Senior Pediatric Residents as Teachers for an Innovative Multidisciplinary Mock Code Curriculum

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Abstract

Background Resuscitation education for pediatric residents may be limited due to the low frequency of actual codes in children. Mock codes represent an opportunity to increase trainee education in acute resuscitations, and we designed a unique multidisciplinary mock code curriculum that uses senior pediatric residents as teachers.

Methods A novel mock code curriculum was designed and integrated into an existing night-float rotation. Our 2-tiered curriculum not only focuses on improving teaching proficiency for resident educators (REs) but also includes separate goals to augment simulation-based resuscitation education for resident participants (RPs) and the multidisciplinary staff.

Results Seventy-six residents (17 REs, 59 RPs) and more than 75 nurses have participated in the curriculum. After participation, 100% of residents felt that this curriculum would improve the quality of actual resuscitations, and 94% of RPs reported receiving valuable feedback. Comfort with teaching and feedback increased for REs ($P < .05$), and comfort in resuscitation and crisis resource management improved for RPs ($P < .05$). The nursing staff also felt that communication, teamwork, and collaboration improved due to implementation of this curriculum.

Conclusions A unique mock code curriculum can improve resident comfort with teaching, peer facilitation, feedback, and resuscitation. Curricular interventions of this nature may also be able to improve the balance between service and education within a residency training program. As we move toward a competency based training model within graduate medical education, further investigation is needed to link educational modifications of this nature to clinical outcomes and actual resident performance.

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Background

The frequency of cardiopulmonary arrests in pediatrics is low, and limited exposure to acute deteriorations may contribute to trainee discomfort during actual code situations.[1] When confronted with actual code events, many residents express anxiety and resistance to leading and participating in resuscitations, and surveys have identified a need for improvement in formal resuscitation education for pediatric residents.[2–4] Resuscitation training is an integral part of pediatric residency, and mock codes have been shown to improve confidence, knowledge, and comfort in managing pediatric emergencies.[5–8] Mock codes using high-fidelity simulation have also been shown to improve cognitive performance and knowledge of resuscitation algorithms.[9–13] This supports the importance of mock codes to augment resident training, but this type of resuscitation education often is underrepresented in pediatric residency programs.[1,2,4]

We also recognized a deficiency in resident teaching proficiency within our pediatric residency program. Teaching is another important component of graduate medical education, with residents spending up to 20% of their time on this activity.[14,15] Despite the substantial time

TABLE 1 **Resident Educator Curriculum Objectives by Accreditation Council for Graduate Medical Education Core Competency**

Objective	Patient Care	Medical Knowledge	Practice-Based Learning and Improvement	Interpersonal Communication	Professionalism	Systems-Based Practice
Develop an interactive mock code module designed to teach participants principles of crisis resource management and PALS.	x	x	x	x		x
Prepare, run, and facilitate a mock code.		x	x	x	x	x
Identify effective feedback and debriefing techniques.	x		x	x	x	x
Debrief a mock code module to provide specific feedback to learners regarding their performance.	x	x	x	x	x	x

Abbreviation: PALS, Pediatric Advanced Life Support.

and effort residents spend teaching, education in this area is also commonly lacking in residency curricula.[16,17]

In response, we developed and implemented an innovative, 2-tiered multidisciplinary mock code curriculum in which senior pediatric residents function as teachers and peer facilitators. An added aim of this initiative was to assess the impact of the new curriculum on the self-confidence, communication, and team preparedness of residents and nursing staff.

Methods

Development

After Institutional Review Board review and exemption, a resident, 2 chief residents, a pediatric critical care medicine (PCCM) faculty member, and a formally trained educator in the Department of Pediatrics collaborated to design a multimedia mock code curriculum using a variety of resources (videos, books, journal articles, online resources, presentation, and handouts). The materials address resuscitation, crisis resource management, adult learning principles, feedback, and debriefing and are used in a self-directed manner with guidance from a pediatric chief resident or PCCM faculty member.

