Mock-ups as "Interactive Laboratories": Mixed Methods Research Using Inpatient Unit Room Mock-ups


Key Concepts/ Context

Simulations allow designers and researchers an opportunity to evaluate how users may interact with a proposed environment prior to the construction of a design. While mock-ups have been used in healthcare environments to assess the efficacy of design solutions, to help clients experience proposed design decisions, and to make changes prior to the building phase and evaluate products and technology, minimal literature exists detailing multiple or mixed methods that can be used to evaluate the results associated with the use of mock-ups from a participatory, qualitative, and quantitative perspective.

Methods

Utilizing a mixed-methods approach, data collection consisted of both qualitative and quantitative methods. Qualitative methods used in this study included interviews, focus groups for pilot work and during workshop sessions, on-demand modifications, open-ended survey questions, scenarios, and ethnography. Quantitative methods included questionnaire data and inpatient room dimensions.

Over the span of four months five mock-up workshop sessions were held. A total of 71 participants consisting of administrators, nurses, physicians, support staff, environmental and maintenance staff, and patient/staff safety representatives from throughout the VA healthcare system responded to the questionnaire during the workshop sessions.

For this study, three types of inpatient rooms were simulated: (1) acute care, (2) intensive care unit (ICU), and (3) isolation. Simple mock-ups of the three inpatient rooms were constructed of movable office partitions. Smaller fixtures and equipment were made from foam-core and fitted with Velcro and wheels to easily
**DESIGN IMPLICATIONS**

Results from this study suggest that designers, researchers, administrators, and end-users should consider using mock-ups when looking to identify and test potential design solutions against healthcare delivery challenges, understand the user experience prior to final construction, evaluate proposed technology and products, and educate end-users on the use of new designs.

Meet on-demand modifications. Actual beds, ventilators, crash carts, X-ray equipment, and furnishings such as tables, chairs, and sofas were also used.

A questionnaire was developed for this study and piloted with focus groups consisting of VA staff. Following the focus groups, the questionnaire was revised to reflect questions regarding specific EBD solutions the VA was considering. The questionnaire consisted of close-ended questions to which respondents replied with either a “yes” or “no,” and open-ended questions were used to qualify respondents’ “yes” or “no” responses with explanations. Each participant was given four copies of the questionnaire during each mock-up work session. The first three copies were used to evaluate each room mock-up individually, and the fourth copy was used to give a general evaluation of all three of the inpatient room mock-ups.

Several scenarios involving two to five VA staff were observed, timed, and videotaped. The scenarios performed were: an emergency medical evacuation, standard procedures, the transfer of a “patient” from a stretcher to a bed and back to the stretcher, and the use of mobile patient lifts to transport the “patient” from bed to toilet. Insights from the scenarios were used in later workshops and schematic drawings. Participants’ modifications of the mock-ups were monitored. Updates of moved features within the mock-ups were given at the midday break and end of each session.

Analysis of the questionnaire was conducted through a three-step process. First, the number of “yes” and “no” responses was totaled for each question. These totals were then used to determine if design features had an unnecessary or negative impact on the program elements. Finally, content analysis using principles from grounded theory was performed on open-ended questions to determine why a feature was considered unnecessary or to have a negative impact.

**Findings**

Findings from this research revealed that participants preferred the headwall to be opposite the entry into the room. Participants felt this position in the room allowed for improved patient care delivery. However, several participants reported issues regarding visibility when placed near an inboard toilet. To mitigate those concerns the bathroom door was canted 45 degrees.

When evaluating the caregiver zone, participants responded positively to the use of computer-on-wheels (COWs). However, concerns were raised throughout the work sessions as to storage and privacy issues. In response to those concerns vestibules were created forward in the acute care and isolation room that contained a nurse charting station, sink, supply storage, and waste disposal to create an optimal caregiver zone.

Equipment was evaluated to determine appropriate clearances, wheelchair accessibility, and bariatric considerations. Participants shared concerns regarding
SYNOPSIS

adequate clearances for gurneys, equipment booms, and lifts. Lack of space for portable equipment, including portable X-rays and patient lifts, was also raised as a concern with participants. Based upon these concerns, acute care and isolation rooms were designed with ample space to accommodate multiple in-room devices and angled entry into the bathroom, a turning radius with a 5’ to 6’ diameter, clearance for portable patient lifts, and straddle bars surrounding toilets. Bathrooms were also reconfigured to accommodate bariatric patients through wider doors, a sink placed adjacent to the entry, and a wider turning radius.

When evaluating the option of universal rooms, 13 participants from the first work session reported that they felt universal rooms were ideal. Later work sessions revealed that universal room configurations were tight for bariatric patients, provided inadequate work surfaces, and did not align with VA staffing, treatment, and operational models. To mitigate these concerns, only standard and isolation rooms were designed to be acuity adaptable.

Patient and family amenities were evaluated to ensure an appropriate response to acuity and length of stay while not compromising clearances and care delivery. Some participants felt a freestanding wardrobe in the contained room for family belongings and TV would be ideal. However, other participants felt a recessed wardrobe with a flat-screen TV would help alleviate clearance issues. Ultimately the wardrobe was placed at the corner of the room opposite the headboard and nearest the entry into the room. It was also determined that a sleeper/chair and computer access would be adequate to support family needs.

Due to these findings, several design considerations were integrated into the final design of all inpatient rooms. These design considerations were as follows: bariatric design features, a vestibule serving as a caregiver zone, and patient and family amenities. These findings also helped support unique design solutions within each inpatient room. Acute care rooms were designed to contain an inboard bathroom with an inboard shower stall and inboard toilet. The bathroom door was angled to enhance visibility to the patient’s head. These private rooms also received a privacy curtain between the vestibule used for the caregiver zone and the patient area. Sleeper sofas were added to the family zone, along with a patient chair and wardrobe for personal belongings. Isolation rooms used the caregiver vestibule as a means for further infection control by adding a wall around the vestibule with a sealed door. Other accommodations were made such as a communication whiteboard, space for providers’ personal protection equipment, and space to store a respirator. The locations of the sink and charting area were also switched. Once the wall was placed around the vestibule, the headwall was positioned on the side of entry into the isolation room to address concerns about visibility to the patient. ICU rooms were designed to accommodate all patient care requirements. Monitoring and medical gas services were provided by a wall-mounted patient column and ICU-articulating boom. The headwall was placed on the side of the room opposite the
entry, and a sliding door was placed in the center of the entry wall for optimal visibility. Nursing substations were placed outside the room opposite the headwall, which provided an uninterrupted view of the room. After much discussion, an outboard toilet with privacy curtain was positioned in the room. A bedside cabinet was chosen for patient belongings, and a recliner/visitor chair was also incorporated into the family zone.

**Limitations**

Limitations to this study are that the results are not generalizable to other organizations, since the design guidelines generated from this research were specific to the VA’s culture, needs, and patient demographics. Further, the study’s findings were limited to descriptive statistics and qualitative data.