Who’s Driving? The Role and Training of the Human Patient Simulation Operator

LAURA GANTT, PhD, RN, CEN, NE-BC

Much of simulation-based education originated in the military and aviation fields. Within aviation, simulation was first used as early as the 1930s for initial training of pilots; it is now also used routinely for recurrent training and proficiency checks.1 Airplane cockpit simulators are operated by current or former pilots whose expertise ensures the relevance and authenticity of the experience (Joshua C. Brehm, personal oral communication, February 8, 2011).

Having simulators for specific types of training operated by other professionals or experts within the same field seems to make sense. However, the practice of identifying the best or most appropriate person to run a patient simulator has not been translated into healthcare. In the fields that use simulators for training, it is difficult to find information on their operators. Having a person assigned to run a simulator while another instructor facilitates learning is a luxury that many organizations cannot afford. Patient simulators may remain unused because faculty members do not have the time to learn how to use the simulators within their courses, much less run them.2

Simulator operators tend to be the “behind the scenes” personnel whose work often goes unrecognized and unrewarded. In truth, the importance of the simulation operator may become clear only is when there is no person fulfilling the role or when the person is not able to do so in a satisfactory manner. Little can be found in the literature about the role, educational background, or training of the simulation operator. Furthermore, few resources exist for training those who must learn the intricacies of the relationship between a simulator, a scenario, and educational objectives.

For purposes of this article, patient simulators are computer-controlled, full-body manikins, which are preprogrammed or may be run in a mode allowing for response to learner actions. Patient simulators are operationally labor intensive, and faculty or other personnel are

Within the airline industry, where much of simulation-based education originated, cockpit simulators are operated by current or former pilots whose expertise ensures the authenticity of the training experience. As yet, identifying the most appropriate person to run a patient simulator has not been translated into healthcare. Furthermore, few training resources exist for those who must learn the intricacies of the relationship between patient simulators, simulation scenarios, and educational objectives. This article reviews literature related to the role, educational preparation, and training of the patient simulator operator and explores solutions to the uncertainty about the difference between simulator operators and technicians. Because simulators are operationally intensive and because scarce faculty may be best used to facilitate student learning within the laboratory, the tendency has been to use a variety of personnel to manage patient simulators. Recommendations for standardizing the role of the operator that are consistent with the pedagogical purposes of simulation are offered. Potential questions are posed, and methods for future work are discussed.

KEY WORDS
Education • Human patient simulation • Simulator operations

Author Affiliations: Learning Technologies, Labs, and College Support Services, College of Nursing, East Carolina University, Greenville, NC.

Dr Gantt is now executive director of the College Support Services.

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Corresponding author: Laura Gantt, PhD, RN, CEN, NE-BC, Learning Technologies, Labs, and College Support Services, College of Nursing, East Carolina University, 2137 Health Sciences Bldg, Malisstop 162, 600 Moye Blvd, Greenville, NC 27858 (ganttl@ecu.edu).
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commonly needed to facilitate student learning both from within the laboratory setting and from the vantage point of the simulator. Thus, there has been a tendency to use a wide variety of types of personnel to manage patient simulators. This article reviews the literature related to the functions, experience, and training of the patient simulator operator and examines the uncertainty about the differences among the various terms used to describe the role. Potential solutions for establishing consistency in the role are discussed. A typology for simulation in relation to operator requirements is offered.

## REVIEW OF RELEVANT LITERATURE

### Definitions

The problems facing the simulation community related to language and terminology are evident in the literature.\(^{5,6}\) The roles of simulation technician, simulation operator, and simulation driver are often thought to be interchangeable. For those who are not well acquainted with what goes on behind the scenes and in the simulation laboratory, using these terms synonymously may lead to problems that arise, for example, when the simulator technician knows a great deal about programming the simulator, but not about normal parameters for patient vital signs.

Although there is no definition for simulation technician in the healthcare literature, position descriptions found online\(^{5,6}\) specify the need for a technology degree or engineering background; some also specify the need for basic healthcare certification, such as emergency medical technician or nurse’s aide. In the healthcare arena, simulation technician may be an appropriate label or title for the person who assists in programming scenarios within simulator software, although the specifications of the position within some organizations may include much more than just this.