Our 2-tiered mock code curriculum was designed to accommodate 2 groups of learners with distinct educational goals and objectives. The first tier involves senior residents (postgraduate year level 2, 3, or 4) on night-float rotation. We designated them as resident educators (REs) and made them responsible for developing and facilitating a mock code exercise during the assigned rotation. The educational goals and objectives for REs are primarily in the areas of teaching proficiency, leadership, debriefing, and feedback (TABLE 1).

The second group targeted are resident participants (RPs), who include interns and residents of all training levels assigned to the inpatient pediatric service. The educational goals and objectives for RPs focus on resuscitation and crisis resource management principles (TABLE 2). The 2 groups (REs and RPs) are closely linked through participation in the curriculum, but the program is designed so that each group functions independently to achieve a unique set of educational goals and objectives.

Given the multidisciplinary nature of the mock code exercises, nursing leadership also developed educational goals for nursing participants involved in the new curriculum, and there was coordination with our institution's Code Committee to link this educational program with institutional quality and performance improvement initiatives. These curricular components involved close collaboration and coordination among leadership of the pediatric residency program, nursing staff, and hospital code committee.

Implementation

After the development phase, this self-directed curriculum was integrated into a preexisting night-float rotation. The senior resident assigned to this rotation assumes the role of RE for the curriculum and is responsible for executing a mock code by the end of this 2-week block. During this short rotation, REs develop specific goals and objectives that will be addressed by their mock code module and implement their educational plan using simulation-based mock code education and debriefing for the multidisciplinary team. Each mock code team includes at least 4 RPs and members of the multidisciplinary team. These mock code sessions last approximately 1 hour, with

TABLE 2 **Resident Participant Objectives by Accreditation Council for Graduate Medical Education Core Competency**

Objective	Patient Care	Medical Knowledge	Practice-Based Learning and Improvement	Interpersonal Communication	Professionalism	Systems-Based Practice
Identify, clarify, and review participants' roles in a code situation based on the mock code module (using the defined pediatric code roles).	x		x	x	x	x
Recognize effective communication techniques that should be utilized to optimize acute resuscitations.	x			x	x	x
Ensure personnel and resources are available during a code.	x			x		x
Identify which equipment/ resources are found on the ward and code cart	x					x
Identify what equipment/ resources arrive with the code team.	x					x
Discuss the importance of the global assessment in a code situation.	x	x		x		x
Implement appropriate PALS algorithms.	x	x	x			x

Abbreviation: PALS, Pediatric Advanced Life Support.

roughly 15 to 20 minutes of simulation followed by 40 to 45 minutes of debriefing and feedback.

The debriefing and feedback session is facilitated by the RE. Given that there is no simple, standard way to facilitate debriefing and feedback sessions, REs are provided with a number of resources that address this topic as part of the curriculum. They include information on both the rationale and conceptual framework behind the debriefing process, along with practical techniques and strategies. The REs also often meet with the supervising faculty to discuss debriefing and feedback approaches prior to the mock code.

The REs conduct the session under the direct supervision of a pediatric chief resident and/or PCCM faculty member experienced in debriefing and feedback. Following debriefing, the RE receives specific, individualized instruction, evaluation, and feedback from the chief resident and/or faculty member regarding all elements of the entire 2-week rotation, including the debriefing session.

Assessment

We developed and used surveys for program assessment. Residents were asked to rate their confidence in a number of areas before and after participating in the mock codes. Separate surveys were designed for REs and RPs that correlated with the specific programmatic goals and objectives developed for each group. Nursing leadership also independently developed and conducted a follow-up survey to assess nursing attitudes and impressions regarding this curriculum. Chi-square analysis was used for data comparison, with the Yates correction being applied as appropriate. A P value of less than .05 was considered significant for all analyses.

Results

Our self-directed mock code curriculum was successfully implemented and has become a stable part of our inpatient night-float rotation. A mock code for the multidisciplinary team occurs every 2 weeks, each coordinated by a different senior resident (RE) and directly supervised by a pediatric chief resident or PCCM faculty member.

To date, there have been 17 mock codes that included 17 REs, 59 RPs, and approximately 75 nurses. Of the 76 residents, 88% had participated in 0 or 1 mock code in the 6 months prior to the implementation of this program, and more than one-fourth of the participants had participated in 0 or 1 actual code situation.

