Five Tips for a Successful Submission on Simulation-Based Medical Education

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Over the past 2 decades, there has been an exponential adoption of simulation in health care education throughout the continuum of medical training and practice. During this time evidence demonstrating the effectiveness and impact of simulation-based medical education (SBME) has mounted: When simulation training is conducted under the right conditions and outcomes are measured by instruments with evidence for reliability and validity, research has shown not only that graduate trainees can obtain desired skills in a controlled, simulated environment[1] but also that these skills can transfer to the clinical setting[2] and, in some cases, lead to improved patient outcomes.[3] Several systematic reviews and meta-analyses indicate that the magnitude of the effects of SBME are significant and consistent across medical disciplines, and these studies highlight the features of SBME that lead to more effective results.[4–6]

Faculty involved in postgraduate education are increasingly adopting simulation in response to several challenges: mounting curricular demands in a setting in which there are fewer real patient encounters because of changes in patient care reimbursement and work hour restrictions, emphasis on patient safety and quality care, and recently, more rigorous requirements to teach and evaluate on a regular basis the Accreditation Council for Graduate Medical Education (ACGME) core competencies and developmental Milestones.[7] These pressures have led to widespread change in postgraduate medical education that increasingly involves simulation technology and innovative ways to provide a standardized training and evaluation program. At the same time, academic medical centers expect their faculty to demonstrate scholarly activity in the form of peer-reviewed publications and presentations at scientific and education meetings. The *Journal of Graduate Medical Education* provides detailed guidelines for the preparation of manuscripts reporting various categories of scholarly activity, and authors should always follow these instructions before submitting their work for consideration to publish.[8] The goal of this brief article is to provide 5 specific tips to authors for a more successful submission (especially in the "Original Research" category) on the use of simulation for health care education.

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Tip 1: Define the Purpose of Study

The purpose and scope of the project should aim beyond the simple description (case report) of a training intervention at a single institution and make an argument for its potential generalization beyond local use. Even brief reports should aim to surpass the idiographic description of an intervention, method, or approach and lead to generalizable knowledge. A new report can contribute optimally to the existing literature only if it is supported by a description of the theoretical or conceptual rationale for the intervention and a discussion hypothesizing which generic aspects of it could be used in other contexts or situations.[9] This is very important if the report is to have an impact on readers who may wish to adopt a similar approach at their own institution. There needs to be a link that bridges the described work to readers' prior knowledge and that indicates the relevance to their current educational setting or practice. In postgraduate education, at a minimum, this usually means linking the project with ACGME core competencies and specific Milestones in the relevant specialties. This will immediately make the work germane to others who share the same challenges to document training and evaluation of these important outcomes.

Tip 2: Conduct a Literature Review

The study should build on previous studies in some manner. The literature on the modern use of simulation for health care training has a 40-year history. Begin with previous studies in the same field, and then move to other disciplines and professions in health care. What is known from the previous literature? What are the gaps and limitations, and how will the current work address these gaps and add to our knowledge? Be sure to conduct a thorough literature search before concluding that the current question or issue has not been previously addressed and that is why you have chosen to carry out the study or project. Truly novel uses of simulation are becoming increasingly rare.

TABLE **Key Elements and Examples of a Successful Submission on Simulation-Based Medical Education**

Key Elements	Examples[a]
Purpose of study	The American Board of Internal Medicine (ABIM) requires residents to be familiar with the indications, complications, and interpretation of this procedure. Recently, the Accreditation Council for Graduate Medical Education (ACGME) added paracentesis skills as a 2012 program requirement for gastroenterology fellowship training as well as a requirement that fellows have access to simulation training. Simulation-based mastery learning featuring deliberate practice gives residents and fellows the opportunity for procedural skills development and feedback. We hypothesized that the mastery model of procedural training could be successfully extended to paracentesis skills on an ultrasound-compatible simulator that was designed and created at our institution.
Literature review	Despite ACGME recommendations, many procedures are performed by learners who are not appropriately proficient or confident, and there is variable adherence to the gastroenterology core curriculum regarding hepatology in many programs.
Description of simulation intervention	All study residents completed a 3-hour educational session featuring a lecture, the *New England Journal of Medicine*'s paracentesis video, ultrasound training, and deliberate practice with the paracentesis simulator with directed feedback.
Description of role of instructor	Two faculty members, each with at least 10 years of experience in performing paracenteses, supervised the training sessions. Each faculty member received instruction in the deliberate practice, mastery learning methodology of training. They were independently evaluated and provided with feedback on their teaching skills before participating in the study.
Outcome measures	The 25-item checklist was developed by 1 author using evidence-based guidelines for paracentesis and checklist design. The checklist was reviewed for completeness by 2 other authors with expertise and experience in paracentesis, simulation-based education, and checklist design. The minimum passing score for the paracentesis clinical skills examination was determined by 9 clinical experts (ABIM-certified physicians: 6 physicians from internal medicine, and 1 physician each from gastroenterology, pulmonary/critical care, and infectious disease) using the Angoff and Hofstee standard setting methods. All pretests and posttests were graded by a single, unblinded instructor and were videotaped. A dichotomous scoring scale (done correctly or incorrectly) was used for each item. A faculty instructor with expertise in scoring clinical skills examinations, who was blinded to the pretest and posttest status of each examinee, rescored a 50% random sample of the videotaped examinations to assess interrater reliability.

