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Integration of High-Fidelity Simulation into the Advanced Disaster Life Support (ADLS) Class

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Abstract

The education and training of health care providers for disaster preparedness is a recognized national concern. Little evidence exists in the literature regarding the most effective ways to train our nation's health care providers to manage large-scale mass casualty events. Critical to health care provider preparedness is the establishment of a uniform, coordinated approach to mass casualty management from all types of hazards. New applications in clinical simulation made possible by recent advancements in human, model-driven, physiologic clinical simulators are being implemented nationally to meet this serious concern. The Advanced Disaster Life Support (ADLS) course is the first known nationally standardized disaster preparedness course to incorporate high-fidelity simulation of human patients into its design. This article will outline this innovative application of clinical simulation in a nationally distributed educational and training program.

Learning Objectives: 1) To describe an innovative application of high-fidelity human-like clinical simulation in a nationally distributed educational and training program. 2) To list the components of a standardized disaster preparedness course incorporating high-fidelity simulation of human patients into its design. 3) To list the three fundamental learning domains of adult-learner theory that are influenced by this application of simulation. 4) To discuss two different designs of high-fidelity human-like clinical simulators. 5) To discuss the benefits and barriers to implementation of clinical simulation on a large scale. 6) To list the key features of simulation that lead to effective learning. 7) To describe the role of clinical simulation in the Advanced Disaster Life Support course including scenario design, clinical pathophysiologic case selection, and student satisfaction. 8) To describe items important to faculty and course instructors involved in the teaching of this clinical simulation application.

Disaster response is a complex process that involves many different types of providers with many different skill levels and jobs. A review of the literature reveals a well-established concern for the public health infrastructure, health care facilities, and health care providers' preparedness to mitigate and manage the consequences of large-scale mass casualty events.¹⁻¹⁸ Analyses of most disasters have shown problems with communication and coordination.² Results of this literature review also revealed that only modest evidence, and in some cases, very little evidence, exists regarding effective ways to train health care providers to prepare and respond to many types of public health emergencies and related health care disasters.

The education and training of health care providers for disaster preparedness is a recognized national concern.^{2,15,19,20} To meet this national concern, the National Disaster Life Support (NDLS) Foundation was created. Critical to health care preparedness is the establishment of a uniform, coordinated approach to mass casualty management from all types of hazards. Under a congressional appropriation originally managed by the Centers for Disease Control and Prevention, the NDLS series of courses was developed to implement and maintain a nationwide foundation in education and training, resulting in a measurable effect on disaster preparedness to a critical mass of the health care workforce. Table 1 describes and lists some of the NDLS courses.

The NDLS Foundation is sponsored by the American Medical Association, is nationally endorsed by such groups as the American College of Emergency Physicians, and is the result of a Delphi expert panel of national stakeholders in disaster preparedness.^{21,22}

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Course	Full Name	Subject Taught
ADLS	Advanced Disaster Life Support	All types of hazards
BDLS	Basic Disaster Life Support	Didactic program for core concepts of disaster management
CDLS	Core Disaster Life Support	Introduction to all-hazards preparedness

Learning Domains	Description	Teaching Methods	Examples
Knowledge acquisition Cognitive performance	Did the student learn the facts taught?	Examinations Small groups Discussions	DISASTER paradigm Table-top scenarios
Psychomotor skills	How did the student perform skills in drills?	Simulator clinical skills Equipment demonstration Exercise performance	Skills stations Mass casualty drill Mass triage Patient simulation Personal protective equipment Decontamination Immunizations
Effective learning/engagement	Is the student willing to show up and perform?	Team participation Skill use Satisfaction measurements Confidence Enrollment	Skills stations Role-playing Team leadership Teaching others

The NDLS series of courses is being distributed nationally and has already trained tens of thousands of students in more than 30 states.

The Advanced Disaster Life Support (ADLS) course is the first known nationally standardized disaster preparedness course to incorporate high-fidelity simulation of human patients into its design. The ADLS course is designed to help health care providers integrate into the disaster response by teaching a standardized approach to all types of hazards, whether it be a natural disaster (e.g., a hurricane), a chemical spill, a biological incident (e.g., avian flu), or a terrorist event.²³

The ADLS Human Patient Simulation Skills Station reinforces the recognition of clinical signs and symptoms of commonly encountered illnesses and injuries (e.g., multiple trauma) as well as uncommonly encountered scenarios (e.g., chemical or biological agent release). This application in clinical simulation training also challenges the students to deal with communication problems, integration with other health care providers, determining who is in charge, and making difficult ethical decisions while operating in an unfamiliar simulated environment (e.g., tactical, collapsed building, emergency medical services [EMS], or hospital scene).