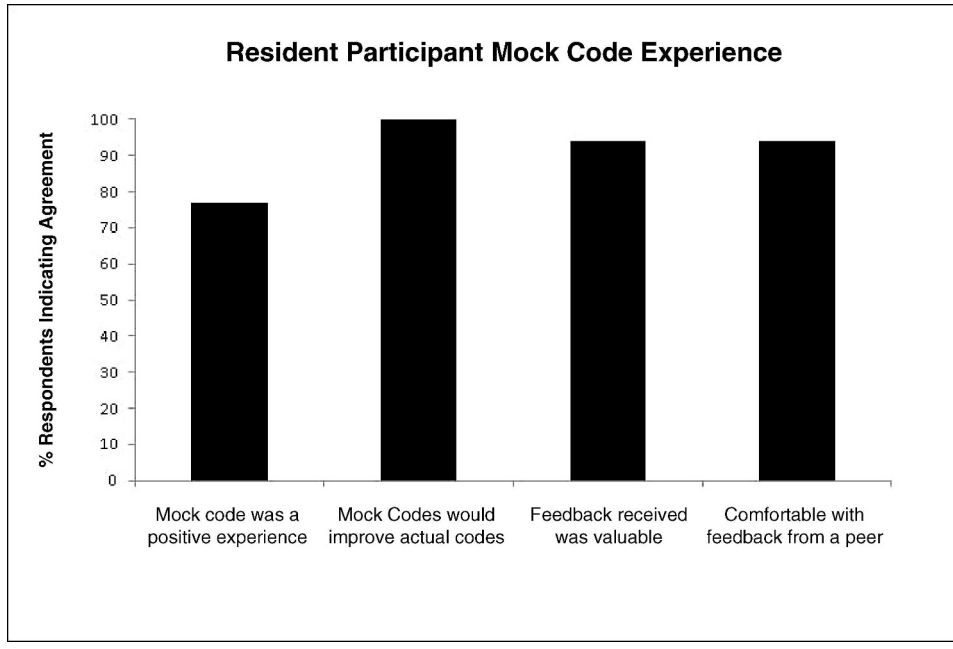

FIGURE 1 **Resident Participant (RP) Impressions of the Mock Code Experience (n=59)**

After participation in this curriculum, 100% of residents involved in the mock codes felt that this curriculum would improve the overall quality of the management of actual resuscitations (FIGURE 1). Of the RPs, 94% reported receiving valuable feedback, and 94% were comfortable accepting this feedback from one of their peers (FIGURE 1). Seventy-seven percent of RPs also reported that the mock code experience was positive and felt that this curriculum would improve patient outcomes in actual code situations (FIGURE 1).

REs demonstrated significant improvement regarding their confidence in developing an educational module, running and facilitating a mock code, teaching peers, identifying effective feedback/debriefing techniques, and using effective feedback/debriefing techniques ($P < .05$; FIGURE 2). Similarly, RPs demonstrated significant improvement in their confidence in assessing a patient in a critical or acute event; identifying, clarifying, and reviewing participant roles during a code; coordinating the team during a code; communicating effectively; knowing available personnel and resources; utilizing PALS algorithms; and dosing code medications ($P < .05$; FIGURE 3).

Of the 52 nurses who completed follow-up surveys, 80% reported that the mock code curriculum helps to better prepare the team for emergency situations (FIGURE 4). More than two-thirds stated that this program helps them think through clinical problems and improves collaboration among members of the team (FIGURE 4). Sixty-two percent of nurses also felt that this curriculum encourages open communication among the team, and 65% stated that mock codes decrease anxiety associated with actual emergencies (FIGURE 4).

Residents and nursing staff anticipate and enjoy the mock codes as an important addition to their education (FIGURES 1 and 4). We did find that initial incorporation of this curriculum created some anxiety, and concern was voiced by residents and nurses about the inconvenience of participating in code practice and mock exercises. Initial implementation was met with some resistance, but the value of the curriculum was quickly recognized, with the positive learning experience substantially outweighing prior objections. Our success also highlights the ability of a dedicated multidisciplinary group of educators to implement positive curricular change. This was in large part due to the daily effort of the chief residents and nursing educators "in the trenches" who remained committed to education and improvement.

