Background

The high risk and low volume of medical emergencies, combined with long periods between training sessions, on 2 progressive care units at Mayo Clinic, Rochester, Minnesota, established the importance of transforming how nursing staff are trained to respond to medical emergencies.

Objectives

To increase confidence levels and improve nursing performance during medical emergencies via in situ simulation.

Methods

An in situ, mock code quality improvement program was developed and implemented to increase nurses’ confidence while improving nursing performance when responding to medical emergencies. For 2 years, each unit conducted mock codes and collected data related to confidence levels and response times based on the recommendations in the 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.

Results

In those 2 years, nursing staff response times for calling for help improved 12%, time elapsed before initiating compressions improved 52%, and time to initial defibrillation improved 37%. Additionally, staff showed an increase in perceived confidence levels. Staff reported their appreciation of the opportunity for hands-on practice with the equipment, reinforcing their knowledge and refining their medical emergency skills.

Conclusions

In situ mock codes significantly improve response times and increase staff confidence levels. In situ mock codes are a quick and efficient way to provide hands-on practice and allow staff to work as a team.

Positive outcomes for patients after medical emergencies are dependent on the ability of first responders (nurses and patient care assistants) to deliver the care needed quickly and accurately during the critical first few minutes of a code situation. The skills and knowledge gained from basic life support/advanced cardiac life support (BLS/ACLS) training are quickly lost after these programs are completed.1–5 A lack of hands-on practice can lead to high anxiety and poor performance when nurses are faced with medical emergencies.6 The loss of knowledge and lack of proficient skills among nurses put patients at risk for adverse outcomes.

Patients who have a cardiac arrest in the hospital have a survival rate of approximately 10.0% to 23.9%.7,8 Nurses experience high levels of anxiety and have difficulty recalling the knowledge and demonstrating the skills required during medical emergencies.9,10 However, the use of mock code simulation can improve nurses’ confidence and performance.6,9,11 The high risk and low volume of medical emergencies, combined with the annual competency sessions and biannual recertification training, on 2 progressive care units at Mayo Clinic Hospital–Rochester, St Mary’s Campus, established the importance of transforming how nurses are trained to respond to medical emergencies.

**Background**

Through extensive research, the American Heart Association (AHA) discovered that the highest survival rates after cardiac arrest are in people who have a witnessed arrest, an initial rhythm of ventricular fibrillation or pulseless ventricular tachycardia, and chest compressions and defibrillation delivered quickly.8 Survival from a witnessed sudden cardiac arrest can be doubled or tripled if cardiopulmonary resuscitation (CPR) is administered quickly; for every 1 minute of delay in initiating CPR, the chances of survival decrease by 7% to 10%.8,10,12 Skills and knowledge retention decline following BLS/ACLS certification.2,5,10 In a mixed-method, explanatory study, Curran et al2 reported that the skills gained from these training methods progressively deteriorate in as little as 2 weeks, and substantial reduction in these skills occurs within 6 months of initial training. ACLS skills decrease at a faster rate than BLS skills; Dichtwald et al7 reported a retention success rate of 14% for ACLS versus 58% for BLS 12 months after training. Another downside of training in a formal BLS/ACLS class is that such training has little similarity to resuscitation in the hospital setting.10 Facilitators of BLS/ACLS programs often allow participants to verbalize their actions instead of performing them, taking away realism. The 2010 AHA Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care8 recognize the need for additional training, stating that along with BLS/ACLS certification, organizations should provide periodic reinforcement or refresher information as needed for periodic assessment of staff members’ knowledge and skills. Although BLS and ACLS classes are necessary and beneficial, additional training methods are needed for nurses to maintain the skills, knowledge, and confidence needed during medical emergencies.

As first responders to medical emergencies, nursing staff must have the confidence to take action and deliver the care needed during a code situation. Nursing staff are not as confident or comfortable as they would like to be when using their BLS/ACLS skills in a true code situation.5,9,13,14 In a quantitative study involving 250 staff nurses, Delac et al9 found that after participating in mock code training, nursing staff reported an increased level of confidence with initiating first-responder interventions, operating emergency medical equipment, and using hand-off communication. Lack of confidence can lead to hesitation and uncertainty about how to respond to medical emergencies, which can ultimately affect patient safety and contribute to adverse outcomes.9 Mock code training is a method proven to improve confidence levels among nursing staff.

At Mayo Clinic, nurses and nursing assistants are required to demonstrate proficiency in
emergency medical response and proper use of equipment on an annual basis during competency evaluations. The competency program is designed to validate knowledge and skills but does not provide a learning opportunity for the nursing staff to have hands-on practice with the skills and knowledge needed during a code. Staff members are expected to demonstrate the skills during the competency check-off; if they are unable to complete the required steps, they are directed to review the resources available and to return at another time. Because of the limitations of the current training and competency system, the way in which staff members are trained to respond to medical emergencies needed to change. This is a reason why in situ simulation was chosen as the method of mock code delivery.