This article will outline how high-fidelity human patient simulation is being successfully used in a standardized, nationally distributed, disaster preparedness education and training program.

Adult Learning and Medical Simulation

The ADLS course design, as well as the entire NDLS course series, has a foundation in the classic domains of adult learning principles. The qualitative and quantitative assessment instruments

of this educational and training program are rooted in well-accepted learning theory application such as Bloom’s taxonomy.²⁴ Table 2 lists and describes these fundamental learning domains that are used in the NDLS course series.

The NDLS Foundation and its associated educational consortium monitor the validity of the course series. The internal validity (i.e., Are the right facts and principles being taught?) are monitored as well as the external validity (i.e., Are the courses portable, reproducible, and sustainable for multiple providers in multiple settings?).

The use of patient simulation using a life-like human, high-fidelity clinical simulator is a significant learning enhancement in the psychomotor (clinical assessment and skills) domain enabling engagement as described in classic learning theory.

Simulation has been used in medical education for many decades. Nearly all USA-trained health care providers have used simulation. Examples include using an orange as a training tool for intramuscular injections, nonhuman tissue use for invasive and suturing skills, as well as premolded, anatomically similar, task trainers.

Simulation in medical education has been used to teach diagnosis, treatment, skills, procedures, teamwork, and ethical decision-making. It has also been used in evaluation of all of the previously mentioned areas.²⁵⁻²⁹ The literature shows that simulation in medical education is perceived as very beneficial to both the students and teachers.³⁰⁻³² All simulators, to varying degrees, require the suspension of disbelief so that the student can successfully transfer knowledge gain into psychomotor skill demonstration in a somewhat realistic but not actual performance.

We also have found the same results in the course evaluations of several thousand students. More than 98% of the students indicated that the human patient simulation station was a valuable learning experience. Overall satisfaction scores on this same student population demonstrated a similar result: 98% of students rated this human patient simulation station as excellent (score = 5) or very good (score = 4) on a 5-point scale.

The incorporation of human patient simulation using high-fidelity technology into medical education is a relative recent endeavor.³³ High-fidelity models of human patient simulation used in the ADLS course to date consist of an anatomical and physiological replica of a human being, comprising a patient mannequin, instructor’s workstation computer, and electropneumatic interface components.³⁴ Advancements in sophisticated mathematical modeling of physiology and pharmacology provide automatic and realistic patient assessment and responses to therapeutic interventions. The human physiology-based models allow for a wide range of patient types (male or female, young or old, healthy or diseased at baseline) and a wide range of clinical disease and injuries that can be simulated. The automatic mathematically modeled physiologic responses of high-fidelity models make this a valuable tool helping to better suspend disbelief. The automatic responses to therapeutic and diagnostic interventions of the high-fidelity models provide an exceptional opportunity for students to self-assess the “human patient’s” dynamic clinical status with limited, if any, dependency based on instructor input or feedback.³⁴

Other types of moderate-fidelity to high-fidelity clinical simulators use a script-controlled model of physiology, compared with the mathematical modeling of physiology previously described. With a script-controlled model, there is a fixed program that controls the physiology, and every action that the students may possibly dream up has to be written into the program and an appropriate instructor-selectable branch incorporated in the program. If the students do something unexpected that is not prewritten into the program, the instructor has to decide on what that intervention is going to do to the vital signs. For example, what are the vital signs going to be if the student gives multiple medications that have conflicting actions? Or when do you make the vital signs deteriorate when the students have a difficult airway? With a mathematical model-driven simulator, the physiology is based on underlying published and generally accepted mathematical models of physiology, and is independent of the instructor (and the instructor’s experience and biases). The vital signs and responses are determined by the interaction of various physiologic parameters and mathematical models of the drug response. The students can do whatever they want, and the response will be determined by the mathematical model. The resulting simulated clinical experience is more uniform because it is independent of the instructor.³⁵ This is especially important as the scenarios used have many, many different treatment options, and both our students and instructors will be of varying skill levels. To achieve the reproducibility desired, we chose a simulator with a mathematical-model based physiology.

