In situ simulation exercises before practicing clinically in a new facility can both increase familiarity with new clinical environments and impact important organizational outcomes. Thus, simulation in a new work space can influence factors important to employees, organizations, and patients.

Introduction: In situ simulation within new facilities holds the promise of identifying latent safety threats. The aim of this study was to identify if in situ simulation can also impact important employee perceptions and attitudes.

Methods: In the current study, health care professionals of an adult, urban, community teaching hospital level 1 trauma center participated in simulated scenarios in a new emergency department. Before and after the simulated scenarios, participants provided responses to the variables regarding their ability to work in the new facility and other work-related variables.

Results: Significant increases in communication (P = 0.05), facility clinical readiness (P < 0.05), self-efficacy (P < 0.01), trauma readiness (P < 0.01), and work space satisfaction (P < 0.05) were found from presimulation to postsimulation. The results also demonstrated a significant decrease from presimulation to postsimulation with performance beliefs (P < 0.001). Finally, cardiac readiness did not reveal a significant change from presimulation to postsimulation.

Discussion: In situ simulation exercises before practicing clinically in a new facility can ultimately have organizational-level implications. As noted by Sinreich and Marmor, hospitals have been searching for ways to improve productivity. They state that using simulation is a great tool to increase operational effectiveness. However, simulation is often underused in health care settings because the organizational-level benefits to be
gained are frequently unrealized. Thus, more research needs to be conducted to identify how simulation can impact important employee and organizational outcomes. Pines and McCarthy suggest that borrowing from other disciplines, such as organizational behavior and industrial psychology, can be helpful in improving our understanding of successful interventions. We responded to this call for research by examining variables often overlooked by researchers within healthcare research. Specifically, we adopted a more employee- and organization-centric approach by investigating variables that can directly contribute to the performance of healthcare professionals. Meta-analyses have revealed that self-efficacy and satisfaction have a positive impact on job performance. In addition, communication has been identified as a strong predictor of job performance. Furthermore, research suggests that high performing teams can have a significant impact on the financial performance of organizations. For these reasons, we investigated how using simulation in a new facility can not only help staff acclimate to a new facility but also impact important attitudinal and behavioral variables that can have important implications for organizational outcomes.

The current study used in situ simulation in a new ED to achieve 3 main aims. First, we attempted to identify potential issues in ED preparedness. We sought to ensure that any latent safety threats that may otherwise go unnoticed were acknowledged and addressed before opening the facility. Second, we intended to orient workers to their new work space, allowing them to become familiar with the new layout by working in a high-fidelity scenario. Finally, we sought to ascertain how simulation can increase self-efficacy, communication ability, work space satisfaction, and performance beliefs. These variables are often studied when examining the success of organizational interventions but are frequently omitted within simulation research.

METHODS

Design

Questionnaires were distributed for completion before and after the simulation. No identifying information was collected from the study participants, although prescenario and postscenario questionnaires were linked by unique identifiers to allow comparison. Summa Health System’s Institutional Review Board approved the study through expedited review procedures, and a waiver of consent was requested because the study was minimal risk. A cover page with the elements of informed consent was used on the presimulation survey.

Setting and Population

The study was performed in an adult urban community teaching hospital at a level 1 trauma center. All simulation participants were employees or contracted providers of the institution and had roles in patient care or diagnostic testing in the ED. Participants represented a variety of disciplines and experience levels that routinely function in this setting. Thus, all employees would benefit by assisting in identifying logistic issues and opportunities for improvement within the new work space. ED staff were invited by their departmental leadership to voluntarily participate in an initial orientation session and/or the simulation sessions to help assess readiness of the newly constructed ED. The orientation occurred before the simulation sessions and consisted of a walk through the department as well as a 24-item “scavenger hunt” in which personnel needed to locate several pieces of critical equipment that were located within the new facility (eg, ultrasound machine, intravenous pressure bags, suture cart).

Study Protocol

To obtain a comprehensive number of responses and input, we implemented 2 days of identical simulation sessions. On each day, staff participated in 1 of 2 simulation cases and group debriefing. Staff members also had the option to participate in a second different simulation taking place in a separate ED space if they desired. In total, 4 simulation sessions occurred on each day, and staff participated in at least 1 scenario and debriefing session. Advanced debriefing strategies were used to debrief all participants regarding their perceptions of the training, the physical features of the new environment, the availability of equipment, the ease of communication, the ability of the individuals to perform their assigned duties, and the ability to work as a team. Comments and suggestions were recorded by the simulation team during the debriefing sessions. Figure 1 illustrates the simulations performed during the study.

