

CLINICAL REVIEW

Implementation of a Three Year Internal Medicine Simulation Curriculum – Lessons Learned

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Abstract

Background: Simulation is increasing in use in Internal Medicine residency programs to train residents on tasks such as performing procedures and leading codes. However, little has been published regarding the process and challenges of implementing of a curriculum across three years of residency. We describe the implementation of such a curriculum at a large university based program, the challenges faced, and the lessons learned.

Innovation: Simulation training was first integrated into the second year curriculum in 2007 to address an identified need of preparing residents to function as code team leaders. Recognizing the importance of deliberate, distributed practice to enhance skill and knowledge retention, we further expanded simulation training to first and third year residents. Curricular decisions were based on an ongoing needs assessment with careful consideration of learning objectives as well as timing of the curriculum. Feedback was solicited from participants at each session as well as annually in the program evaluation.

Discussion: Approximately 250 PGY-1, 350 new PGY-2, and 200 PGY-2/3 pre-ICU residents participated in our curriculum since initiation. Trainee feedback has been overwhelmingly positive with frequent requests for more simulation based training. Major challenges include 1) curriculum design, 2) scheduling/logistics, and 3) faculty recruitment/development.

Implications: Simulation training for large programs is feasible and sustainable with deliberate incorporation of faculty development, careful development of curriculum with adult learners in mind, and support from residency program directors to provide protected time for education.

Introduction

Internal medicine residents must gain competence in a wide range of clinical skills applicable to general medicine and acute care. At many institutions, these residents also act as first responders for code blue teams and are required to perform procedures and function as code team leaders. Yet, many do not feel prepared to take on these roles, and educational programs vary in critical care training.¹⁻³ Furthermore, with duty hour restrictions and patient safety concerns, the traditional

apprenticeship model is inadequate, and supplemental educational strategies have become increasingly attractive.⁴

Simulation based medical education (SBME) is one such strategy, providing adult learners with hands on experiential learning, opportunities for deliberate practice, and real-time feedback. Simulation has been shown to improve procedural skills, code team efficiency, and patient outcomes.⁵ Widely adopted in a number of residency programs, simulation is used to train patient care-related technical and behavioral skills and is now included in Accreditation Council for Graduate Medical Education (ACGME) program requirements for Internal Medicine training. While simulation is an effective tool for training, there is no consensus regarding simulation curriculum for internal medicine residents.^{1,6-9} In addition, many of the simulation experiences are either single sessions or a short series of sessions.¹⁰⁻¹² While many have been shown to be effective, they have also suffered from decay of knowledge over time.^{12,13} This raises the need for a coordinated curriculum that spans all three years of Internal Medicine Residency training.

Developing and implementing this type of curriculum raises many questions and challenges. Given the high resource cost of simulation-based training, learning objectives must be carefully considered and prioritized, with appropriate consideration of learners' level of training. Scheduling constraints must be considered in order to ensure the optimal number of participants for a given session as well as to ensure that each trainee receives a consistent experience. Faculty facilitators need to be recruited, developed, and sustained.

We describe the development and implementation of a three-year simulation-based curriculum for Internal Medicine residents at a large academic medical center with a focus on key challenges and lessons learned.

Conceptual Framework

A small group of academic hospitalists who were already integrated into the residency program began the simulation program with the encouragement and support of the residency program director. Recognizing that simulation would be most effective as a tool to provide experiential learning opportunities

that are not readily available in the clinical environment, several key principles were established to guide the overall program.

1. All simulation sessions must have a faculty member present to provide feedback.
2. Faculty involved in simulation education should receive training to ensure competency in running scenarios and debriefing.
3. Learning objectives should be informed by a variety of sources including core internal medicine competencies, resident feedback, program leadership input, actual clinical cases such as near-misses or morbidity and mortality rounds, and available medical research.
4. Curriculum would be developed with continuous improvement in mind, following the six-step model described by Kern et al.¹⁴

Faculty members developed scenarios through an iterative process. After reaching consensus on educational objectives and performance items, scenarios were scripted, programmed, and piloted. Each scenario was derived from a real case, accompanied by de-identified patient data (labs, electrocardiograms, radiographs, etc.), which provided authenticity. This also provided a venue for a virtual morbidity and mortality conference where residents could learn from mistakes and eliminate future errors.

