NPSF-Funded Research Project 2012–2013

Identifying and Examining Micro Physical Environment Factors Contributing to Patient Falls

Debajyoti Pati, PhD, FIIA, IDEC, LEED®AP
Rockwell Professor, Department of Design
College of Human Sciences
Texas Tech University

While it is generally accepted that falls are costly and painful for patients, family members, and providers, most scientific studies have focused on patient-specific factors, such as age or use of medications. Few studies have examined the physical environment, whose vital role in reducing falls is generally accepted. Studies on extrinsic factors are scattered, and have provided few areas for potential comprehensive applications.

Dr. Debajyoti Pati

The aim of this study is to identify and examine micro-elements in the physical environment along a patient's trip to the bathroom, and the use of bathroom, that are associated with incidents of patient falls, and to develop design recommendations. This project will examine two questions, from a physical design perspective:

1. What are the specific decisions pertaining to patient room design that may contribute to falls during a patient's trip to the bathroom?
2. What is the relative order of importance of these factors?

Considering the current unprecedented investments into new/replacement health care facilities, this study will help in the design of safer hospitals for the next generation, contribute to quality improvement projects, and help create a foundation for future interaction studies.

This project adopts a multimethod approach involving motion capture experiments, video capture, and interviews, to triangulate study data. With the aid of Covenant Hospital staff, fall scenarios will be recreated in the state-of-science Human-Centric Design Research (HCDR) Lab at Texas Tech University. The design archives of HKS Architects – a large international architecture firm specializing in health care design – will be used to design and build caregiver zone and bathroom mock-ups, representative of actual hospital rooms, in the HCDR lab. Thirty subjects, carefully selected to match the physical profile of the worst-case fall patients, will carry out scripted activities in the mockups, conducting trips to the bathroom from the patient bed and use of the toilet and sink. The experiments will manipulate critical physical design variables identified in a recent exploratory study as possible contributors to falls. A total of 600 experimental trials will be conducted. Kinematic data will be captured using a motion-tracking system, with synchronized video capture of all activities. Semi-structured interviews will be conducted to triangulate other data.

This study will examine 'potential falls' as opposed to actual falls, defined as "a specific point in time when the 'center of gravity' of the human body gets outside the 'base support.'" This constitutes the universal starting point of all falls, irrespective of cause or severity. The stability criteria algorithms will identify all events where 'potential fall' occurred. Physical design attributes associated with potential falls will be identified by closely examining the synchronized video segments corresponding to the potential fall events. The study subjects will be harnessed to prevent actual falls.

This study involves collaboration between Texas Tech University, a large architecture firm specializing in health care design, and a large tertiary care hospital. The three entities have a history of successful research collaboration. As a result, dissemination of results will be multipronged, targeting facilities standards, designers, clinicians, clinical management, and academics.