[a] Several of the examples are taken from reference 1.

Tip 3: Describe the Simulation Intervention

The primary purpose of sharing your experience using simulation to train or evaluate residents and fellows is so that others may learn from your work and perhaps adopt similar methods at their institution. In order for this to occur, you should describe the simulation intervention—usually in the form of a scenario, skills station (for physical examination technique, other psychomotor or procedural skills, or communication abilities)—with detail sufficient enough that it can be replicated elsewhere. Several templates and models for scenario development exist,[10] and citing at least 1 of these (or providing these as an appendix to accommodate word limits) will give readers some basis for developing their own scenarios if your particular intervention does not apply exactly to their local situation or needs.

Tip 4: Provide Information on the Role of the Instructor

In the current literature on SBME there is a conspicuous absence of details about the experience and expertise of faculty instructors using simulation as a methodology for training and assessment.[11] If any description is provided, it is usually vague like "faculty with experience in the use of simulation." What does "experience" mean in this context? Medical educators more easily grasp this notion in the clinical context: They understand that an "experienced" person has usually graduated from medical school, completed several years of residency (and fellowship) training, and then practiced in a professional setting that often requires board certification (and recertification). But what about simulation instruction experience? Did the faculty receive formal training and certification? If so, where and in what form? This factor is often overlooked, but it is very important for readers to understand that, in addition to simulation equipment, facilities, and other resources, investment in faculty development and support is critical to the success of SBME interventions and the achievement of effective outcomes.

Tip 5: Select Outcome Measures

Previous articles in the *Journal* have offered guidance on providing validity evidence for the use of assessment instruments.[12] These guidelines should be followed when evaluating the effects of SBME, where we often attempt to measure constructs related to performance. As opposed to (objectively measurable) physical properties, the subjectivity inherent in most performance-based assessments requires, almost without exception, that we provide evidence each time we use an assessment tool to support the argument that such use is valid. Statements such as "previous studies have demonstrated the validity of this tool" are insufficient. Because the conditions and people

(study participants and raters) involved are likely to be different from those previously described, investigators must demonstrate that they have taken steps to reduce threats to validity in the current study by:

1. Controlling and standardizing the conditions and setting for the simulation, including equipment choice and operation, instructor role, and so on.
2. Analyzing the reliability of the data (usually in the form of interrater reliability calculations). Rater training and calibration can improve reliability of data, and if carried out, it should be reported in the study methods.
3. Describing the motivation of the participants to perform optimally. What was the participants' motivation to perform at their highest level during the simulation exercise? Was participation in the simulation exercise voluntary or mandatory? (Consent to use data is required in either case.) What were the consequences of performance outcomes? For example, were simulation training and achievement of a certain benchmark required before the trainees could apply these skills to real patients? These factors have tremendous influence on the motivation of participants, and providing readers with an understanding of this context will help them to make judgments about the validity of the results and conclusions presented.

Reviewers and editors often identify failure to address these 5 areas when they reject submissions on the use of simulation for training and assessment. By contrast, manuscripts that follow most or all of these tips are more likely to be successful—the first reference cited here is exemplary in this regard (TABLE).[1] These suggestions are intended to provide practical guidance to authors when submitting future work to a journal. The goals are to raise the level of scholarship in the field of SBME, to increase the likelihood of having a journal submission accepted for publication, and to improve the education and proficiency of trainees and, ultimately, the care of their patients.

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