Study participants were asked to complete a presurvey before the start of the simulation sessions. The presurvey included self-reported items regarding staff members’ self-appraisal of their own trauma readiness, cardiac readiness, communication ability, facility readiness, self-efficacy, performance beliefs, and work space satisfaction. A unique 4-digit code was used to link presimulation and postsimulation responses while maintaining anonymity.

Leadership from ED, nursing, and surgery were involved in the creation of both of the simulated scenarios. The trauma scenario involved a critically ill patient with trauma (patient simulator) who presented with multisystem injuries including loss of a patent airway, a tension pneumothorax, an unstable pelvis, and a femur fracture. To successfully treat the patient, participants had to immediately obtain an appropriate Advanced Trauma Life Support resuscitation. The multidisciplinary team needed to immediately obtain a definitive airway, decompress the tension pneumothorax,
obtain intravascular access, initiate resuscitation, stabilize the pelvic fracture, and splint the extremity fracture.

The cardiac scenario involved a critically ill standardized patient actor complaining of severe, crushing chest pain. A prehospital electrocardiogram (EKG) demonstrated an acute myocardial infarction. To successfully treat the patient, participants had to immediately obtain an EKG that indicated an ST-segment elevation myocardial infarction (STEMI). The STEMI protocol was then to be initiated, which included providing appropriate oral and intravenous medications (aspirin, nitroglycerin, heparin, IIB/IIIA inhibitors, etc), placing the patient on a clinical monitor, placing defibrillator pads on the patient, providing oxygen, and calling the cardiac catheterization laboratory. After 10 minutes, the team received a call that the cardiac catheterization laboratory was available and to immediately transport the patient. The patient was taken from the ED. The nurse and the transport team returned to the ED 2 minutes later with the patient in full cardiac arrest and compressions in progress (the standardized patient actor was replaced with a patient simulator) indicating that the patient lost vital signs en route and never made it to the laboratory. Advanced Cardiovascular Life Support protocol was initiated for several minutes, and then, the simulation was concluded.

All participants were expected to be proficient in the clinical skills needed to manage the cases because they were all certified in Advanced Trauma Life Support, Advanced Cardiovascular Life Support, Trauma Nursing Core Course, or International Trauma Life Support as appropriate for their clinical role; however, they were not specifically familiar with the presented cases. After each of the simulation sessions, participants were asked to complete a postsurvey that was identical to the presurvey, but with the addition of an open response section for participants to report strengths and limitations of the new ED space.

**Measures**

On the presurvey, participants reported their departmental role from the following: attending physician (surgery), attending physician (emergency medicine), resident physician (surgery), resident physician (emergency medicine), physician assistant, medical student, nurse, nurse practitioner, emergency medical technician/paramedic, respiratory therapist, EKG technician, radiology technician, or other. Perceptions of personal abilities regarding trauma readiness, cardiac readiness, communication ability, facility readiness, self-efficacy, performance beliefs, and work space satisfaction were all measured via presimulation and postsimulation self-report questionnaires (see Appendix for descriptions of each scale). Unless otherwise noted, participants used a Likert-type response scale ranging from 1 (strongly disagree) to 5 (strongly agree) for all survey measures.

**Statistical Analysis**

All statistical testing was performed with SPSS (version 18.0, Chicago, IL). An α level of 0.05 was chosen for statistical significance. Data were examined for internal consistency by using Cronbach α. The data were also examined for extreme scores because the presence of extreme scores can lead to inflated error rates and substantial distortions of statistical estimates. Researchers note that a value ± 3 SDs from the mean is an acceptable approach to identify extreme scores. Thus, a guideline with z value of 3 or greater was used as an initial screening tool to identify and remove potential extreme scores. The distribution of the results for each scale was assessed for normality through visual examinations of normal quantile plots (Q-Q plots). The Q-Q plots produced minor deviations from the straight line, indicating that the data had a normal distribution. Because a normal distribution is a condition for running parametric tests, the data were evaluated using t tests.