Simulators have a wide range of fidelity, ranging from cardboard cutouts to fully functional mannequins with computer-simulated physiology.^{33,36} Fidelity describes how much realism is present. How realistic or what degree of fidelity is needed to achieve the educational and training objectives is a controversial question. The cost of simulation increases proportionately, and by some descriptions exponentially, as higher levels of realistic patient encounters are required/desired. This cost calculation is complex as it includes many facets such as the equipment purchase, maintenance, faculty-operator training, storage, shipping, utilization frequency, and many other factors. The value of higher fidelity is significant as it has a positive impact on many of the domains of learning. High-fidelity models of simulation remain controversial as

Table 3. Top 10 Features of Simulation Leading to Effective Learning³⁷

1.	Providing feedback
2.	Repetitive practice
3.	Curriculum integration
4.	Range of difficulty level
5.	Multiple learning strategies
6.	Capture clinical variations
7.	Controlled environment
8.	Individualized learning
9.	Defined outcomes
10.	Simulator validity

the educational value is still being investigated. However, from the students’ point of view, after encountering high-fidelity clinical simulation in the ADLS course, there is no controversy. They want more of it, as well as better access to high-fidelity clinical simulation in disaster medicine.

Although this course offers an exceptional opportunity for learning to some students, it undoubtedly limits access to other students where the lack of these resources may limit or prevent such training programs to be offered.

When integrating simulation into ADLS, we wanted to know what features of high-fidelity simulation lead to effective learning. Recently, a review of the literature during the last 34 years, looking at what are the features of simulation that lead to effective learning, was published.³⁷ Table 3 lists these 10 features that have an impact on effective learning. When integrating simulation into the ADLS class, we tried to cover as many of these features as possible.

ADLS Human Patient Simulation Skill Station

The ADLS editors and contributors made the decision early on to achieve a level of realistic clinical disaster simulation for all types of hazards. Therefore, high-fidelity clinical simulation was essential to the course design. Emphasis was made to incorporate as many as possible of the key features of simulation that lead to effective learning. Simulation fidelity involves the integration of three components, including equipment fidelity, environment fidelity, and psychological fidelity.³⁸ The ADLS course is an approximate 15-hour total session over a 2-day period. Day 1 consists of didactic sessions and small-group table-top exercises. Day 2 consists of a 45-minute didactic session for orientation and organization of the practical skills stations that will be provided throughout the remainder of day 2. The ADLS practical skills stations consist of four stations, each 80 minutes in length, as seen in Table 4.

Table 4. ADLS Practical Skills Stations

Rotation	ADLS Practical Skills Stations	Duration (minutes)
1	Human patient simulation (four crisis scenarios)	80
2	Disaster skills	80
3	Mass casualty event	80
4	Personal protective equipment and decontamination	80

The Human Patient Simulation Skills Station is designed to be completed in the allotted 80 minutes. The course size for ADLS is limited to a maximum of 50 students. Therefore, one fourth of the class, or approximately 12 to 13 students, rotates through a given station at one time. A minimum of two high-fidelity human patient simulators are used. Each simulator has a recommended maximum of six students. One faculty member per simulator is recommended. Table 5 lists the typical schedule for this skills station.

Target Audience. The target audience for the ADLS course is a broad group of health care providers. Included in this target audience are physicians, nurses, nurse practitioners, physician assistants, EMS personnel (paramedics, emergency medical technicians of various levels), respiratory therapists, and public health workers. This target audience is consistent with the accepted disaster preparedness health care personnel descriptions of “first-responders” and “first-receivers.”*

Scenario Design and Curriculum

Integration. From the beginning concepts of the ADLS course, simulation was integrated into the program’s curriculum. The scenarios were designed to specifically reinforce the concepts and diagnosis and treatments that were taught in the didactic portion of the ADLS course and the prerequisite Basic Disaster Life Support course. Table 6 includes examples of the NDLS course-specific concepts.^{23,39} Because the class is taken by a wide range of health care providers from first responders to physicians, there was built-in variability: the scenarios were designed so that no matter what the type of health care provider a given student is, he or she could complete the scenario and learn at the respective clinical level.