Seropian\(^{7}\) describes the simulation operator as follows: “Operator” is a descriptive term, referring to the person running the computer and perhaps the communications. The operator makes the simulation happen in real time.\(^{7}(p1698)\) A few healthcare organizations have begun to advertise for and fill positions called simulation specialist;\(^{8}\) when these job descriptions are reviewed, the functions represented are very similar to the simulation operator.

A new title and job description for a position called simulationist\(^{9}\) have also emerged and can sometimes be found on job and simulation organization Web sites. This position appears to meld simulation operator and technician. Indeed, the simulation technician may become the simulator operator at times, so this new term may appropriately represent a mix of job functions. There comes a point in scenario development when it is time to test scenarios before they are deployed with learners. The simulation technician must be able to connect programming with the reality of the entire scenario to see the impact of his/her work and thus, may run or operate the scenario. However, the focus of this article is on the role of the simulation operator; Seropian’s\(^{7}\) description of the position is used.

### Learning Theory and Teaching via Simulation

For simulator operators who do not have degrees or experience in education, the concept of learning objectives in and of themselves may be foreign. All simulation scenarios must be based on goals that fit within the learner’s designated curricula.\(^{10}\) However, many simulator operators do not have this understanding at first. The simulation operator, like the instructor or facilitator, must keep learning objectives in mind, whether designing or running the scenario.\(^{11}\)

There is no learning theory specific to the role of the simulation operator, so any linkage between the two can only be implied. Zigmont and colleagues\(^{12}\) discuss the necessity of formal and informal mentors to help learners make sense of their experiences. The simulation operator’s less formal mentorship role is to facilitate the simulation itself, while the more formal instructor or faculty role is to provide feedback and guidance. Within the Jeffries\(^{10}\) simulation framework, the role of the simulation operator is part of the student support component of simulation design. Student support involves the cueing that helps direct the student to appropriate patient care without detracting from independent clinical reasoning.

Clapper\(^{13}\) sees the work of the simulation team, which would include the operator, as key to the development of the reflective practitioner. He further states that, in order to create a workforce that thrives on self-improvement and lifelong learning, educators must also know what brings the learner to the simulation experience and what can be done to make the learning experience superior. Clapper’s work draws on the work of Malcolm Knowles,\(^{14}\) in that adults are seen to draw on internal motivation and resources from accumulated experience as they learn and that there must be a perceived applicability and purpose for learning.

While the simulation operator may not have a healthcare background or the title of faculty member, he/she is still a facilitator of the learning experience. Founds and colleagues\(^{15}\) describe the role of the simulation operator, whom they call a coder, as follows:

This person opens and runs the computer program for the simulation, can adjust the mannequin’s vital functions manually, observes and evaluates whether critical behaviors are met, and can check off completed tasks.
The coder may act as the voice of the patient, doctor, or other roles through an intercom to the simulation room.15(p8)

The simulation operator does all of this while also, in some cases, videotaping the simulation for debriefing, and while others, like faculty members, talk to them about what to introduce into the scenario. The role requires a diverse knowledge base that includes a grasp of sound educational principles, an awareness of where a particular simulation fits within a curriculum, how particular technology works, and an understanding of the purpose of technology in learning.

**Development and Training of the Simulation Operator**

How is the role of simulation operator learned or taught? Should the operator come to simulation with a certain degree or type of experience? Simulator manufacturers offer workshops on the assembly and programming of simulation equipment, but scenario design is considered an advanced function. While certificates in simulation are becoming more common, and there are a few master’s and doctoral degree programs in modeling and simulation, there is no undergraduate degree in simulation.16 Simulation operations training has often been a “see one, do one, teach one” enterprise, as has been the case with many types of healthcare education; a person who is more experienced in simulation helps to guide the orientation of the novice.

A small number of simulation manuals, textbooks, and handbooks have been written, but practically no guidance on simulation operations exists, except as part of journal articles or book chapters on other topics; this makes finding the information difficult and sometimes accidental, but not altogether impossible. Simulation center operations articles, chapters, and courses include scenarios that are not preprogrammed may require more detailed clinical understanding. Jeffries10 indicates that it is often clinical information that is included in the cues provided by “faculty or other designated persons”10(p101) to students to assist them with a current or approaching step. While it might be possible to train a nonclinical simulation operator to provide specific cues in a particular case, the number of ways that a student could become “stuck” in a mannequin-based simulation scenario is extensive.