Bivariate correlations using Pearson r were performed to assess relationships among variables. Moreover, paired sample t tests were conducted to compare presimulation and postsimulation differences on cardiac readiness, communication, clinical readiness, self-efficacy, trauma readiness, and work space satisfaction means. In addition, the open-response items ("Please comment on the strengths and advantages of the new ED that you noticed during the simulation session" and "Please comment on the weaknesses and problems that you noticed during the simulation session") were examined and coded qualitatively by 3 PhD students not involved in the study, who were trained in testing and metric evaluation. The authors provided the coders with potential themes (eg, space, equipment, transportability) from which to categorize comments, thus using an inductive thematic analytic approach. The coders then classified all open-response items into thematic groups and tallied the number of comments within each group.

**RESULTS**

Ninety-eight (44%) of the total ED and affiliated staff participated in the simulation sessions. Of these, 69 (70%)
TABLE 1. Presimulation and Postsimulation Self-Reported Responses

<table>
<thead>
<tr>
<th></th>
<th>Presimulation, Mean (SD)</th>
<th>Postsimulation, Mean (SD)</th>
<th>Presimulation-Postsimulation Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac readiness</td>
<td>2.78 (1.18)</td>
<td>3.03 (1.62)</td>
<td>0.31 (NS)</td>
</tr>
<tr>
<td>Communication</td>
<td>3.64 (0.64)</td>
<td>3.82 (0.56)</td>
<td>0.18*</td>
</tr>
<tr>
<td>Facility readiness</td>
<td>3.33 (0.61)</td>
<td>3.51 (0.50)</td>
<td>0.18*</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>3.98 (0.42)</td>
<td>4.12 (0.48)</td>
<td>0.14†</td>
</tr>
<tr>
<td>Performance beliefs</td>
<td>3.72 (0.53)</td>
<td>3.25 (0.71)</td>
<td>-0.47‡</td>
</tr>
<tr>
<td>Trauma readiness</td>
<td>2.93 (0.96)</td>
<td>3.52 (0.15)</td>
<td>0.59†</td>
</tr>
<tr>
<td>Work space satisfaction</td>
<td>3.81 (0.54)</td>
<td>3.97 (0.59)</td>
<td>0.16*</td>
</tr>
</tbody>
</table>

*P < 0.05. †P < 0.01. ‡P < 0.001.
Mean responses on 5-point Likert scale, SDs, and P values are indicated. NS indicates not significant.

had complete presimulation and postsimulation responses. Fourteen survey sets were identified as extreme scores. Closer inspection of these cases indicated that 14 responders checked all 1’s or 5’s throughout so that responses were internally inconsistent. Because such responses inflate SD of the data set and increases likelihood of type II error, these cases were removed from the final data set for analysis. A final sample of 55 participants was used to investigate the effects of simulation. The majority of the final sample was composed of resident physicians in emergency medicine and nurses (Fig. 2).

Before examining the presimulation-postsimulation relationships among the constructs, the internal consistency of the scales used was first examined. Cardiac readiness was extremely reliable across presimulation and postsimulation responses with Cronbach α at 0.93 and 0.90, respectively. Pearson r across presimulation and postsimulation responses for communication was 0.53 (P < 0.001) and 0.66 (P < 0.001), respectively. Cronbach α for operational readiness before and after simulation was 0.80 and 0.69, respectively. Self-efficacy produced a Cronbach α of 0.68 and 0.87 across presimulation and postsimulation responses, respectively. Reliability of performance beliefs was 0.86 and 0.77 across presimulation and postsimulation responses, respectively. Trauma readiness was also highly reliable (presimulation simulation α = 0.91; postsimulation α = 0.94). Finally, Cronbach α for environmental satisfaction in this study was 0.84 and 0.89 across presimulation and postsimulation responses, respectively.

Mean presimulation and postsimulation survey scores for the variables of interest were evaluated (Table 1). Significant increases were found from presimulation to postsimulation on communication (t_{53} = -1.96, P = 0.05), facility clinical readiness (t_{52} = -2.03, P < 0.05), self-efficacy (t_{52} = -3.05, P < 0.01), trauma readiness (t_{53} = -3.26, P < 0.01), and work space satisfaction (t_{52} = -2.02, P < 0.05). The results also demonstrated a significant decrease from presimulation to postsimulation with performance beliefs (t_{53} = 5.17, P < 0.001). Finally, cardiac readiness did not reveal a significant change from presimulation to postsimulation (t_{52} = -1.428, P = 0.31).