Along with its impact on the REs and RPs, the curriculum has enhanced communication and teamwork among the multidisciplinary team (FIGURE 4). During curriculum development, there was close collaboration with nursing leadership as the program was implemented in situ on the pediatric wards. Each mock code begins with the RE initiating the simulation with a bedside nurse, who subsequently engages additional members of the multidisciplinary team. This interaction has led to improved communication and collaboration between physicians and nurses, as reported independently by both groups (FIGURES 1 and 4). In addition, the curriculum has

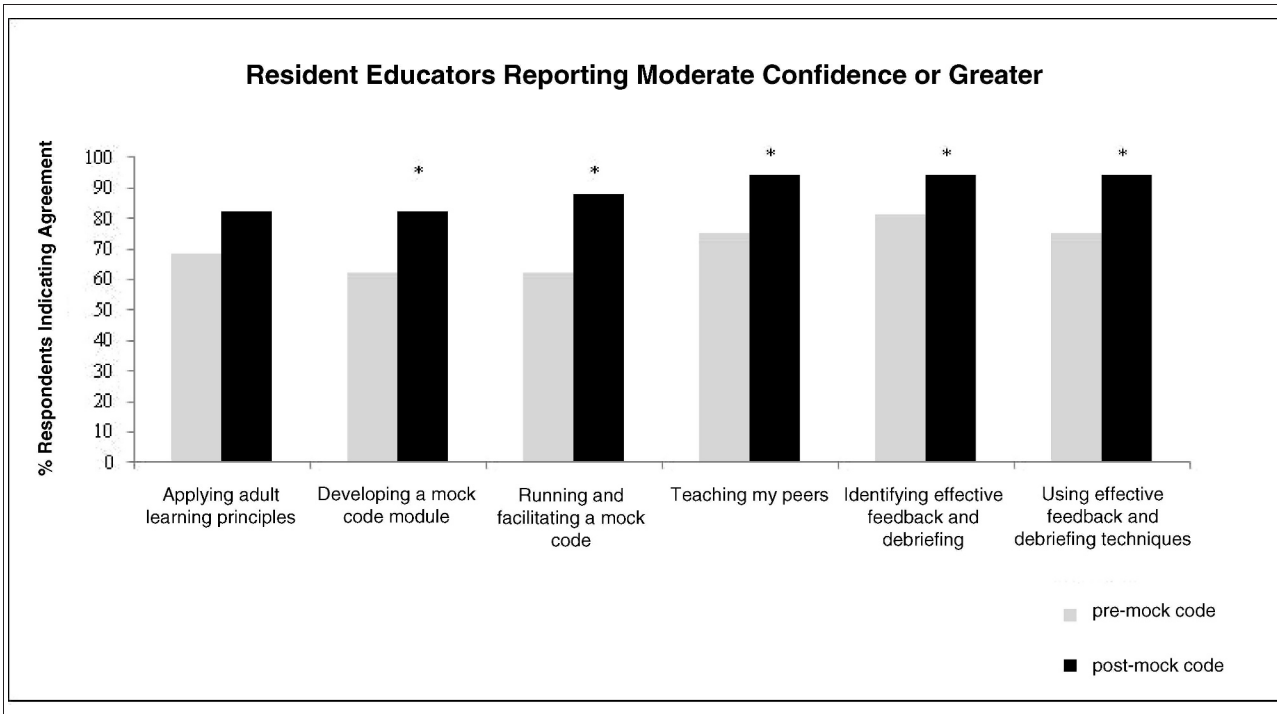

FIGURE 2 **Comparison of the Percentage of Resident Educators (REs) Reporting Moderate Confidence or Greater Pre–mock Code and Post–mock Code (n = 17; *p <0.05)**