Beyond this study of nonfaculty nurses, however, there are themes in the literature that can be identified or extrapolated about the background and training of simulator operators. First, more questions than answers can be found about whether the simulation operator in patient care scenarios should or must have a healthcare-related background. In their recent article about the present and future of simulation, Marco and Holmes20 asked whether technical support people for a cardiac catheterization simulator need to function like trained catheterization laboratory nurses. In a similar vein, Gaba (personal written communication, February 26, 2011) responded to questions on the Society for Simulation in Healthcare’s e-mail discussion list regarding training of nonclinicians to play the roles of clinicians. When asked whether it was possible to do this, his response was:

> It depends most of all on how much knowledge they need to have and how flexibly they need to be able to deploy it. This in turn depends on how scripted the scenarios are and how experienced the learners are. For complex scenarios with residents or staff-level physicians, or experienced nurses, the actions and queries/conversations of the clinician participants may vary so much that certain roles of confederate coworker may require so much improvisation ability that only a clinician can do it. We have anesthesia attending (instructors) playing the role of surgeons in our anesthesia crisis resource management courses for anesthesia residents (and attendings), and we think it would be really tough to have a layperson trained sufficiently to have all the varieties of conversations that the surgeon needs to have with the anesthesiologists and nurses.

Since simulator operators must also play the roles of physicians, nurses, nurse aides, and family members, the assumption that the role could be filled by a nonclinician may not be a safe one. As Gaba explains above, the range of knowledge that the simulation operator must have to flex between satisfactory responses in clinical situations may mean that only clinically trained operators will suffice for certain types of scenarios. For example, simulations that are run “on the fly” or those that are not preprogrammed may require more detailed clinical understanding. Jeffries10 indicates that it is often clinical information that is included in the cues provided by “faculty or other designated persons”10(p101) to students to assist them with a current or approaching step. While it might be possible to train a nonclinical simulation operator to provide specific cues in a particular case, the number of ways that a student could become “stuck” in a mannequin-based simulation scenario is extensive. Some degree of clinical knowledge is likely required for the scenario to progress way that mimics reality.

Perhaps nowhere is it clearer how well versed a simulation operator must be than in Dieckmann and colleagues21 discussion of scenario “life savers,” or methods used to rescue a scenario that has strayed from its intended course. Simulation scenarios can be thrown off track by any number of factors, including unanticipated misunderstandings or actions by participants, mismatch between scenario difficulty and participant competence, and technological malfunctions. Using the best recovery method during a derailed scenario requires attention and judgment...
from the simulation team and should be anticipated in the initial design. The writers provide extensive examples of how a simulation can be salvaged by the right mix of skills and finesse exerted by a knowledgeable simulation operator and others involved in a scenario. While these authors do not advocate specifically for clinically prepared simulator operators, they do discuss having the operator play a variety of clinical roles within the scenario or speaking as the patient to provide diagnostic clues.

**Simulation Classification and Typologies**

A few authors have developed works that outline levels of technological complexity in simulation design and fidelity; requirements of each level in terms of such factors as participant interaction or skill to be developed, facilities, costs, personnel needs, advantages, and disadvantages are included in Tables 1 and 2.22-24 Musselwhite22 described his process in building the simulation classification criteria (Table 1), which involved working with simulation professionals to develop a system to match complexity of simulations to trainer and participant needs. Concerns about using simulation fell into two basic categories: issues around participant interactions and facilitator competency or skill. The criteria, as published on the American Society for Training and Development Web site, clearly show that, as simulation complexity and participant interaction increase, facilitator skill must also increase. Unfortunately, Musselwhite's criteria do not include any information about simulator operators, unless perhaps trainers and operators are synonymous in this model; definitions are not included. It is also unclear how many trainers or facilitators were included in the development of Musselwhite's classification system.

Alinier23 also proposed a typology of methodologies for simulation. While Musselwhite's22 classification system has four levels of complexity, Alinier's includes six. One of the primary differences in the systems developed by the two authors is that Alinier's includes a level 0 for paper-and-pencil simulations, such as case studies. Alinier's typology includes a high degree of detail, but does not include the participant interaction component that Musselwhite's classification does. For Musselwhite, this interaction increases the complexity of the simulation because it decreases the predictability of the simulation and therefore increases the probability of the participants' emotional arousal. Like that of Musselwhite, Alinier's typology also does not include information related to simulation operation, as it focuses on the “tools” rather than their use.