Curriculum Development

Our simulation training program was borne out of the need to better prepare residents starting their second postgraduate year (PGY) of training for code team leadership responsibilities. Despite all trainees receiving standard advanced cardiac life support (ACLS) training from American Heart Association accredited courses, this issue was raised by the residents themselves as well as members of the Code Blue Quality Improvement Committee. With support from the residency program, our simulation program began in 2007 with all second year residents scheduled on the same day in early July, thus priming their experiences prior to holding the code pager. This education day is now known as the “R2 Retreat.”

After several years of refinement and learning from this experience, the curriculum was expanded to the intern year in 2010. While the PGY-2 simulation experience was highly regarded, the faculty recognized the need for repetition as evidenced by studies showing decay of ACLS skills over time. In addition, interns at our institution provide night cross-coverage for a variety of inpatients and often encounter urgent clinical situations. This rotation is often met with anxiety by our trainees; thus, it was felt that simulation would provide an ideal and safe environment to expose early trainees to acute situations such as sepsis and acute coronary syndrome.

In 2011, simulation was integrated into the PGY-2 and PGY-3 years by targeting residents prior to their intensive care rotations. The primary educational goal was to provide refreshers on central line placement and ACLS just prior to their ICU rotation where they would be most likely to need these skills. This was consistent with the desire to make the simulation experiences as relevant and timely as possible. In 2012, these sessions were opened to nursing staff making the

experience more authentic and providing an opportunity for inter-professional teamwork training. Anesthesiology residents began participating in 2013. In order to ensure the learning objectives were appropriate for all inter-professional learners, champions from Nursing and the Department of Anesthesiology were recruited to be involved in scenario development and curriculum design.

Since the pilot simulation training session, approximately 250 interns have received the first year curriculum, 350 residents have participated in the second year resident retreat, and 200 residents have participated in the interprofessional curriculum. The simulation sessions consistently receive outstanding reviews and were considered a clinically valuable experience with an average rating of 4.6 on a 5-point Likert scale. Comments described the simulator session as “extremely valuable” and the “highlight of the rotation.” Participants consistently ask for further expansion of the simulation curriculum.

Scheduling and Logistics

Scheduling of simulation sessions requires coordination between the respective availabilities of the trainees, simulation center equipment/staff, and facilitators. As the residency program has expanded in size, this has become more challenging as more sessions are required.

Key to the success of simulation curriculum is to ensure that the trainee has protected educational time away from clinical responsibilities. This is essential to ensure that the learner’s attention can be focused on the simulated experience. For the R2 Retreat, this is accomplished by having the third year residents provide coverage for all second year residents. For the other sessions, the residents are excused from their rotations for a half day. Typically, these rotations are electives or other lower intensity rotations that do not require coverage.

Other than the R2 Retreat, three to four residents are scheduled for any given session. Careful attention is given to ensure that a given resident does not receive a case more than once during the course of their training. With over 150 residents in our training program, this results in fifteen intern sessions and twenty-five resident sessions in an academic year. In order to accomplish this volume of sessions, we begin planning with the simulation center as early as February or March for the following academic year.

Faculty Recruitment and Development

All sessions are facilitated by two instructors. One directs the scenario, ensuring the case moves along appropriately and responding to the learners’ actions. The other instructor plays the voice of the patient while taking notes on important points for debriefing. We have found this division of work greatly improves the debriefing experience especially for our more complex scenarios. Unfortunately, this also doubles the amount of faculty time required.

Recruiting faculty with the interest and time to teach simulation is a major challenge to the success of this curriculum. We are not able to financially compensate our faculty for this activity,

and thus rely on other means to recruit and retain our instructors. The chance to teach and work with residents is a significant motivation for many of our teaching faculty. In addition, we generate learner evaluations from each session, which contribute to the academic promotions process. We also develop simulation based research projects to further the careers of our teaching faculty.