Investigation of the open-response items revealed an array of strengths and limitations of the new work space. Of the 48 responses regarding the strengths and advantages, 48% mentioned space, 19% equipment, 15% layout, 6% transportability, 4% cleanliness/newness, and 2% lighting. From the limitations category, the majority mentioned the small space for resuscitation (56%), followed by the lack of supplies (16%), proximity to supplies and equipment (13%), lighting (9%), and equipment issues (6%). Table 2 presents example items within each theme.

TABLE 2. Qualitative Responses Documenting the Strengths and Limitations of the Environment

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Qualitative Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space</td>
<td>“New ED has more space in general.” “I like the room you have to work.”</td>
</tr>
<tr>
<td>Equipment</td>
<td>“Improved equipment, more space overall, adequate desk space/computers.”</td>
</tr>
<tr>
<td>Layout</td>
<td>“Good flow and placement of equipment.”</td>
</tr>
<tr>
<td>Transportability</td>
<td>“Ease of transport.” “Hallways large enough to expedite transport of patients.”</td>
</tr>
<tr>
<td>Cleanliness</td>
<td>“All rooms are clean.”</td>
</tr>
<tr>
<td>New</td>
<td>“New equipment in each room.”</td>
</tr>
<tr>
<td>Practice</td>
<td>“Talking out loud was good for communication.” “Practice makes perfect.”</td>
</tr>
<tr>
<td>Lighting</td>
<td>“Good lighting.”</td>
</tr>
<tr>
<td>Limitations</td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>“Rooms too small, too many people crammed into 1 room, too many people taking corners.”</td>
</tr>
<tr>
<td>Lack of equipment</td>
<td>“Rooms not stocked.” “Need additional trays for chest tube, need curtain for privacy of patient.” “Need more chest tubes, need more than one Pleurovac and chest tube sets.” “Would like a telephone in the room to call CT, need trays/bedside tables available for procedure setup, need trash cans readily available.”</td>
</tr>
<tr>
<td>Proximity to supplies/resources</td>
<td>“Trauma room far away from exam rooms.” “Very far from CT. No hanging x-ray in trauma bay.”</td>
</tr>
<tr>
<td>Lighting</td>
<td>“Low overhanging lights.” “Examination light too low.”</td>
</tr>
<tr>
<td>Equipment</td>
<td>“The communication devices are not operational so it is difficult to say how well that aspect will work.”</td>
</tr>
</tbody>
</table>

DISCUSSION

Our investigation reveals that in situ simulation before the opening of a new clinical facility can increase perceptions of trauma readiness, cardiac readiness, communication, facility clinical readiness, self-efficacy, and work space satisfaction. As researchers have suggested looking at more proximal goals that will clarify the relationship between patient safety and medical simulation, identifying the effect of simulation-based training on employee attitudes and perceptions is needed. Our investigation suggests that integrating simulation-based education in a new facility can impact outcomes that are not always recognized in producing
patient safety. Because many of these outcomes have also been linked to workplace effectiveness, our findings have important organizational implications as well.

Perceived facility clinical readiness improved after the training, likely a consequence of simulation training and orientation efforts by the ED leadership. However, although a majority of staff participated in orientation sessions, the results of the present study found that simulation resulted in additional favorable outcomes (as evidenced by the presimulation-postsimulation increases even after the orientation session). The data suggest that the participants gained an even greater appreciation with the clinical environment after the simulation and that it was equipped and prepared for actual clinical use. As shown in Table 2, common themes from the qualitative data emerged in written responses: “improved equipment” and “increased total space.” The trauma scenario presented as a patient with several life-threatening injuries. One of the objectives of the scenario was to force the staff to locate and use several pieces of resuscitative equipment throughout the department (surgical airway, chest tube trays, intraosseous device, intravenous pressure bags, pelvic binder, ultrasound machine, etc.). The cardiac scenario also required the use of several critical pieces of resuscitative equipment (crash cart, defibrillator, airway “red” box, clinical monitors, and a cardiac medication “blue” box). Several areas in need of improvement were identified, brought to the attention of the departmental leadership, and subsequently corrected before opening the new ED as it related to the facility layout, placement of supplies, and location of diagnostic equipment (Table 3). An area of particular concern for staff was locating the quickest routes to critical areas within the hospital from the new facility. Importantly, efficient routes were not addressed in the initial orientation to ED staff and were not addressed at all for departments outside of the ED responding to calls for rapid treatment and evaluation of critical patients in the ED. The quickest route to the computed tomographic (CT) scanner, operating rooms, catheterization laboratory, helipad, and blood bank were of greatest concern and were all addressed as part of the scenarios, contributing to the statistically significant improvement in this category.