Many of the mock code programs found in published reports used in situ simulation—holding the training session in a realistic training environment where care is actually delivered, such as patients’ rooms, waiting rooms, procedural areas, and showers, as well as during times when care is being provided to other patients. The benefits of in situ simulation training are that staff members are able to identify the location of emergency medical equipment, know how to call for help and activate the code team, learn to work as a team, and know what resources are available during an actual code. This type of training also offers the opportunity to identify issues with the existing code processes such as equipment availability, location, and functionality. In situ simulation training provides a realistic and interactive training environment that helps participants think critically about the location of emergency medical equipment and resources available to them, while holding onto the nonthreatening environment that can be created by simulation. Thus it appeared that the development and implementation of a unit-based in situ mock code program could improve performance and increase confidence levels among nursing staff.

**Methods**

In situ simulation was chosen as the method of delivery of the mock codes on 2 progressive care units to increase staff members’ confidence and knowledge, while improving performance when responding to medical emergencies. For 2 years, each unit conducted in situ mock codes quarterly and collected data related to confidence levels and response times according to the recommendations in the 2010 AHA guidelines. All staff members voluntarily completed a confidential electronic survey before the start of the mock code program to measure perceived confidence levels in responding to medical emergencies and handling the emergency medical equipment. The staff who participated in a mock code were sent the same survey within 2 weeks of completion of the mock code. The 3 survey questions were as follows:

1. I am confident in my ability to perform chest compressions on a patient who has no pulse.
2. Overall, I am confident in my ability to participate in a code 45 (medical emergency).
3. I am confident in my ability to be a team leader during a code 45.

Response options were categorized as strongly disagree, disagree, agree, and strongly agree. The changes in response proportions from the presurvey to the postsurvey were analyzed by using the $\chi^2$ test. Dichotomous variables combining strongly disagree and disagree versus agree and strongly agree were also tested for change from the presurvey to the postsurvey by using the Fisher exact test. Statistical analysis was performed by using JMP 11.0 (SAS Institute Inc).

An observational evaluation tool was developed on the basis of the 2010 AHA guidelines for in-hospital arrest response and this institution’s annual competency program. The 2010 AHA guidelines recommend response times for assessing the patient and calling for help to be within 20 seconds of discovery, for initiating chest compressions to be within 60 seconds, and for delivering the first shock to be within 180 seconds. The evaluation tool measures these response times, proper CPR technique, and the ability of the nurses to use emergency medical equipment. Staff were not notified of these criteria before the mock codes.

**Demographics**

The in situ mock code program was introduced on a 36-bed medical and vascular surgical progressive care unit, which had 64 registered nurses and 19 nursing assistants, and a 33-bed thoracic surgical progressive care unit, which had 60 registered nurses and 9 nursing assistants. Nurses and nursing assistants who participated in the mock code program had a large span of experience, from 0 to 40 years. All nurses are BLS/ACLS certified; whereas the nursing assistants are BLS certified. Nurses and nursing assistants are required to complete annual assessments of competency in emergency medical response.
Results

Using the observational evaluation tool previously described, data were collected for 2 years to measure response times for calling for help, initiating compressions, and delivering the first shock. Figure 1 shows the median quarterly results for assessing and calling for help; a 12% improvement was seen from the first year to the second year. The improvement seen in assessing and calling for help directly affected the other 2 criteria, initiating chest compressions and delivering the first shock. Figure 2 shows the median results of time taken to initiate compressions (goal, within 60 seconds). Between the first year and the second year of implementing mock codes, this response time improved by 52%. Figure 3 shows the median results of initial defibrillation in running mock codes. The timing of initial defibrillation in the second year of running mock codes had improved by 37%. The results indicate a significant improvement in response times after initiation of the mock code program.

The results of the presurvey and the postsurvey are shown in Figure 4. The responses strongly disagree and disagree are considered unfavorable, and the responses agree and strongly agree are considered favorable. The question about confidence level related to initiating chest compressions had 90 responses for the presurvey: 82.0% of staff reported favorably and 18.0% of staff reported unfavorably. The 89 responses to the presurvey question about perceived confidence levels related to overall participation in a medical emergency were 86.5% favorable and 13.5% unfavorable. The question about confidence levels related to being a team leader during a medical emergency had 90 responses for the presurvey: 50.0% favorable and 50.0% unfavorable.

The postsurvey confidence results conducted within 2 weeks following a mock code received 86 responses, and revealed that staff members’ perceived confidence levels to initiate chest compressions increased to 100.0% favorable. The 86 responses to the postsurvey question about overall confidence levels for participating in a code 45 increased to 98.8% of staff responding favorably and 1.2% of staff responding unfavorably. The 86 responses to the postsurvey question about confidence levels to be a team leader during a code 45 increased to 67.4% favorable and 32.6% unfavorable.

The results indicate a significant improvement in response times after initiation of the mock code program. These response times were better than the times recommended in the 2010 AHA guidelines (Figures 1-3). A shift in results also is apparent from the presurvey to the postsurvey, with some staff reporting feeling more confident in their emergency response skills following an in situ mock code.