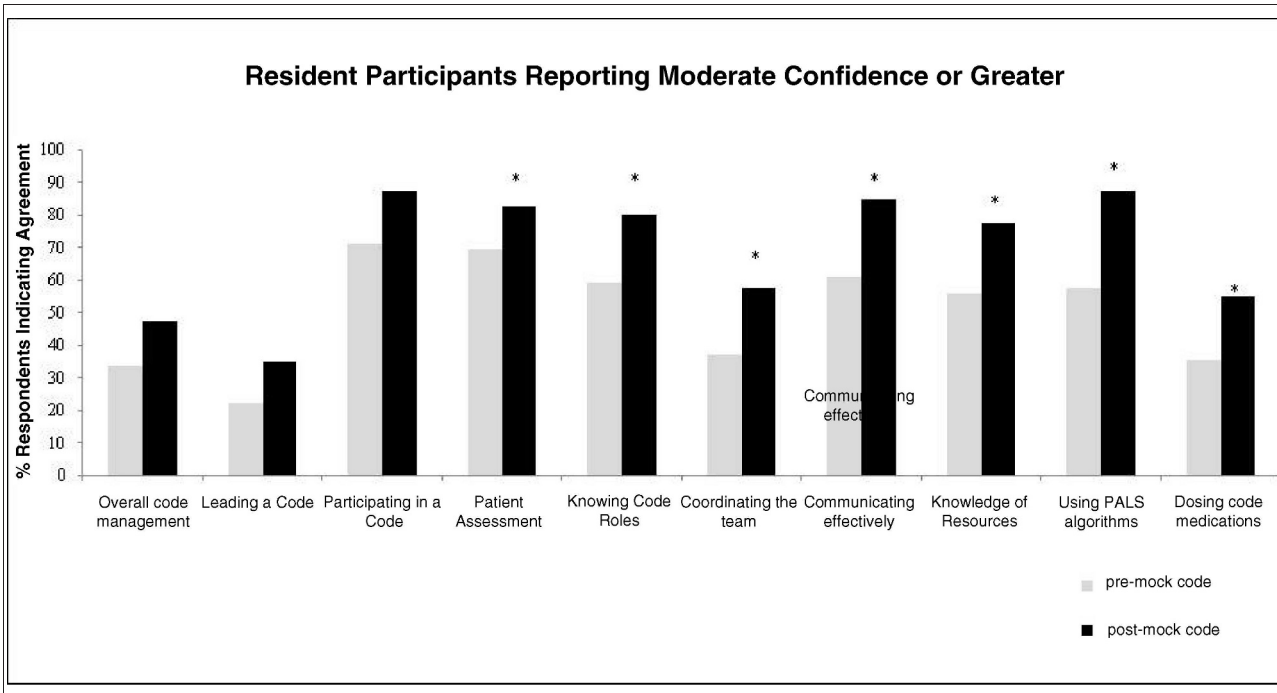

FIGURE 3 **Comparison of the Percentage of Resident Participants (RPs) Reporting Moderate Confidence or Greater Pre–mock Code and Post–mock Code (n = 59; *p <0.05)**