The clinical cases used during the human patient simulations of ADLS are well-crafted, peer-reviewed, pathophysiologic cases relevant to the model for all types of hazards of the NDLS national training program. The ADLS clinical scenarios also integrate and reinforce the principles of clinical approaches to care found in other standardized courses such as Advanced Cardiac Life Support (ACLS) and Advanced Trauma Life Support (ATLS).^{40,41} This creates a learning environment whereby the students recognize the unique clinical aspects as related to ADLS, while being expected to apply the basic and advanced tenets of cardiac and trauma life support and resuscitation principles. For example, the recognition that the complex of signs and symptoms likely represents a cholinergic syndrome most likely from a nerve agent exposure and the appropriate therapeutic interventions represent critical actions is important. But also any possible (potential) ensuing cardiopulmonary arrest requires

*First responder = one of the first people to respond to a disaster; these people are typically police or firefighters, and typically have medical training in basic first aid only. First receiver = the first people who will receive the victims of a disaster; this typically takes place at the nearest hospital emergency department.

Table 5. ADLS Human Patient Simulation Skills Station Schedule

Human Patient Simulation Skills Station	Duration (minutes)	Simulator 1	Simulator 2
Warm up (meet your “patient”)	10	6 Students 1 Faculty	6 Students 1 Faculty
Scenario 1	12-15	6 Students 1 Faculty	6 Students 1 Faculty
Scenario 2	20	6 Students 1 Faculty	6 Students 1 Faculty
Scenario 3	12-15	6 Students 1 Faculty	6 Students 1 Faculty
Scenario 4	20	6 Students 1 Faculty	6 Students 1 Faculty
Wrap-up (group performance assessment)	3-5	6 Students 1 Faculty	6 Students 1 Faculty
TOTAL	80	All 12-13 students complete same 4 scenarios during each 80-minute rotation	

Table 6. National Disaster Life Support Foundation Concepts

<u>Mnemonic</u>	<u>Explanation</u>
	<u>Advanced Disaster Life Support</u>
RED Survey	Rapid Evaluation of Disaster Step 1: Incident survey Step 2: Casualty survey Step 3: Immediate life-saving skills
Casualty Survey	Evaluate or evacuate (exit) ↓
	Airway/breathing/circulation ↓
Incident Survey	DDx, detection, delivery ↓
	Enter or Exit ↓
	Aware/barrier/contain ↓
	Disaster <u>Basic Disaster Life Support</u>
DISASTER	<u>D</u> etection, <u>I</u> ncident command, <u>S</u> afety and security, <u>A</u> ssess hazards, <u>S</u> upport, <u>T</u> riage and treatment, <u>E</u> vacuation, <u>R</u> ecovery
MASS Triage	<u>M</u> ove, <u>A</u> ssess, <u>S</u> ort, <u>S</u> end
ID-me!	<u>I</u> mmEDIATE, <u>D</u> elayed, <u>M</u> inimal, <u>E</u> xpectant, <u>D</u> ead

Table 7. Scenario Construction

Human Patient Simulation Skills Station Scenarios	Clinical Pathophysiology Skill Level	Simulator Patient Assessment Skill Level	Key Features
1. Biological agent	Basic	Basic	Life-threatening infection; high-risk transmission
2. Trapped victim in collapsed building	Basic and advanced	Basic and advanced	Multiple trauma, medical issues, and ethical decision-making
3. Chemical agent	Basic and advanced	Advanced	Toxidrome recognition; antidote delivery; decontamination
4. Chemical agent with multisystem trauma	Advanced	Advanced	Toxidrome recognition; life-threatening trauma; atypical chemical

the management to follow acceptable resuscitation standards with equally weighted critical actions.

The group of clinical simulation scenarios is chosen specifically to facilitate learning. The scenarios are balanced in skill levels for clinical pathophysiology complexity (basic and advanced) and human-patient simulator assessment and management (basic and advanced), as listed in Table 7. This design allows for a variety of provider types and a wide spectrum of prior simulation experience.

The first scenario for the station is an introductory scenario. Most of our students have never worked with high-fidelity simulators. We found that if we started with a complicated simulated case, the students would not diagnose correctly (because they were unfamiliar with the simulator and would concentrate on the simulator itself, and not on the clinical situation, i.e., the mechanics of where to hear breath sounds, or where the pulses are on the simulator) simply because they never had used a high-fidelity simulator. For that reason, the first scenario is very basic, with easy physical examination findings, and very straightforward background information.