Beyond motivation, it is imperative that the time commitment is not overly burdensome for any given faculty. In order to achieve this, a sufficient number of simulation instructors must be recruited and maintained. Each year the three physician leads of the simulation program make an assessment of faculty availability and identify potential new recruits. Many of these are former chief residents. For the 2016-2017 academic year, thirteen faculty are involved in the curriculum.

While some of the senior instructors have nearly a decade of experience, newer faculty require training and development. All faculty must complete a two-day simulation instructor course that is provided free of charge by our institution. In addition to this, ongoing faculty development is provided by our two instructor system. Whenever possible, the schedule is made such that a senior instructor is paired with a more junior instructor allowing for direct observation of the junior faculty and immediate feedback.

Discussion

Simulation is a resource intensive but high yield experiential learning. We describe implementing a three-year longitudinal simulation curriculum for an internal medicine residency program with 157 residents per year. Each resident is now guaranteed 16 hours (4 hours as PGY1, 8 hours as PGY2, 4 hours as PGY3) of high fidelity simulation training. In addition, residents receive at least 10 hours of central line and intraosseous line placement workshops also spread out longitudinally over three years. Key instructional design features of the curriculum include deliberate practice, clinical variation with different scenarios of varying difficulty, group practice and team training, ample feedback on performance via debriefing, distributed practice over all three years of residency training, and integration into the training program curriculum.

Several challenges were encountered during the process of development and implementation. First, the learning objectives needed to be designed to address the needs of the learner. This was accomplished by resident surveys, discussions with program leadership, and review of morbidity and mortality cases. A database of cases is maintained along with a system to ensure that a resident does not see the same case twice. The difficulty and learning objectives also change as the learner advances through training. Second, the logistics of implementing this curriculum must be overcome. This is done with close coordination between the simulation center, training program administrative staff, and lead faculty members. Third, faculty who are involved in the curriculum must be recruited, trained, and retained. Our faculty are asked to provide teaching on their own time without compensation; therefore, a large enough group is essential to ensuring that the time burden is not excessive for any one instructor. More instructors, however, creates the potential issue of quality control. We have mitigated

this by recruiting clinician educators who have a proven track record in resident education, providing a free two-day simulation instructor course, and pairing junior faculty with more experienced instructors whenever possible to provide ongoing faculty development. Teaching evaluations are also collected at each session which provide feedback and contribute to the academic promotions process.

Conclusion

Simulation training for large residency programs is feasible, sustainable and effective. Key elements for curricular success include:

1. Protected learning time for residents and thoughtful timing of educational interventions as activities should be highly relevant and parallel clinical experience.
2. Purposeful selection of scenarios to augment clinical skills including procedural skills, delivery of bad news, communication and teamwork, and management of complex or rare medical emergencies.
3. A faculty development plan to train and retain instructors.
4. Continuous improvement of each component of the curriculum based on feedback.

Table

Table 1. Simulation Curriculum Overview

Objectives	Logistics	Topics
PGY1 Intern Year: Apply medical knowledge to critical clinical events Teach interpersonal and communication skills	4 hour sessions once a month 3 residents, 2 instructors, 3 scenarios per session Each resident leads one and assists in two scenarios Each resident gets 4 hours simulation training	Night float and cross cover issues Delivering bad news Introduction to code blue management
PGY2 R2 Retreat: Prepare residents to be code team leader Enhance procedural skills	Full day once a year 8 residents, 2 instructors, 8 scenarios in 4 hour critical event team training simulation session Rotate with 8 residents, 2 instructors in 2	Cardiac Arrest Arrhythmias Respiratory emergencies

	hour central line workshop and 1 hour leadership skills didactic discussion	
	Each resident gets 6 hours simulation training	
PGY2-3 Pre ICU: Provide deliberate practice immediately prior to ICU rotation Reinforce inter-professional teamwork and procedural skills	4 hour team training simulation once a month with 3 residents, 1 instructor, 3 scenarios 2 hour central line workshop once a month with 3 residents, 1 instructor, 3 central line torsos Each resident gets 12 hours simulation training	Ventilator emergencies Advanced arrhythmias Multiple acute patient triage

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