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Editor's Note: Send submissions to jfreeman@kumc.edu. Articles should be between 500–1,000 words and clearly and concisely present the goal of the program, the design of the intervention and evaluation plan, the description of the program as implemented, results of evaluation, and conclusion. Each submission should be accompanied by a 100-word abstract. Please limit tables or figures to one each. You can also contact me at Department of Family Medicine, KUMC, Room 1130A Delp, Mail Code 4010, 3901 Rainbow Boulevard, Kansas City, KS 66160. 913-588-1944. Fax: 913-588-2496.

Simulation Enhances Resident Confidence in Critical Care and Procedural Skills

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Background: *The goal of this study was to determine if clinical simulation improved resident confidence in performing critical care skills, neonatal resuscitation, and colonoscopy.* Methods: *Residents participated in clinical simulations utilizing high-fidelity medical simulators in a realistic environment. We compared resident responses on pre- and post-experience surveys.* Results: *Residents reported satisfaction with quality of demonstrations and opportunity for hands-on learning and practice. Residents felt more confident in their ability to apply these skills independently and in the applied context.* Conclusions: *Simulation is a well-accepted teaching method for critical care and procedural skills and improves resident confidence.*

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Clinical simulation is an exciting new method for medical education. Several medical schools, hospitals, and the military have developed training modules for critical care, anesthesia induction, and surgical skills training. The perceived benefits are similar to those seen with the use of standardized patients, including the ability to standardize elements of a varied curricular experience, safe introduction to new and advanced treatment methods, and a setting that is shielded from the pressures of the clinical environment. However, despite this interest, and the previously demonstrated benefit of standardized patients in primary care medical education,[1,2] few articles have been published in the primary care literature evaluating the effectiveness of simulator-based education.[3] This article describes residents' assessment of their confidence in managing clinical situations following training with a simulator and the degree to which they accepted the use of simulators in the curriculum.

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Methods

Course Description

A change in our residency curriculum prompted a needs-assessment that identified respiratory emergencies, management of shock, and Advanced Cardiac Life Support (ACLS) as areas in need of additional training. We designed simulation modules to address each

of these areas and included neonatal resuscitation and colonoscopy training to address other curricular needs. We introduced these modules into the longitudinal 3-year residency curriculum. We asked the residents to review Web-based tutorials and standard reading materials prior to arrival.

During specific outpatient rotations, the residents were scheduled to participate in one to eight sessions per year (one session for first-year residents for endoscopy training and four to eight sessions for second- and third-year residents for critical care training). A total of 36 residents participated in the study over 2 years. Sessions were conducted by four family medicine faculty using the METI® Human Patient Simulator™, Laerdal® Code Blue Baby, and Immersion® Endoscopy AccuTouch® System at the University of Michigan Clinical Simulation Center (www.med.umich.edu/umcsc).

The Clinical Simulation Center was developed by the dean's office and medical school departments and was made available to residency programs whose departments agreed to fund a portion of operations. One faculty member received outside training in simulation teaching and curriculum development, and the other faculty were trained individually during simulation sessions. The vast majority of preparation was done in the curriculum development phase, so faculty preparation for sessions was minimal.

To ensure a realistic medical environment and high-pressure situation, instructors presented a brief history from a control room not visible to residents. Residents took a history from the mannequin (the instructor responded via a speaker near the head of the mannequin), performed a physical exam, ordered real-time tests (cardiac monitor, pulse oximetry, labs, and X rays) and performed medical and procedural interventions on the mannequin. All scenarios were videotaped and debriefed with residents immediately following each scenario.

Course Evaluation

Optional pre- and post-assessment forms were completed by residents before and after each session. The pre-assessment form consisted of theree items concerning (1) the level to which the resident believed they could perform the procedures in the applied context, (2) the level to which they felt they could participate helpfully in the procedure in the applied context, and (3) the degree to which they believed simulators could help prepare them. The post-assessment form included the same three items, as well as questions about the quality of the demonstrations and the opportunity to practice in the simulator context. All ratings were made on a Likert scale ranging from 1 to 6 (indicating "very poor" to "outstanding"). The study was approved by the University of Michigan Institutional Review Board.

Results

A total of 35 post-assessment forms were completed. Overall response was strongly positive. Residents reported "good" to "very good" ratings for quality of demonstrations, clarity of verbal and visual presentations, and step-by-step instructions (see Table 1). Residents reported "very good" to "outstanding" ratings for opportunity to do hands-on learning and practice. Perhaps most encouraging was that residents felt the simulator was "very good" at forcing them to "think through the concepts."

From the paired comparisons of pre-assessment and post-assessment evaluations, learners reported an increase in the level to which they believed they could perform the procedures or skills in the applied context (from 2.88 to 3.92; $t(24)=5.85$, $P=.000$), as well as an increase in the level to which they believed they could participate helpfully in the applied context, (from 3.64 to 4.52; $t(24)=5.29$, $P=.000$). Finally, the degree to which they felt that simulators could prepare them for procedures increased significantly (from 4.40 to 4.80; $t(24)=2.83$, $P=.009$), indicating increased acceptance of the simulator as an effective instructional tool.

Table 1

Results From the Post-assessment Form

	Research Question	*n*	*Minimum*	*Maximum*	*Mean*	*SD*
1	Quality of demonstrations	35	3	6	4.63	.65
2	Visual clarity of demonstrations	35	3	6	4.69	.63
3	Clarity of verbal presentations	33	3	6	4.67	.78
4	Opportunity to do hands-on learning	35	4	6	5.31	.68
5	Opportunity to have hands-on practice	35	4	6	5.51	.66
6	Guided step-by-step instruction	34	3	6	4.68	.73
7	Instruction forced me to think through the concepts	34	3	6	5.09	.79
8	Level of procedural knowledge applied to practice exercises and skills	35	3	6	4.97	.78
	Grand mean	35	3.75	6	4.94	.52

Scale: 1=very poor, 2=poor, 3=average, 4=good, 5=very good, 6=outstanding.

SD—standard deviation

Discussion

To meet a need for additional critical care and procedural training, we incorporated medical simulation into our residency curriculum. Our approach succeeded in improving resident confidence and was readily accepted by residents. Anecdotal evidence from residents and faculty supported these ratings, suggesting that the simulation curriculum improved performance of specific skills, team leadership, and communication. However, additional studies are needed to evaluate efficacy and transferability.

One of the most significant and intriguing findings of this study was that residents felt the simulator was useful in forcing them to think through essential components of the procedure while performing. This corresponds to other reports in the literature demonstrating that simulators allow residents to learn from repetition and to work through difficult situations without compromising patient care.[4-6]

One limitation of the current study is that it did not include objective performance assessment following simulator training, which could have tested whether the observed increases in confidence were justified. We are currently studying this issue by evaluating resident endoscopy simulator performance as well as the transferability to endoscopy performance on live patients and hope to expand the research to other skills.

In the near future, medical simulation could serve not only as a well-accepted and effective educational method but also as an effective method for assessing resident competence.[7] The entire curriculum can be viewed on the Family Medicine Digital Resources Library Web site at www.fmdrl.org/794.

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