

Evaluation of Simulation for the Development and Delivery of Rapid Response Team Curriculum

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Educational Aims

Aim 1: To catalog and quantify deficiencies in medical knowledge and crisis management skills in the management of acute medical emergencies in the inpatient setting by in the Internal Medicine residency

Aim 2: To teach medical knowledge and crisis management skills to improve trainees' ability to manage acute inpatient medical emergencies

Aim 3: To evaluate the long-term retention (at three months) of material presented through simulation versus online independent learning modules

Project Rationale

Residents in the Internal Medicine residency play a large role in running Code Blue and Rapid Response Team (RRT) activations at the three hospitals within the Stanford residency program. However, survey data among residents in our program indicates that the majority of residents (63%) feel somewhat or very uncomfortable directing care in these scenarios (unpublished internal data). Over 80% of residents indicated that simulation would be useful in improving their perceived competency in these roles. However, it is unknown in which aspects of crisis management residents feel and perform deficiently (e.g. personnel direction, differential diagnosis, drug dosing). Medical simulation has long been used to identify and characterize errors in medical management during crisis (DeAnda, *Anesthesia & Analgesia* 1990). This project seeks first to identify areas of insufficiency, and second to evaluate the efficacy and durability of simulation as a medium to address those insufficiencies in the curriculum of the internal medicine residency.

Pilot Data

The Simulation in Medicine for Acute Response Teams (SMART) program launched in May 2015, with the volunteer assistance of residents and attendings from the department of anesthesiology and internal medicine, and critical care fellows. Preliminary and anecdotal data has identified some knowledge gaps; for example, the formulation and doses for various route of administration for epinephrine to treat anaphylaxis are frequently confused. Other errors identified include a failure to consult available cognitive aids. Initial feedback on the usefulness of the sessions has been positive, but has not been quantified.

Approach

Aims 1 and 2: Sessions will continue in the Center for Integrative and Simulation-based Learning (CISL) at Stanford once per month. The team of instructors will be consolidated for consistency across simulations, and will consist of two senior residents, two attendings, and 1-2 critical care fellows. Each session will last two hours and will consist of two simulated scenarios; three members of the instructor team will be present at each session. Three to four residents (two senior residents and 1-2 interns) will participate as trainees in each session. Scenarios will be prescribed with learning objectives and a detailed if-then flowchart to preserve fidelity between sessions. A total of three unique scenarios will be rotated, for a total of eight simulation runs per scenario. Each simulation run will be recorded with audio and video equipment available at the CISL. An instructor will review all the videos and catalog the errors made by trainees using standardized criteria. Furthermore, surveys will be administered after each session to solicit perceived areas of deficiencies by the trainees. Data from all 12 simulation sessions (September 2016 to August 2017) will be used for Aims 1 and 2.

Aim 3: Following participation in the simulation session (November through April sessions), study participants will be instructed to complete a short online teaching module in an unrelated critical care topic (control), as well as a baseline online quiz. Three months later (February through July), participants will be asked to complete another online quiz to measure their retention. Retention of critical care topics addressed via simulation will be compared with those topics addressed via online teaching module.

Because of time needed to develop teaching modules, and of the need to wait 3 months to measure retention, only trainees from the November 2016 to April 2017 simulation sessions will be studied for Aim 3.

Timeline and Plan for Implementation

September 2016 – August 2017: Run simulation sessions once per month

September 2016 – October 2017: Develop online teaching modules for Aim 3

November 2016 – April 2017: Enroll simulation participants in Aim 3 initial online teaching module and evaluation

February 2017 – July 2017: Aim 3 follow up evaluation of retention

May 2017: Review all videos and survey data from September 2016 - May 2017 for preliminary data analysis.

June 2017: Present preliminary data to Internal Medicine residency at the Annual Program Evaluation for use in upcoming academic year.

August 2017: Review all videos and survey data for July and August 2017. Quantify common errors and deficiencies. Analyze Aim 3 online quiz results to evaluate retention.

Anticipated Work Product

Upon completion of Aim 1, we will have a catalog of areas of improvement in the management of acute inpatient medical emergencies among medicine residents, including those in the categories of medical knowledge, crisis resource management, interdisciplinary collaboration, and systems practice. Aim 3 will also produce data that will inform whether simulation, a resource-intensive teaching modality, allows learners to retain information more effectively than traditional teaching modalities. We will also have a deliverable online self-learning module in a critical care topic that, if found to be useful, could be expanded and used as another educational modality.

Evaluation Plan

Formal evaluation of Aim 1 will occur during video review, in June and August of 2017. However, methods and surveys will be reviewed on an ongoing basis after each simulation session to ensure that useful data is being collected.

Evaluation of Aim 2 (to teach medical knowledge and crisis management skills) will occur via self-assessment by simulation trainees. Surveys addressing different aspects of crisis management will use a Likert scale to assess the efficacy of simulation at addressing these skills. Evaluation of Aim 2 will also be accomplished by Aim 3; measurement of retention of medical knowledge obtained during simulation sessions will inform us of the efficacy of simulation as an educational intervention.

Dissemination of Results

Preliminary findings from our simulations (from the May 2017 review) will be presented to the Internal Medicine residency at the Annual Program Evaluation, along with recommendations for potential interventions to address knowledge or behavioral gaps. We also plan to present our findings at the Third Annual Stanford Innovation in Education Conference in May 2018. Results will be submitted for presentation at the Society for Critical Care Medicine Congress in February 2018, and for publication in the Journal of the Society for Simulation in Healthcare.