The second scenario is slightly more complex. We start with increasing the complexity of the background information. We make sure that the students realize that the patient they are treating is part of a larger disaster. For example: “You are the medical component of a FEMA (Federal Emergency Management Agency) special response team (DMAT [Disaster Medical Assistance Team] or US&R [Urban Search and Rescue]) that has responded to a disaster zone.” We also increase the complexity of the injuries and conditions that the students need to treat. Finally, we add a surprise ethical dilemma that they have to deal with. Given the complexity of this scenario, we usually allow approximately 20 minutes to complete the scenario. We then usually need some time for the students to debrief and discuss the ethical dilemma.

For the third scenario, now that the students are used to simulation, we even further increase the complexity of the background information. This gives the students the feeling that they are part of a larger crisis. We also increase the seriousness of the injury, illness, or exposure that they have to treat. This scenario concentrates on treatment of the illness, exposure, or injury.

The final scenario is another, yet more complex, scenario. Again, we try to increase the complexity of the background to give the students the feeling that they are part of something larger. We also increase the complexity of what we want the students to determine/diagnose/manage and treat. There may be a combination of injuries, exposures, or illnesses. We may add in interactions of the

team with the incident commander or another responder from somewhere else to reinforce some of the overall concepts taught in the ADLS course. This scenario usually takes about 20 minutes to complete.

We needed scenarios that covered the depth of ADLS clinically, while introducing the students to the unique environment and circumstances of a disaster. Following the case selection of quality clinical pathophysiologic cases, there are several important, often crucial, components that need to be addressed. These include the large percentage of the student population lacking high-fidelity clinical simulation experience, team-training design applications, and the scenario background having an impact on team member engagement.

High-Fidelity Clinical Simulation Experience

In the experience of the NDLS course series, only a small percentage of students who take the ADLS course have had prior experience using this high-fidelity level of clinical simulation. In 2003, less than 10% of ADLS new students acknowledged having any prior experience on high-fidelity human patient simulators. In 2005, approximately 15% to 20% of ADLS new students now indicate/state such experience. Several important points and questions flow from this observation. First, in about a 2-year period, the number of new ADLS students with such prior experience has increased by 1½ to 2 times. Is this growth in the use of simulation unique to the ADLS student population? Does it represent a broader availability and use of high-fidelity human simulation applications? Second, the overall low percentage (10%-20%) of students experienced in the use of high-fidelity human clinical simulators necessitates that just-in-time education and training on high-fidelity simulation for the majority of ADLS students are required to effectively use this skill station design. The implications of the second observation will be further developed.

The incorporation of just-in-time training to meet this deficit is accomplished during the ADLS course. A didactic session (PowerPoint presentation of 20 minutes’ duration) is presented to all course participants. Additionally, the first portion (approximately 10 minutes’ duration) of the actual simulation skills station is dedicated to an instructor-facilitated demonstration and student hands-on session reviewing the basics of simulated patient assessment, therapeutic, and diagnostic procedures and automated patient

responses. This introduction to high-fidelity patient simulation is valuable and rewarding to the students. It is, however, time-consuming (a total of 30 minutes) and therefore costly in terms of prioritization of what other disaster-related educational or training session could occupy that time if this was not required. The risk-benefit analysis is difficult to compute as it is multifactorial. The overwhelming positive student satisfaction and performance is a compelling reason alone to justify use of this introductory session.

Team Training Scenario Design

The overall plan is to provide a series of four meaningful high-fidelity-based human patient simulation encounters for 12 to 13 students of 80 minutes each to fulfill the complete ADLS class course requirements. When integrating simulation into a course that has been developed for national distribution and duplication by numerous NDLS training centers, an important consideration is the ratio of the number of students per simulator. In a simplistic assessment, the challenge is to balance each student's individual simulator interaction time (improved with fewer students per simulator during training) compared with the course objective to train the maximum allowed class size (increased with a greater number of students per simulator during training). Many other factors are also relevant for consideration; most importantly is the delivery of a valid, reproducible quality training session. The available literature relevant to optimal numbers of student training per simulator is limited at best. The literature is essentially nonexistent in information specifically related to applications in clinical disaster preparedness.