Staff members’ perceived ability to communicate in the new work space also improved after the training. The improved communication could be a result of various factors. First, the simulation provided teams with hands-on exposure to realistic scenarios in which they would need to interact and communicate with other interprofessional staff. Our results suggest that practicing in a high-acuity environment enhances perceptions of communication ability among ED staff. In addition, before the simulation training, the teams had not been given an opportunity to use the wireless Vocera telecommunication badges in the new facility. Using this technology in a realistic patient case likely improved the perceptions of communication ability among hospital staff. However, Vocera was introduced 6 months before the simulation sessions, rather than at the time of the study. We included it solely to test functionality in the new space because technology failure could result in patient harm. Vocera may have played a small role in increasing communication perceptions in the new ED as employees found that the technology was in working order and they could easily communicate with other staff. However, how much it contributed to the increase in communication perceptions is unknown. As communication has been shown to have a positive impact on job performance, the finding also has important implications for organizational-based outcomes.

Self-reported self-efficacy and trauma skills (“trauma readiness”) showed improvement after the simulation training. It is worth mentioning that presimulation self-efficacy scores had a statistically higher mean than all other presimulation variable means, with the exception of work space satisfaction. Despite the high levels of self-efficacy reported by the staff before the training, this variable did show a significant

### TABLE 3. Summary of ED Findings, Recommendations, and Improvements Made as a Result of Simulation Training Exercise

<table>
<thead>
<tr>
<th>Findings</th>
<th>Recommendations</th>
<th>Changes Made Before Opening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead lights too low, struck several team members in the</td>
<td>Talk to installers of lights and raise</td>
<td>All overhead lights raised 10 inches from</td>
</tr>
<tr>
<td>head during resuscitation</td>
<td>height of lights for staff safety</td>
<td>previous installation</td>
</tr>
<tr>
<td>Medical equipment carts taking up too much space in new</td>
<td>Make carts smaller or move carts just</td>
<td>Cart size modified and moved outside of</td>
</tr>
<tr>
<td>resuscitation bays</td>
<td>outside of room</td>
<td>the room</td>
</tr>
<tr>
<td>Radiology monitor/computer missing adjacent to trauma bays</td>
<td>Add computer/monitors</td>
<td>Added computer/monitors</td>
</tr>
<tr>
<td>Additional equipment/supplies needed on resuscitation carts</td>
<td>Add certain equipment/remove certain</td>
<td>Carts modified according to needs of staff</td>
</tr>
<tr>
<td>Several pieces of equipment were difficult to locate</td>
<td>equipment from carts</td>
<td></td>
</tr>
<tr>
<td>Clinical monitors missing in CT suites for trauma staff</td>
<td>Make equipment more readily available or</td>
<td>Labels added to all shelves and cabinets</td>
</tr>
<tr>
<td>able to visualize vital signs of patients</td>
<td>more clearly labeled within storage</td>
<td>identifying contents of equipment</td>
</tr>
<tr>
<td>Path from blood bank, CT scanner, operating room, intensive</td>
<td>Add monitors to CT that will attach to</td>
<td>Monitors added</td>
</tr>
<tr>
<td>care unit, helipad, and catheterization laboratory unclear</td>
<td>portable monitors to allow better</td>
<td></td>
</tr>
<tr>
<td>Lack of vital equipment on walls in resuscitation bays</td>
<td>visualization of vital signs during CT</td>
<td></td>
</tr>
<tr>
<td>Path to CT uses common hallway exposing patients to visitor</td>
<td>Take several routes from ED to target</td>
<td>Shortest paths identified and information</td>
</tr>
<tr>
<td>traffic</td>
<td>location with stop watch and identify</td>
<td>distributed via e-mail to respective</td>
</tr>
<tr>
<td></td>
<td>shortest paths</td>
<td>department leadership</td>
</tr>
<tr>
<td></td>
<td>Add missing equipment before opening</td>
<td>All equipment added before opening</td>
</tr>
<tr>
<td></td>
<td>Have security escort all patients with</td>
<td>Security personnel respond to all traumas</td>
</tr>
<tr>
<td></td>
<td>trauma from ED to CT scan to clear path</td>
<td>and escort all patients to CT scanner and</td>
</tr>
<tr>
<td></td>
<td>of travel in common areas</td>
<td>operating room</td>
</tr>
</tbody>
</table>