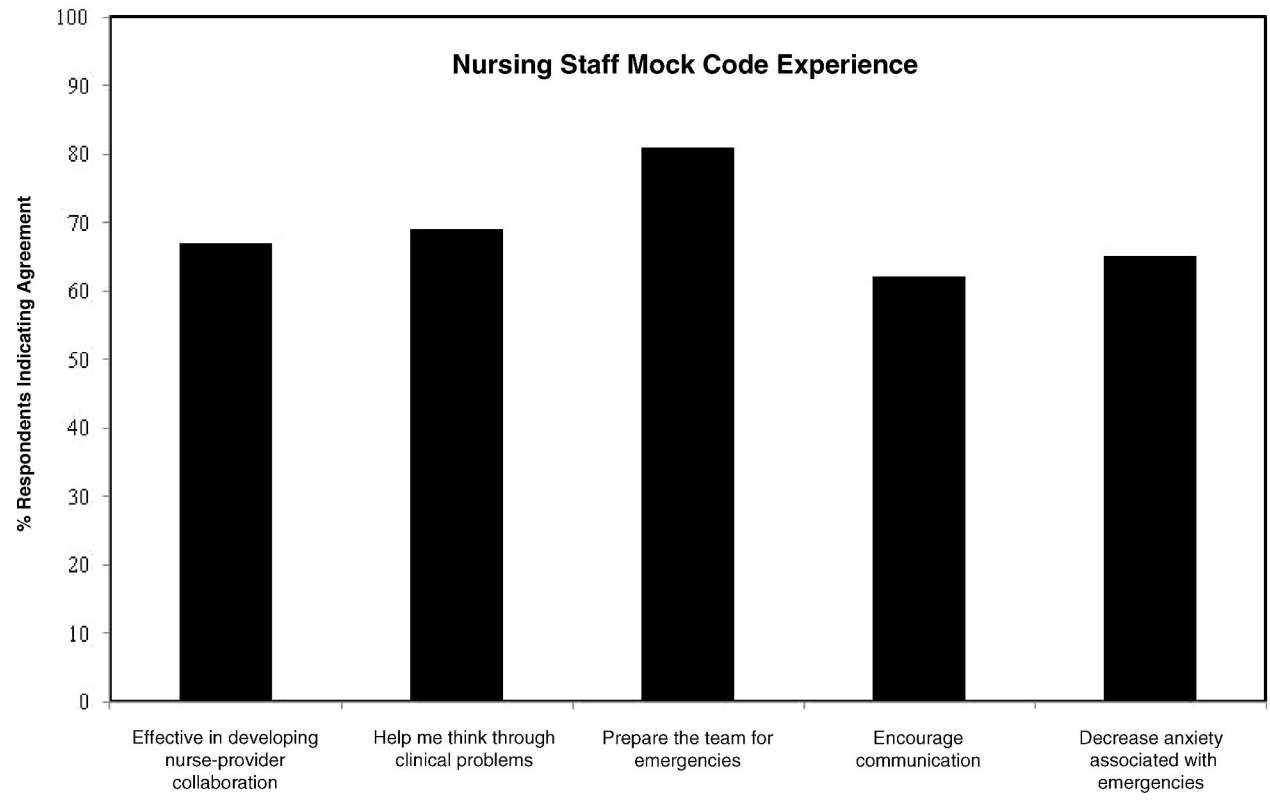

FIGURE 4 **Nursing Impressions of the Mock Code Experience (n = 52)**

become an integral component of the ongoing quality improvement initiatives undertaken by the Children's Hospital Code Committee.

Another important element is the focus on all 6 of the Accreditation Council for Graduate Medical Education (ACGME) core competencies[15] (TABLES 1 and 2). The curriculum has been helpful in further developing our educational approach to the often difficult areas of interpersonal and communication skills, systems-based practice, and practice-based learning and improvement, as members of the team participate in the mock code and then engage in self-reflection and discussion of their experience.

Discussion

The new mock code curriculum has become embedded into our pediatric residency training program and has not only enhanced our residents' experience and comfort as educators and peer facilitators but also bolstered our night-float rotation and multidisciplinary communication and teamwork in acute resuscitations. Our novel approach to resident education in the area of teaching proficiency has filled an educational void in our program by providing residents with the opportunity to engage in multiple aspects of the teaching experience and has improved resident comfort with teaching, communication, feedback, and debriefing. With the guidance and mentorship from a chief resident and/or PCCM faculty member throughout this 2-week rotation, the REs assume the role of educators and learners simultaneously, allowing them to educate their peers and the multidisciplinary team, while actively learning to become better teachers and facilitators.

Peer facilitation, as used in our curriculum, has been shown to be effective by allowing participants to practice skills in a nonthreatening environment.[18] Immediate feedback and debriefing following simulation exercises serves to solidify teaching points and enhance the educational experience in an attempt to improve future performance.[19–23] There is evidence to suggest that improved confidence following mock codes may not improve future performance without appropriate feedback.[21] The feedback provided through this curriculum directly benefits the RPs and multidisciplinary staff by supplementing the educational experience. In addition, the structure of the curriculum allows for the REs to receive individualized faculty mentorship and guidance while facilitating the debriefing session.

