



Patient-Room Design: The Same-handed, Mirror-image Debate. Hospital professionals across the United States—and the design resources they work with—are debating the merits of each approach. The issue comes down to whether same-handed or mirror-image standardization does a better job at improving patient safety and staff efficiency, whether in new or renovated facilities. And if so, at what cost?

The people who make America's hospitals work—nurses, doctors, planners, administrators—face serious challenges every day. Some are literally life-and-death situations. Others, while less dramatic, can have major implications for the future health of the institution itself. While taking care of today, hospital professionals must also be thinking about next month and next year and 25 years from now.

One of their most important ongoing challenges involves the design of healthcare facilities. With a focus on increasing both safety and efficiency, the architectural design profession is actively engaged with them in seeking optimal facility solutions. Employing evidence-based design in consultation with healthcare professionals and other experts, designers are proposing and making pivotal changes to hospitals' physical environments.

The emphasis on patient safety and staff efficiency has been especially evident since the publication in 2001 and 2003 of reports from the Institute of Medicine and the Agency for Healthcare Research and Quality that called attention to unsafe conditions in American hospitals.¹ Prior to that, in 1999, the Institute of Medicine reported that as many as 98,000 deaths and more than one million injuries are caused by preventable medical mistakes annually in the United States.²

Focus on the Patient Room

This call for greater safety and efficiency affects all elements of a healthcare facility, but the single most important component is the patient room. Research has shown that patient healing and recovery are affected by the design of the physical environment.³ "The patient room is the place that has the most direct impact," says Roger Call, AIA, ACHA, director, Healthcare Architecture + Design at Herman Miller. "It's also the place that has the greatest impact on construction costs, whether a hospital is building new, transitioning from an existing facility, or upgrading."⁴ There's plenty of all three of those going on these days, as the design models that hospitals adopted 30 or 40 or 50 years ago give way to newer prescriptions that promise—or at least indicate—a better framework for the future.

At the same time, healthcare professionals have to balance the call for increased safety and reduced staff errors with the reality of tight budgets and serious financial scrutiny. Working within such constraints, they need to decide which design solutions, among the many possibilities, are most likely to deliver the desired results. They must consider at what point, and under what circumstances, the cost of implementing a design decision might outweigh the potential benefits it offers, or seems to. These are not easy decisions. They're often slowed by competing philosophies, entrenched opinions, and insufficient or inconclusive evidence that a proposed solution will actually lead to better care.

Same-handed and Mirror-image Standardization

One such decision involves same-handed versus mirror-image room design. Both can be standardized. Standardization of environments, which is generally accepted

as supporting processes and workflow, isn't the subject of the current debate. The question is whether same-handed or mirror-image standardization does a better job in improving patient safety and staff efficiency. And if so, at what cost? Questions like these are being addressed by hospital professionals across the United States as they work with designers to implement best-practice solutions. They're asking whether rooms with same-handed design have achieved the same general acceptance that private rooms and views to nature have. And they're wondering if the extra cost of building same-handed rooms is justified.

The defining difference between mirror-image and same-handed rooms is the positioning of the headwall of a patient's bed. Standardized mirror-image rooms share the wall that accommodates their headwalls, so they are reflections—back-to-back mirror images of each other. The headwalls in same-handed rooms do not share a wall. They're always positioned on the same side of the patient room—typically the left sidewall, which prompts the approaching caregiver to position herself to the patient's right, as traditionally advocated.

With standardized same-handed design, each component, each piece of equipment, is in a location that doesn't vary among rooms. This constancy means that caregivers know exactly where everything is in relation to their own position. The result? Some would say fewer errors, less wasted time, and more efficiency than mirror-image rooms.⁵ According to *Healthcare Design* magazine, there's "compelling and evolving evidence" that indicates identical rooms "encourage repetition and standardization that reduce the chance for errors and waste. The strategy makes intuitive sense."⁶ The logic of such standardization, some say, can be seen in the uniform design of airplane cockpits. If such standardization can improve aviation safety, might it not also improve healthcare safety?

Same-handed design is also seen as facilitating a consistent approach to the right side of a patient, which has been advanced as the optimum caregiver location. With standardization of approach and location vis-à-vis the patient, elements in the environment can be designed and located to provide caregivers with familiar settings that reduce their cognitive burden and lead to safer patient-care support.⁷

There's also evidence that same-handed design can reduce noise transmission between patient rooms. This, again, is due to the positioning of the headwall. In mirror-image rooms, where the headwalls are placed back to back in adjacent rooms, the holes in the headwalls that accommodate gas and power outlets, light, switches, data jacks and other equipment and systems allow noise from one room to penetrate the other. In same-handed rooms, where headwalls face the same direction, they're backed by walls that provide solid barriers to sound transmission.⁸

A Cost Differential

If it weren't for the additional construction costs, the choice of same-handed room design wouldn't be so difficult or debated. As things stand, however, the cost differential between

same-handed and mirror-image rooms is significant. This is largely due to the fact that same-handed rooms don't share bathroom plumbing chases while mirror-image rooms do. Having to provide individual plumbing chases (along with individual medical gas and electrical lines) rather than sharing them between rooms adds what has been estimated to be between \$3,000 and \$5,000 to the cost of each same-handed room. There are ways to mitigate this differential. Prefabricating headwalls and millwork off-site instead of building them on-site, for example, can reduce labor costs,⁹ but the additional overall price tag of same-handed room design is still enough to give decision makers pause.