Because educators in both smaller and larger simulation centers have not, in many cases, had dedicated personnel to operate simulators, most rely on anyone who can to assist in this role. How does the simulation community

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Simulation Level Classification Criteriaa</th>
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<tr>
<td>Criteria</td>
<td>Participant Interaction</td>
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<tr>
<td>Level 1</td>
<td>Interactive</td>
</tr>
<tr>
<td>Level 2</td>
<td>Highly interactive</td>
</tr>
<tr>
<td>Level 3</td>
<td>Complex</td>
</tr>
<tr>
<td>Level 4</td>
<td>Complex</td>
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*Reprinted with permission from Musselwhite.22*
## Table 2
Amended Proposed Typology of Simulation Methodologies With Respective Characteristics

<table>
<thead>
<tr>
<th>Technological Simulation Levels</th>
<th>Level 0</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
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<tbody>
<tr>
<td>Simulation technique</td>
<td>Written simulations include pen-and-paper simulations or &quot;patients management problems&quot; and latent images</td>
<td>Three-dimensional models that can be a basic mannequin, low-fidelity simulation models, or part-task simulators</td>
<td>Screen-based simulators; computer simulation, simulation software, videos, DVDs, or virtual reality (VR) and surgical simulators</td>
<td>Standardized patients; real or simulated patients (trained actors); role-play</td>
<td>Intermediate-fidelity patient simulators; computer controlled, programmable full-body-size patient simulators not fully interactive</td>
<td>Interactive patient simulators of computer controlled model-driven patient simulators, also known as high-fidelity simulation platforms</td>
</tr>
<tr>
<td>Mode of delivery</td>
<td>Usually student led Passive cognitive</td>
<td>Student or trainer led Psychomotor</td>
<td>Student or trainer led Interactive cognitive</td>
<td>Student or trainer led Psychomotor, cognitive, and interpersonal</td>
<td>Preferably trainer led Partially interactive; psychomotor, cognitive, and interpersonal</td>
<td>Preferably student led Interactive; psychomotor, cognitive, and interpersonal</td>
</tr>
<tr>
<td>Learning domains</td>
<td>Classroom</td>
<td>Clinical skills room or classroom</td>
<td>Multimedia/computer laboratory or classroom</td>
<td>Depends on the scenario requirements</td>
<td>Clinical skills room or simulation centre realistic setting (simulated theatre, ICU, A&amp;E, or ward)</td>
<td>Simulation center with realistic setting (simulated theater, ICU, A&amp;E, or ward) usually set up with audio and video recording equipment</td>
</tr>
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<td>Facilities needed</td>
<td>No operator needed, but assembly of materials requires clinical expertise appropriate to discipline of participant to ensure fidelity</td>
<td>None, unless manikin is to be &quot;voiced&quot;; vocals could be scripted; requires limited or no clinical knowledge depending on use</td>
<td>No operator needed; may require appropriate clinical or trained nonclinical personnel to perform calibration and student direction/supervision (clinical experience = 0–1 y based on type of training; training = 3–6 mo)</td>
<td>No simulation operator required—clinical facilitator or evaluator appropriate to types of participants is required (clinical experience 2–5 y at minimum; training level and amount variable)</td>
<td>Clinically experienced, moderately trained person recommended to operate physiologic trends and parameters within simulator programming; operator may have to assist students directly (clinical experience ≥5 y; training 6–9 mo)</td>
<td>Clinically experienced, highly trained person to operate physiologic trends and parameters within complex simulator programming; operator may need to role play while operating simulator and also directly assist students (clinical experience ≥5 y; training 9–12 mo)</td>
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<td>Patient management problems; diagnosis mainly for assessment</td>
<td>Cognitive skills; clinical management, sometimes interpersonal skills (software allowing for a team to interact over networked computers)</td>
<td>Same as level 2 plus patient physical assessment, diagnostic or management problems and interpersonal skills</td>
<td>Same as level 3 plus procedural skills; full-scale simulation training; sometimes used for demonstrations</td>
<td>Same as level 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical use</td>
<td>Unrealistic feedback</td>
<td>Limited range of training functions; no or little interactivity</td>
<td>Unrealistic setting; students and trainers have to be familiar with the software/equipment; software has to be kept up to date with the relevant medical regulations/procedures; VR sometimes requires very high computational power</td>
<td>For small groups of students only; students have to be trained and briefed; inconvenient if the exercise has to be repeated many times; not valid for any invasive practice unless used in conjunction with a part-task trainer</td>
<td>May require programming of scenarios; several trainers required for a relatively small group of students; trainers have to be familiar with the equipment; requires an emulated patient monitor for most parameters</td>
<td>Cost (mannequin and facility); several trainers required for a relatively small group of students; trainers have to be familiar with the equipment; not very portable</td>
</tr>
<tr>
<td>Advantages</td>
<td>Low cost (no special equipment required in most cases); one academic may be sufficient for a large number of students</td>
<td>Equipment relatively mobile and always available; one academic may be sufficient for a class of students working on the same skill; spares patient discomfort</td>
<td>Relatively low cost, except for VR; one academic may be sufficient for a large number of students; students can use it on their own (self-learning); software often provides feedback on performance</td>
<td>Can be very realistic; a must for communication skills and patient history taking; allows for truly multiprofessional training</td>
<td>Provides a fairly realistic experience; can be used to apply a broad range of skills; students' performance sometimes recorded; allows for truly multiprofessional training; usually portable</td>
<td>Provides a realistic experience; can be used to apply a broad range of skills; students' performance recorded for debriefing; allows for truly multiprofessional training; can be used with real clinical monitoring equipment</td>
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Abbreviation: A&E, Accident and Emergency.