This curricular design not only allows the REs to accomplish their individual educational goals and objectives but also creates a self-sustaining model and improves the educational component of the night-float rotation. Teaching

by residents improves their learning, but "resident as teacher" rotations and experiences remain quite limited.[16,17,24–26] Our curriculum improves the balance between service and education, which was an important consideration in the decision to implement it in an existing night-float rotation. The mock code curriculum shifts the educational balance of our night-float rotation, transforming it from a predominantly service-oriented rotation into a robust educational experience.

Resident time constraints are an important potential obstacle as curricular adaptations are considered, and integrating this mock code curriculum into an existing rotation enabled implementation within the current duty hours. Because clinical and nonclinical educational time is limited, curricular modifications not only must address deficiencies but maintain or improve the balance between service and education. This benefit of our curriculum also is relevant to the duty hour limits that will become effective July 2011.

Although exciting and innovative, our new curriculum is not without limitations. One limitation is that this program was implemented as a curricular adaptation rather than a formal investigation, so there is no control group. There may be other factors that have contributed to the increased confidence in teaching, communication, and resuscitation during this time period, but our data are consistent with prior published reports demonstrating that practice via mock codes improves confidence in code situations.[5–8,27,28]

Improved confidence is not necessarily an indicator of improved performance, and it is important to note that there is often a discrepancy between resident confidence and actual competence improvement.[29–32] The current project did not provide an opportunity to link our educational initiative to actual performance in either teaching or resuscitation, but consistent with the ACGME Outcome Project, future curricular interventions and adaptations of this nature should focus on competency assessment and reliable indicators of performance.[15]

As educators seek to improve resident education through curricular modifications, an important area for future investigation entails assessing the impact of interventions on resident performance and competency. In an era of anticipated changes in the assessment of resident performance, and with upcoming further limitation on resident duty hours, optimizing the educational experience is a critical consideration for those responsible for educating the next generation of physicians.

Conclusions

A mock code curriculum focused on resident teaching, peer facilitation, and multidisciplinary communication, teamwork, and resuscitation education was successfully integrated into an existing night-float rotation. Our novel approach has broad applicability to curricular design in other training programs and represents an easily integrated, self-sustaining addition that can improve the equilibrium between education and service in a residency program.

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The following are corrections to the June 2011 issue.

1. Sullivan GM. A primer on the validity of assessment instruments. *J Grad Med Educ*. 2011;3(2):119–120.

On p 119, the sentence should read: Cronbach alpha calculates correlation among all the variables, in every combination, and generates one number that the closer it is to 1, the higher the reliability estimate.

2. Salem JK, Jones RR, Sweet DB, Hasan S, Torregosa-Arcay H, Clough L. Improving care in a resident practice for patients with diabetes. *J Grad Med Educ*. 2011;3(2):196–202.

The Figure legends should read:

Figure 1 Description of Sample Selection for Outcomes Analysis

Figure 2 Timeline for Implementation of Interventions

3. Saeed F, Majeed MH, Kousar N. Easing international medical graduates entry into us training. *J Grad Med Educ*. 2011;3(2):269.

The lead author's name is Fahad Saeed, MD.

4. Sweeney A, Stephany A, Whicker S, Bookman J, Turner DA. Senior Pediatric Residents as Teachers for an Innovative Multidisciplinary Mock Code Curriculum. *J Grad Med Educ*. 2011;3(2):188–195.

The Figure 3 label for the seventh column is: Communicating Effectively.

5. Le-Bucklin KT, Hicks R, Wong A. Impact of a Teaching Rotation on Residents' Attitudes Toward Teaching: A 5-Year Study. *J Grad Med Educ*. 2011;3(2):253–255.

The Results section of the Abstract should read:

Results: Four categories showed significant improvement, including feeling prepared to teach ($P < .0001$), having confidence in their teaching ability ($P < .0001$), being aware of their expectations as a teacher ($P < .0001$), and feeling that their anxiety about teaching was at a healthy level ($P = .0037$). There was an increase in the level of enthusiasm, but the P value did not reach a significant range ($P = .12$). The level of enthusiasm started high and was significantly higher on the pretest than every other tested category ($P < .0001$).

Footnote c to Table 2 should read: *P* value as calculated using the Mann-Whitney U test.