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increase after the simulation, suggesting that simulation-based training can help increase employees’ self-appraisals of skills even when the initial baseline is high. Self-efficacy has been related to several important employee-level outcomes, including selecting more role responsibilities, job satisfaction, job performance, well-being, and lower turnover intentions.17,28–30 Thus, the improved self-efficacy can have important implications for organizations, beyond patient-level outcomes. The increase in trauma skills scores is likely a result of having a hands-on opportunity to practice caring for a simulated patient that required critical coordination between staff from several departments as well as the use of an array of equipment specific to the patient with multisystem trauma.

Contrary to expectations, cardiac readiness perceptions showed no significant change. However, this may be attributed to the study sample. This facility is a certified chest pain center, and thus, the staff is very experienced. The simulation scenario, although high acuity, may not have challenged the staff or subsequently modified their perceptions of readiness for patients presenting with serious cardiac conditions. In addition, this finding may reflect that a new facility does not necessarily make staff more skilled at their jobs. Although the aim of building a new ED was to enhance efficiency and capability, performance improvements may only occur over time as familiarity increases.

Interestingly, performance beliefs decreased after the simulation training. Performance beliefs described employees’ perceptions that they can easily and efficiently perform in the new ED. The staff’s underestimation of the nuances of the new ED and/or a realized misconception of a seamless transition to the new ED may have contributed to the decline. Thus, although opening new facilities may bring the potential capability of improved efficiency and performance, such new facilities may actually hinder performance beliefs initially. As staff become more familiar with the facilities and equipment, performance and performance beliefs may then improve. This decrease in performance beliefs may also stem from the realization that the new facility still has imperfections. As illustrated in Table 3, the simulation exercise identified several issues not previously considered by many of the day-to-day staff. Many of these concerns arose in the debriefing session. In response, potential issues were discussed with physician and nursing leadership present, and solutions were offered and recorded to discuss in a more thorough fashion at a later time. A number of the concerns recorded both verbally during the debriefing and identified in the survey were corrected or improved before opening the new facility 1 week later.

Limitations

The data collected were based on a total of 8 simulation scenarios during the course of 2 days. The participants represented a convenience sample of staff from several departments throughout the hospital. As a result, we did not have a representative sample from all ED roles. For example, a majority of participants were ED residents, although they consist of only approximately 12% of the total ED staff. It is possible that their responses may not be comprehensive and/or reflect perceptions of all individuals within the ED. Furthermore, the ED residents were more likely to participate as the day 1 simulations were performed during dedicated educational time. A more representative sample would help clarify the generalizability of these findings. In addition, because less than half of total ED staff completed the questionnaires, response bias may be a concern. In addition, we had to remove 15 cases that were clearly the result of spurious activity. We do not believe that this is reflective of the simulation sessions; instead, we posit that inattention to survey items without appropriate thought more likely reflects the significant time constraints of health care providers in a tertiary care center. For example, many participants were voluntarily participating in the simulations at the beginning or conclusion of their shifts. Completing a postsurvey may have impacted how soon they could return to clinical responsibilities or conclude their shift.

Another limitation arises regarding the self-report nature of the survey measures used. The data collected were based on subjective presurvey and postsurvey questionnaires and qualitative hand-written responses. The responses reflect perceptions regarding these variables rather than objective outcomes. However, as individuals base their behaviors on perceptions of reality, and not objective reality per se,31 we maintain that these findings can provide instrumental insight into the effects of simulation-based training. These results should be investigated further in real-task settings to confirm their impact on on-the-job behaviors.