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approach the development of guidelines around education and training for simulator operators? One possible way to begin would be to build on one of the previously discussed classification systems. Because of the level of detail already included, Alinier’s typology lends itself well to this process. Table 2 includes a reproduction of Alinier’s 2007 typology with an additional section matching levels of simulation complexity with levels of simulation operator education and clinical background. As complexity increases, so does the need for clinical background and simulation training. Within simulation circles, discussion has begun about whether simulation professionals of all types should have job-specific, mandatory training. Although many simulation centers utilize nurses for a great many types of positions, such as manager, operator, scenario design, and others, discussion in the literature and at conferences has not included many details around what type of clinical background fits best with these roles. At the 2012 International Meeting on Simulation in Healthcare, there was a debate by two simulation scholars about whether it is best to have clinicians or nonclinicians as facilitators of simulation scenarios.

**FUTURE WORK AND RESEARCH**

The proposed additions to Alinier’s criteria lead to the question of how to decide when simulation complexity increases the need for clinical knowledge and training on the part of the simulation operator. One major issue in deciding what level of clinical expertise is needed pertains to how much of the simulation is preprogrammed and scripted versus flexible and run “on the fly.” The greater the variability in how the scenario is implemented, the greater the need for a clinician who can function at a knowledge level at or beyond that of the student or participant. For example, practicing physician participants must be able to believe that the scenario mimics reality in order to suspend disbelief; this may require a simulation operator who can ensure the clinical fidelity of the scenario. While the simulation operator may not have to be a physician in this example, clinical knowledge must be integrated into the development and implementation of the scenario. For participant groups who do not believe that another discipline can effectively craft an appropriate scenario, it may be necessary to employ more advanced clinical practitioners in any of a number of aspects related to a scenario.

For those who are interested in establishing programs for simulator operators, Henriksen and Dayton state that a critical activity of the analysis stage in a systems approach to training is to conduct a job and task analysis to establish criteria for acceptable performance. While positional descriptions for simulator operators speak to job functions, many roles are implicit in the job and must be seen to be understood. The “magic” that may be attributed to simulation happens when all the work behind a scenario comes together, and it can be seen that the learner “gets it.” A flawlessly run scenario is the work of many. The facilitator frequently gets the credit, but the simulation operator is the one who follows the action, pushes it forward or pulls it back, and provides the cues in response to learner actions. Establishing a list of specific expectations for operators within levels of simulation technology, as originally defined by Alinier, would allow the development of objectives and curricula for training. The amounts of clinical experience and training suggested on the proposed changes to Alinier’s typology (Table 2) are best estimates based on several years of this author’s experience orienting new simulation operators.

**CONCLUSION**

At this time, there is little definition of the role of simulation operator; the purpose of this article has been to review the literature and to stimulate discussion. What is apparent from the literature is that simulator operations should not be left to novices. An appropriate background and structured training are essential features for the simulation operator to create an experience that will best meet the needs of learners. What constitutes the best education and preparation for this type of position cannot be understood until the role itself is studied. That said, most simulation center directors likely know how crucial the role is and will have much to contribute to helping with its delineation.

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