In many cases, though, that pause is giving way to approval as an increasing number of hospitals adopt the concept of same-handedness at all levels of patient acuity.¹⁰ They're willing to pay extra for the reduced errors and improved efficiencies that same-handed rooms seem to provide¹¹ and to disregard the exterior and interior visual monotony that some see as a design deficiency.¹²

However, according to Dr. Debajyoti Pati, with little empirical evidence to provide an objective assessment, stakeholders currently base their assessments on subjective perception. "It's not uncommon," he says, "to find literature promoting same-handed rooms without any specificity regarding the process or workflow standardization the concept is intended to support."¹³ (He also notes that "there appears to be a blurring of the concepts of standardization and same-handed rooms. The two concepts are being used as synonyms, which is not true.")¹⁴

In an effort to provide more specific information, Dr. Pati, vice president and director of research with HKS Clinical Solutions and Research, along with Tom E. Harvey, Jr., HKS senior vice president, Jennie Evans, clinical adviser, and Professor Carolyn Cason, associate dean for research at the University of Texas at Arlington's College of Nursing, have conducted a study that examines the comparative effectiveness, in terms of operational performance, of same-handed and mirror-image healthcare-setting configurations. Their work¹⁵ won the Best International Research Project award at the 2010 Design & Health International Academy Awards at the University of Toronto in Canada.¹⁶ It was funded, in part, through grants from Herman Miller, Inc., and the Academy of Architecture for Health Foundation.

How the Study Was Conducted, What It Found

A 13,000-square-foot simulation venue at the University of Texas Arlington's Smart Hospital provided a setting that allowed the researchers to manipulate room design and monitor and record the results of nurses working in two room configurations in an acute medical-surgical setting—one configuration with a left-handed approach, the other right-handed. Each unit was fitted identically with a bed, headwall, removable over-bed table, and other equipment typically found in a hospital room. Nine different physical configurations of the caregiver zone were created. The approaches to these ranged from being open, with no forced direction, to being forced from the left and right of the patient. The location of an IV pole was also manipulated, from being absent to being placed on the left or right side of the patient.

Working within the nine physical design configurations, the 20 participating RNs (10 right-handed and 10 left-handed) provided three types of care to a patient-actor: checking vital signs using a blood-pressure monitor; suctioning using a hand-held instrument; and helping the patient sit up, dangle his legs, and return to a resting position. The nurses' actions were videotaped in 540 separate segments, which were coded by a team of experts in nursing and kinesiology to document behaviors and potentially stressful or harmful actions including stretching, bending, stabilizing, lifting, twisting, and repositioning. Structured follow-up interviews with nurses, which were also videotaped, focused on workflow, perceived awkward postures or movement, task-supportive elements of the settings, and factors influencing their direction of approach to the patient.

Here are key findings of the study.

- Standardized headwalls are as effective as standardized same-handed rooms in supporting caregiver work patterns.
- The location of the IV strongly influences caregiver work patterns regardless of layout.
- To caregivers, the most important room attribute is having the ability, upon entering the room, to see and quickly assess the area around the patient.

Janet Zeigler, RN, MN, MBA, and director of Healthcare Consulting for Herman Miller, notes that single patient rooms typically include three zones—family, patient, and clinician. "Clinician zones should be standardized for the same reasons that headwalls should be," says Zeigler. "This might include the placement of hand sanitation, gloves, documentation technology, and the storage of standardized supplies—organized, compartmentalized, and labeled." She adds that with increased patient acuity, there are often more supplies, equipment, and medications that need to have standardized locations as well.¹⁷

Implications and Evaluations

Compared to standardized mirror-image rooms, standardized same-handed rooms are a relatively new concept. As such, their impact is in the process of being evaluated. Since design trends have unintended side effects—some positive, some negative—such evaluation is essential.¹⁸ It's clear, for example, that studies of standardized same-handed rooms should include their behavioral impact on caregivers.

With the importance of flexibility around patient care having been documented,¹⁹ key questions arise:

- To what extent can the physical execution of processes and workflow be standardized?
- Can caregivers be forced to always be on the right of the patient? Should they be?
- Would standardizing this position reduce their flexibility?
- If so, what potential impact could this have on safety and efficiency?