There are also practical considerations to address: How many clinical simulators are to be required per class? How much time would it take for individual student scenario completion compared with multiple students per simulation-scenario? How many instructors are going to be required to enable the student-to-simulator ratio chosen? Will a diverse health care provider group (such as physicians, nurses, paramedics), as defined for ADLS, foster or hinder learning in small groups, versus individual scenario sessions during simulation? There are many more considerations that could be listed. Each of these practical considerations is a valid research pursuit. Yet, disaster preparedness training must proceed prior to the completion of all needed scientific assessments on high-fidelity clinical simulation.

For some educational groups, this level of simulation is not being implemented because of these unanswered questions. For ADLS, the decision to incorporate high-fidelity clinical simulation is firm. In fact, for ADLS, we consider our commitment to use clinical simulation a pioneering mindset as well as an essential part to answering these and other relevant research questions. Therefore, our decisions have been based on direct observations and feedback from trainees' assessments following ADLS training.

We also observed that a "team approach" (small group) was almost unanimously preferred by the students over individual or even pairs learning. This is of significant importance as we consider the long-standing major problem in disasters of all types: poor communication. The random mix of diverse health care providers (similar to what is encountered in actual disaster scenarios) is now reproduced in this skills station. Simply stated, if a small group of diverse health care providers cannot function as a team during realistic training on a single "patient," how could they have any expectation of performing well in an actual event (e.g., diverse health care providers stop to assist EMS personnel at the scene of a mass casualty incident while driving home from ADLS training). Also, successful small group clinical management of human patient

simulations is likely to build confidence and have a positive impact on the affective learning and engagement domains. One of the concepts we wanted to teach to the students in disaster response is team development and how to decide who is in charge. To encourage this, we look for and help the students as they go through the scenarios to ensure they did have one person in charge. Did they make use of all of their resources?

Our experimentation with varying group sizes revealed some interesting observations. At first we thought that to get a large number of students through at a time, we could have a few (e.g., two to three students) working with the simulator while the larger group watched. This was not successful at all; the students watching did not seem interested and did not get much out of it. Next, we tried two to three people per simulator with multiple simulators running at the same time and one instructor running between groups. This was an improvement over the first method, but it still did not work effectively, and it was extremely difficult for one instructor to try to teach multiple groups. Following this, we decided that optimally we needed one instructor per simulator. Next, we experimented with group size. We started with groups of 2 students and gradually increased the size up to 10 students. We made the following observations: group sizes of three to six seemed to be optimal; once the group size became larger than six students, some seemed to drift off and did not participate. From our observations, we came to the conclusion that up to six students per simulator is ideal ("the maximum"). Therefore, a minimum of two high-fidelity human patient simulators and corresponding faculty are required to meet the effective learning of this skill station as previously defined.

Scenario Background Design Impacts Student Engagement.

Psychological fidelity was found overall to be the most important part of fidelity.³⁸ This was reinforced to us when developing the scenarios. We found that the most important part of scenario development was the background information given to the students before the scenario starts. The following example best illustrates this. The students consisted of one first responder, two paramedics, two nurses, and one physician. The background information given to the students was: "You are working in the hospital Emergency Department when...." The result was that the nurses and physician immediately started providing patient care, and the first responder and paramedics stood in the back and did not actively participate. We then did the same scenario again. The *only* difference was the background information read to the students was: "You are working on ambulance and get dispatched to" Everything else was exactly the same as the first scenario. What happened this time was that the first responder and paramedics jumped in and started treating the patient, the nurses then helped out, and very soon the physician jumped in to participate. This time there was much more discussion and interaction among the students. In the development and implementation of following scenarios, we were able to reproduce these results. It was amazing how only a few words read at the beginning drastically changed how the scenario progressed, the students' experience improved, and active participatory learning was enhanced.

The background was also very important in putting the scenario in the larger context of the disaster. Related to the background information is anything else that can be done to the physical environment to make it more realistic. For example, we found that just by placing the simulator on the floor made a prehospital scenario that much more realistic. We have found the background information provided to the students and the physical environment have the largest impact on the success of the station. The key point learned was to make the background information as relevant and as realistic to the students as possible.

