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Education

A TWO-YEAR EXPERIENCE OF AN INTEGRATED SIMULATION RESIDENCY CURRICULUM

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☐ **Abstract—Background: Human Patient Simulation (HPS) is increasingly used in medical education, but its role in Emergency Medicine (EM) residency education is uncertain. Study Objectives: The objective of this study was to evaluate the perceived effectiveness of HPS when fully integrated into an EM residency didactic curriculum. Methods: The study design was a cross-sectional survey performed in 2006, 2 years after the implementation of an integrated simulation curriculum. Fifty-four residents (postgraduate year [PGY] 1–4) of a 4-year EM residency were surveyed with demographic and curricular questions on the perceived value of simulation relative to other teaching formats. Survey items were rated on a bipolar linear numeric scale of 1 (strongly disagree) to 9 (strongly agree), with 5 being neutral. Data were analyzed using Student *t*-tests. Results: Forty residents responded to the survey (74% response rate). The perceived effectiveness of HPS was higher for junior residents than senior residents (8.0 vs. 6.2, respectively, $p < 0.001$). There were no differences in perceived effectiveness of lectures (7.8 vs. 7.9, respectively, $p = 0.1$), morbidity and mortality conference (8.5 vs. 8.7, respectively, $p = 0.3$), and trauma conference (8.4 vs. 8.8, respectively, $p = 0.2$) between junior and senior residents. Scores for perceptions of improvement in residency training (knowledge acquisition and clinical decision-making) after the integration of HPS into the curriculum were positive for all residents. Conclusion: Residents' perceptions of HPS integration into an EM residency curriculum are positive for both improving knowledge acquisition and learning clinical decision-making. HPS was rated as more effective during junior years than senior years, while the perceived efficacy of more traditional educational modalities remained constant throughout residency training.** © 2012 Published by Elsevier Inc.

☐ **Keywords—patient simulation; curricula; Graduate Medical Education; teaching methods; educational techniques**

INTRODUCTION

Human Patient Simulation (HPS) has been used to educate and assess medical professionals, including medical students, residents and fellows, practicing physicians, and allied health care providers (1–27). This emerging technology has been used to teach pathophysiology, diagnosis and management, clinical team-building, practice remediation, and procedural-surgical skills (1,3–5,7,9,12–25,27–35). HPS provides learners with an opportunity to apply and integrate new knowledge in a safe, challenging environment without placing patients at risk. When paired with other complementary teaching methods, HPS can accommodate a diversity of learning styles and help learners integrate knowledge in ways that are meaningful and clinically oriented (36,37).

Although effective, HPS is also time and resource intensive when compared to traditional teaching methods (38). These limitations require an understanding of when and how to implement HPS in residency educational curricula in ways that maximize learner benefit relative to teaching resource utilization (39). Although specific

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Table 1. Sample Simulation Course for a 3-Hour Session

Time	Group 1	Group 2a	Group 2b	Group 2c
30 min	Seminar	Simulation 1	Simulation 2	Procedure laboratory
30 min		Procedure laboratory	Simulation 1	Simulation 2
30 min		Simulation 2	Procedure laboratory	Simulation 1
Groups 1 and 2 switch	Group 2	Group 1a	Group 1b	Group 1c
30 min	Seminar	Simulation 1	Simulation 2	Procedure laboratory
30 min		Procedure laboratory	Simulation 1	Simulation 2
30 min		Simulation 2	Procedure laboratory	Simulation 1

teaching interventions with HPS have been studied, to our knowledge there is no research on the full integration of HPS into a residency educational curriculum.

In 2004, the Harvard Affiliated Emergency Medicine Residency at Brigham and Women's Hospital/Massachusetts General Hospital introduced a comprehensive medical simulation curriculum for training Emergency Medicine (EM) residents that comprised 20% of the annual conference teaching hours (Tables 1, 2). This equates to 54 h of simulation curriculum per year. Details of the development and implementation of this curriculum are outlined elsewhere (38). The objective of this study was to evaluate the learner-perceived effectiveness of HPS when fully integrated into a 4-year academic EM residency. In addition, we studied resident perceptions of differences in HPS efficacy between their junior (postgraduate year [PGY] 1/2) and senior (PGY 3/4) years.

MATERIALS AND METHODS

We performed a cross-sectional survey in 2006, 2 years after the implementation of an integrated simulation curriculum. Fifty-four residents of a 4-year EM residency were surveyed anonymously with demographic and curricular questions. Demographic questions included gender, PGY year, and prior educational experience (lectures, problem-based learning, patient simulation, procedure laboratories, role playing, and journal club). Curriculum survey items were rated on a linear numeric scale of 1 (strongly disagree) to 9 (strongly agree), with 5 being neutral. Comparisons between experiences during junior and senior years were limited to PGY 3/4 respondents.

Table 2. Annual Simulation Course Curriculum

Cardiovascular 1 – Acute coronary syndrome
Cardiovascular 2 – Dysrhythmia
Cardiovascular 3 – CHF
Pulmonary 1 – Asthma, COPD, pneumothorax
Pulmonary 2 – Airway management
Environmental emergencies
Trauma 1 – Approach to trauma, trauma of the chest and abdomen
Trauma 2 – Trauma of the head, spine, extremities, and in pregnancy
Neurology/Psychiatry
Orthopedics
Toxicology
Ophthalmology
Infectious diseases
Pediatrics
Dental/Otolaryngology
Genitourinary
Obstetrics/Gynecology

CHF = congestive heart failure; COPD = chronic obstructive pulmonary disease.

Data from the linear numeric scaled responses were analyzed using paired Student *t*-tests for the PGY3/4 class data set when comparing experiences with teaching modalities between junior and senior years of training using STATA (StataCorp LP, College Station, TX). This study was approved by the Institutional Review Board - # 2006P002134 at Massachusetts General Hospital.

RESULTS

Forty residents responded to the survey, corresponding to a 74% response rate. Forty-four percent were men and 56% were women. Twenty-one (52%) were junior residents and 19 (48%) were senior residents.

Before residency, 68% of surveyed residents had experience with medical simulation. All residents had experience with lecture-style teaching before residency. Senior residents (PGY3/4) rated the perceived effectiveness of HPS as higher during their junior years of training compared to their senior years of training (8.0 vs. 6.2, respectively, $p < 0.001$). There were no differences between junior and senior years in effectiveness for lectures (7.8 vs. 7.9, respectively, $p = 0.1$), morbidity and mortality conference (8.5 vs. 8.7, respectively, $p = 0.3$), trauma case conference (8.4 vs. 8.8, respectively, $p = 0.2$), and follow-up conference (7.83 vs. 7.39, respectively, $p = 0.06$). These results are summarized in Figures 1 and 2.

Scores for perceptions of improvement in residency educational training after the full integration of HPS into the curriculum were assessed and compared to a neutral score of 5 (no change in training). Senior residents rated improvement in knowledge acquisition after the introduction of an integrated simulation curriculum as 6.6 ($p = 0.006$) and clinical decision-making as 6.8 ($p = 0.002$).

DISCUSSION

Residents' perceptions of HPS integration into an EM residency curriculum are positive for supporting and