Discussion

The goal of the in situ mock code program was to improve staff response times in a medical emergency and increase nurse-perceived confidence levels in participating in a medical emergency. This quality
Improvement project revealed that when assessing and calling for help, staff hesitated, which resulted in a delayed response. In addition, they did not trust their own assessment skills, were not treating the mock code as a real situation, and would frequently want to talk through it as often is done during the required annual competencies and biannual BLS/ACLS certification. It was observed that staff members who were initiating compressions were still using the old AHA guidelines of airway, breathing, circulation instead of the new 2010 AHA guidelines of circulation, breathing, airway, which delayed the initiation of compressions. This difference is important because the 2010 AHA guidelines recognize that the sooner critical elements in BLS (eg, chest compressions and early defibrillation) are initiated, the better the chances are for survival. In the first year of running mock codes, staff members would tend to finish their 2-minute cycle of compressions before initial defibrillation, were unsure with their assessment of the rhythm, and occasionally were unfamiliar with the equipment and hesitant to use it. Presurvey results indicated that staff were not as confident as they would like to be in their ability to participate in a medical emergency.

The mock code program provided mock codes via in situ simulation, which included a debriefing session, and provided staff an opportunity to respond to a medical emergency and have psychomotor practice with equipment in an environment with which they were familiar. After completing the mock code, the medical equipment was reviewed and a debriefing was done to identify things that went well and improvements that were necessary. All of the barriers that kept staff from responding in accordance to the 2010 AHA guidelines were discussed during the debriefing session after each mock code. In addition to defibrillation, staff members were given an opportunity to practice using the equipment for synchronized cardioversion and external pacing. Additional topics that were discussed during the debriefing session were alternative pad placement, ACLS medications, the 5-lead system, positioning of patients, bag mask ventilation, suction setup, back board placement, side rail position, compression depth, chest recoil, and additional resources available during a medical emergency. Given the variety of experience among all the staff members, every mock code stimulated new questions on different topics. The debriefing session following each mock code reduced barriers in the second year. Because of the frequent mock code scenarios, staff became more familiar with the environment of the in situ mock code, 2010 AHA guidelines, and best practices for a medical emergency.

Staff were supportive of the in situ mock code program and were grateful for the opportunity to refresh their knowledge and psychomotor skills. Each mock code took approximately 15 to 20 minutes to
In situ mock codes are an effective way to train staff for medical emergencies.

...complete, and staff appreciated that they did not have to prepare ahead of time, come to work on their day off, or wait in line for their turn. Staff comments regarding the mock code program were positive, referencing how much they enjoyed the teamwork, critical thinking, location, resources, and controlled environment. Staff reported feeling comfortable and safe to ask questions and make mistakes without experiencing repercussions. The in situ mock code program also empowered the nursing assistants to understand their role in participating in a code without ACLS training. Nursing assistants realized that they do not need to wait for the nurse to begin lifesaving BLS interventions in a medical emergency. The most common comment made by staff was their appreciation for the opportunity for hands-on practice with the equipment, reinforcing their knowledge and refining their medical emergency skills.

The mock code facilitators played an important role in the success and standardization of the in situ mock code program. They not only facilitated each mock code setup, implementation, and debriefing session, but they also facilitated enabling staff to come to the mock code by helping out on the unit with patient care when needed. Mock code facilitators also learned to adapt the mock code session to meet the needs of the staff and to take into consideration the pace of the unit. They conducted mock codes on a variety of shifts (evening, night, day, and weekend) to provide the opportunity to participate to as many staff members as possible. The use of the evaluation tool for each mock code scenario kept expectations clear with staff and ensured that mock codes were conducted in a similar fashion on both units. The standardization and collaboration of the in situ mock code program on both units contributed to its success.

Limitations identified were that participants’ performance and survey results were not matched, which makes it possible that staff could have submitted more than 1 survey if they participated in more than 1 mock code. The program used a variety of trained facilitators and different scenario setups, and the location of equipment varied on each unit, which may have influenced the results. Multiple mock code scenarios were run with the first scenario being a surprise, which could also make a difference in response times between the first mock code scenario and those that followed. Mock code participant dynamics and roles varied with each scenario.

Conclusion

Published evidence and knowledge gained from this quality improvement project support more frequent reviews of emergency response. In situ mock codes are a quick and efficient way to provide hands-on practice needed to promote muscle memory and allow staff members to work as a team. In addition, mock codes have significantly improved response times and increased staff members’ confidence levels. Standardizing the in situ mock code program not only contributed to its success and longevity, but made possible the participation of several other units within the institution. The debriefing session after each mock code scenario ensured that staff learned from the experience and found value in participating. The published evidence and positive results from the quality improvement project suggest that in situ mock codes are an effective means of educating nursing staff.

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FINANCIAL DISCLOSURES
None reported.

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REFERENCES

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