Finally, the design of our simulations did not allow us to capture data on which and how many simulations participants completed. Some staff members voluntarily participated in a second yet distinct simulation. These individuals may have distinct reactions to the simulations and new ED, compared with individuals who participated in only 1 scenario. Future researchers should examine potential practice effects and what factors impact the decision to participate in additional simulations.

CONCLUSIONS

The results of the current study provide a unique reflection of how simulation impacts worker attitudes and perceived abilities. Our data add to the literature supporting the use of simulation as a training and testing methodology for the assessment of new facility orientation, safety threats, and facility readiness. Importantly, this study suggests that using simulation in a new work space can influence factors not typically associated with patient safety and also impact key attitudes and behaviors among workers. Uncovering and further exploration of intermediate relationships regarding the simulation-outcomes relationship will not only serve to expand the existing knowledge base of simulation-based education but also lay the foundation for further simulation and patient safety research. Such examinations will help narrow the evidence gaps that exist between the relationships among simulation, patient safety, and organizational outcomes.

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REFERENCES


Appendix: DESCRIPTION OF SCALES USED IN SELF-REPORTED SURVEY

Trauma readiness (developed by R.L.G.) Please rate your confidence in your ability to perform each of the following trauma skills/tasks in your new ED work space:

1. Locate and use equipment within the difficult airway cart including surgical airway equipment.
2. Locate and use chest tube equipment.
3. Transport the patient to the CT scanner.
4. Transport the patient to the operating room.
5. Locate and use accessory trauma equipment (pelvic binder, intraosseous line, ultrasound machine, etc)

Cardiac readiness (developed by R.A.A.) Please rate your confidence in your ability to perform each of the following cardiac skills/tasks in your new ED work space:

1. Locate and provide protocol medications for patients who have myocardial infarction (eg, “Blue box”).
2. Contact EKG technician in an expedited fashion using telecommunication system (eg, Vocera).
4. Placement of the patient on portable monitors to transport.
5. Initiate call to STEMI cardiologist.
6. Transport the patient to cardiac catheterization laboratory from the new facility.

Communication ability
1. This work space allows me to communicate effectively with others.
2. I am satisfied with my ability to communicate with others in my work space.
Facility readiness
When responding to the following questions, please consider the new ED.
1. I am confident that I can perform resuscitative actions in this new ED (eg, are intubation/intravenous access/medication administration easily accomplished?).
2. I am confident that I can find resuscitative equipment and medications in this new ED (eg, are intubation/intravenous equipment/medications easily found?).
3. The equipment for resuscitative actions is appropriate in this new ED (eg, are intubation/intravenous equipment appropriate for cases?).
4. I feel that I can properly move patient and equipment in this new ED (eg, is movement of the patient from triage to CT scan/operating room/catherization laboratory suite easy?).
5. I feel confident that I can communicate with other providers (eg, were telephones/intercom systems adequate?).
6. I feel able to use computer systems for patient care (eg, are Plato/Picture Archiving and Communication System/Internet/laboratory systems available?).
7. The availability of physical space is adequate (eg, is physical space adequate for intubation/intravenous access/chest tubes?).

Self-efficacy
1. I have confidence in my ability to do my job.
2. There are some tasks required by my job that I cannot do well. (R)
3. When my performance is poor, it is due to my lack of ability. (R)
4. I doubt my ability to do the job. (R)
5. I have all the skills needed to perform my job well.
6. Most people in my profession can do this job better than I can. (R)
7. I am an expert at my job.
8. My future in this profession is limited because of my lack of skills. (R)
9. I am very proud of my job skills and abilities.
10. I feel threatened when others watch me work.
R, reverse scored.

Performance beliefs
1. I feel that I am able to perform in this work space.
2. I am able to work easily in this work space.
3. I feel able to do work efficiently in this work space.
4. I feel organized in this work space.
5. I am able to do more work and more efficiently in this work space.

Workspace satisfaction
1. In general, I am satisfied with this work space.
2. I would be proud to show others this work space.
3. This work space will help me get my job done efficiently.
4. All things considered, I am very satisfied with this work space.