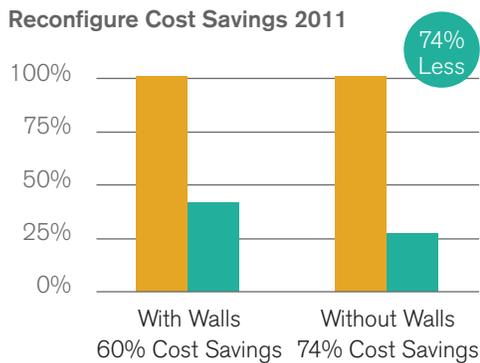
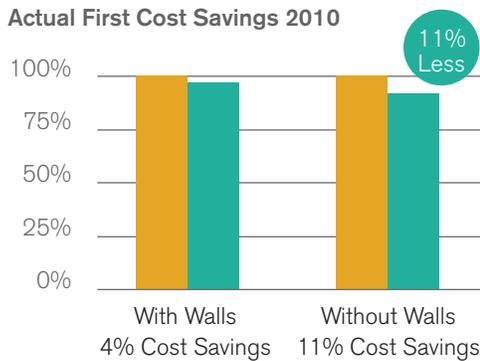
As manager of the Emergency Department, Marsha O'Mahony oversees the work of its staff of 100 nurses, doctors, technicians, and security personnel. "We engaged everyone and we used everything," she says. "If we took down a treatment room, we reused the components in other areas of the unit, for example, the nurse care station, medication room or other areas of the hospital." At the same time, other areas of the facility were also being redesigned, including Inpatient Surgery and Maternal Infant Child.

Contrary to what many people believe, in addition to the functional benefits that reconfigurability provides, there are cost benefits as well. In the initial 2010 installation, Bluewater realized a 4 percent cost savings in the areas where reconfigurable casework and demountable walls were used instead of conventional millwork and walls. It realized an 11 percent cost savings in areas where reconfigurable casework, but not demountable walls, were used.

The 2011 redesign and reconfiguration resulted in further savings. The use of reconfigurable casework and demountable walls instead of conventional millwork and walls led to a 60 percent cost savings. When reconfigurable casework, but not demountable walls, was used, cost savings were 74 percent. Downtime was 72 percent less than it would have been if conventional millwork and walls had been in place instead of reconfigurable casework and demountable walls. In addition, Bluewater Health achieved LEED certification, one of the first acute care hospitals in Canada to do so.

### Five Key Lessons Learned

- 1. Dynamic Environments Need to Change:** "There was nothing wrong with our initial programming and design, but it is virtually impossible for one design, at one point in time, to support a dynamic environment like healthcare," says Lisa Regan. Some, like Bluewater Health, are finding that reconfigurable casework and demountable walls provide the adaptability they need to optimize Continuous Process Improvement or Lean initiatives no matter what tomorrow brings.
- 2. Staff Input and 3D Visualization Are Key:** When making the change it is important to identify key processes and standard work for three to six months, balanced with observation and staff input. It is also important to present staff with



Traditional Fixed Construction ■  
 Reconfigurable/Reusable Casework ■

3D visualization tools—to optimize their understanding of how the space will support their work process.

**3. Take Action on What You Measure:** Healthcare organizations continually determine things to measure and gather indicators such as patient complaints and staff satisfaction. The difference at Bluewater Health was that they responded to the results and took action to change the physical space, with staff engagement. “The result was empowered staff that has more trust, and a culture more accepting to change, which allows for the additional continuous improvement initiatives moving forward,” says Lisa Regan.

**4. Staff Satisfaction Affects Patient Satisfaction:** Without the ability to adapt the physical features of healthcare facilities, it becomes more likely that they can obstruct efficient nursing work and create a risk to patient safety. There are correlations between the work environment and nurse satisfaction. While many healthcare facilities are measured on patient satisfaction, it is critical to improve staff satisfaction. Nurse satisfaction, in turn, directly affects patient outcomes and patient satisfaction. Bluewater recognized that in keeping with their goal of client-centered care; improving staff satisfaction improves patient satisfaction and patient outcomes.

**5. Adaptive Design Concepts Start Before Design Development:** Physical space needs to be forgiving to change. The key point is to include the expertise and research from the reconfigurable casework provider as early as the schematic design stage to ensure that an adaptive design philosophy is entrenched in the criteria so change is easy down the road. Involving the provider in design development is critical to lowering initial building cost and also reducing long-term operating costs.

Hospitals are looking for ways to align workspaces with work processes, for solutions that mitigate the risk of obsolescence and promote the ability to adapt, quickly and cost-effectively.

Mitigating risks while controlling costs and improving work processes are ongoing responsibilities for hospital leaders who make and oversee policy and the nurses, doctors, and support personnel who carry it out. As technologies, medical practices, regulations, and patient and staff expectations evolve and bring new challenges, this responsibility becomes increasingly important—and ever more urgent.

Within this context, the ability to accommodate and facilitate change is crucial. Hospitals are looking for ways to align workspaces with work processes, for solutions that mitigate the risk of obsolescence and promote the ability to adapt, quickly and cost-effectively.

In circumstances where change is a constant, the best investment a healthcare organization can make is in a facility that can change.

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