Patient room design will continue to evolve, building on the evidence that's being gathered as new or established models are evaluated. As more same-handed rooms are built and analyzed, the resulting evidence will help validate how much safer, if at all,

identical rooms really are in clinical practice. The University of Minnesota Children's Hospital, Fairview, for instance, which chose same-handed rooms for its new inpatient tower and emergency department, will conduct studies designed to help inform future projects.²⁰ Other hospitals will certainly be conducting similar follow-up studies.

And, not to change the subject, but what about the nurses' stated preference for a global view upon entering a room? What design implications might that have? The challenges facing designers and hospital professionals are as ceaseless as change itself. Responding with intelligence and foresight continues to be the greatest and most important challenge of all.

Notes

- ¹ "Making health care safer: A critical analysis of patient safety practices," Agency for Healthcare Research and Quality. Rockville MD: AHRQ; 2001. "The effect of healthcare working conditions on patient safety," Agency for Healthcare Research and Quality. Rockville MD: AHRQ; 2003.
- ² Jane Mundy, "Study finds hospitals still unsafe," LayersAndSettlements.com, November 27, 2010 <<http://www.lawyersandsettlements.com/articles/15481/hospital-study-medical-errors.html>> (accessed November 21, 2010).
- ³ I. Glind, S Roode, A. Goossensen, "Do patients in hospitals benefit from single rooms? A literature review," *Healthy Policy*, vol. 8, no. 84, pp. 153 (cited by James Shraiky and Joshua Schoonover in the presentation "Innovation in Healthcare Design; a Critical Evaluation of Contemporary Design Trends that Affect Patient Outcomes," delivered October 2010).
- ⁴ Roger Call, personal interview, November 29, 2010.
- ⁵ J. Reiling, *Safe by design: designing safety in health care facilities, processes, and culture*. Oakbrook Terrace, IL: Joint Commission Resources.
- ⁶ Richard L. Kobus and Russ Williams, "Designing for Safety," *Healthcare Design*, August 2010.
- ⁷ James Shraiky and Joshua Schoonover, "Innovation in Healthcare Design; a Critical Evaluation of Contemporary Design Trends that Affect Patient Outcomes," presented October 2010.
- ⁸ Doug Fick and Gary Vance, "Mind the Gap!" *Healthcare Design*, March 2008.
- ⁹ Sheila Cahnman, "Key considerations in patient room design, part 1," *Healthcare Design*, April 2006 <<http://www.healthcaredesignmagazine.com/me2/dirmod.asp?sid=9B6FFC446FF7486981EA3C0C3CCE4943&nm=Articles&type=Publishing&mod=Publications%3A%3AArticle&mid=8F3A7027421841978F18BE895F87F791&tier=4&id=21E17C4E6B314B66819324CC0C525D4E>> (accessed November 21, 2010).
- ¹⁰ Debajyoti Pati, Carolyn Cason, Thomas Harvey, Jennie Evans, "Room handedness: patient room layout in acute inpatient care," *World Health Design*, July 2010 <<http://www.designandhealth.com/uploaded/documents/Magazine/whdJuly10.pdf>> (accessed November 21, 2010).
- ¹¹ Op. cit., Cahnman.
- ¹² Camie Maze, "Inboard, outboard, or nested?" *Healthcare Design*, March 2009 <<http://www.healthcaredesignmagazine.com/ME2/dirmod.asp?sid=&nm=&type=Publishing&mod=Publications%3A%3AArticle&mid=8F3A7027421841978F18BE895F87F791&tier=4&id=A49F111688A442A683B3A0FB356E1755>> (accessed November 10, 2010).
- ¹³ Debajyoti Pati, "Same-handed patient rooms: an operational perspective," *HKS Smart Healthcare*, January 21, 2010 <<http://www.hkssmarthealthcare.com/?p=337>> (accessed November 15, 2010).
- ¹⁴ Jeff Stouffer, "Are standardized same-handed configurations in acute medical-surgical settings a sound investment?" *Healthcare Design*, December 2010 <<http://www.healthcaredesignmagazine.com/ME2/dirmod.asp?sid=&nm=&type=Publishing&mod=Publications%3A%3AArticle&mid=8F3A7027421841978F18BE895F87F791&tier=4&id=71A63BF5ACCE4973A13A3C684DCF7D21>> (accessed January 13, 2011).
- ¹⁵ Carolyn Cason, Jennie Evans, Thomas Harvey, Debajyoti Pati, "An empirical examination of patient room handedness in acute medical-surgical settings," *Health Environments Research and Design Journal*, vol. 4, no. 1, fall 2010, pp. 11-33.
- ¹⁶ Design and Health.com <<http://www.designandhealth.com/Advocacy/International-Research-Project.aspx>>.

¹⁷ Janet Zeigler, personal interview, January 13, 2011.

¹⁸ Op. cit., Shraiky and Schoonover.

¹⁹ Carolyn Cason, Thomas Harvey, Debajyoti Pati, "Inpatient unit flexibility: design characteristics of a successful flexible unit," *Environment & Behavior*, volume 40, number 2, March 2008.

²⁰ Op. cit., Maze.

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