Evaluation

The evaluation of students in this station is very complex. How can you expect a group consisting of mostly physicians and nurses to perform the same as a group consisting of mostly paramedics and first responders? For this reason, we are still in the process of developing an evaluation tool to assess performance. In the process of developing this tool, we are working on two areas of student proficiency. The first area is: Did they identify and treat the illness, exposure, or injury in an appropriate manner, given their scope of everyday practice? This is accomplished by the instructor using a checklist of critical actions. This checklist is designed to take into account the scope of practice of the student. The second area of evaluation we are working on is: How did the team of students perform overall? Specifically, was a team leader identified? Did the students work together? How did the students interact with the bigger picture? This area of evaluation is more difficult and we are still working on finding the right tool. We currently do not have a formal evaluation process. We want to concentrate on learning, so our current evaluation process is done informally at the end of the scenario with student and instructor discussions, and the students' self-evaluation, for instance: How did their group perform?

Faculty/Instructor Design

It is important to construct this station in such a manner that the learning objectives and student experiences would be as similar as possible, irrespective of where the students took the course or who was the instructor. The role of the faculty member or instructor is to be a facilitator of the learning process: encouraging student self-assessment and group performance to the common goal of minimizing morbidity and mortality. There are volumes of resources that describe important principles that should be applied or that influence the quality of the course provided by well-trained faculty. A few salient points will be addressed as uniquely applicable to this ADLS human patient simulation skills station. These will include simulation fidelity, critical actions and teaching points, scenario simulation flow design, teaching styles, and the ADLS Instructor Workshop.

Simulation Fidelity. The proper implementation of high-fidelity clinical simulation serves to maintain a consistently reproducible training experience for the students. Although instructor variations are inevitable when implementing a nationwide educational course, an effort to minimize the impact of these variations is important. Higher fidelity, model-driven human simulators serve to minimize the effect of this instructor variation.

Critical Actions and Teaching Points. The critical actions are defined as failure to perform or recognize those patient assessment features and therapeutic or diagnostic interventions that will likely result in a significant increase in patient morbidity and mortality. Teaching points are the salient features of the clinical pathophysiologic case scenario that enhance the performance and improve recognition of critical actions.

The faculty member is encouraged/required to facilitate the group performance through direct observation of group performance, individual student participation, and overall completion of critical actions. The faculty member may use the teaching points during the scenario to help prompt the students, or, at the end of the scenario, these teaching points can be discussed as a "wrap-up" and reinforcement. The critical actions are the basis for group performance assessments and discussions during the 2- to 5-minute session wrap-up as listed in Table 5.

Simulation Scenario Flow. The flow of a given simulation-scenario is the student decision-tree overlaid on a predetermined simulated patient clinical state of illness and/or injuries. To manage the flow of a simulation-scenario, the instructor is required to have a core knowledge and performance skills in simulator operation, anticipated response to interventions, and/or the lack of appropriate actions. The instructor serves as a facilitator to guide the small group through the scenario, as well as monitor the individual student's encounters.

As an entry-level facilitator, the instructor has to know how the scenario is supposed to progress, what events are going to happen, when and in which specific sequence, and what the students' responses are supposed to be. Thus, the instructor depends heavily on providing timely teaching points, if not frankly "hints," to maintain simulation flow down the scripted pathway.

As an experienced, competent facilitator, the instructor additionally is able to allow unique, unexpected, and/or inaccurate decisions, or even untimely but accurate clinical decision-making on the part of the group to influence, but not derail, the learning objectives of a given simulation scenario.

Teaching Styles. The success and limitations of simulation-scenario flow management is influenced by the teaching styles of the faculty. Although there are variations, our observations noted two distinct styles of teaching. These styles are labeled "traditional" and "interactive."

In the traditional style, the instructor does not become part of the scenario. The instructor sits back and simply gives the students the information that they cannot obtain from the simulator (e.g., symptoms and signs). The instructor may occasionally ask the students questions to get them back on track, inject hints, or even switch to the traditional didactic mode of teaching when all else fails. This traditional style of teaching seems to be the easiest for instructors to do. The disadvantage of this style is that it is more difficult to create the atmosphere that the students are part of a larger crisis.

An alternative style is the interactive style, in which the instructor becomes part of the scenario. When the students need information, the instructor will feed them the information as part of the scenario. For example, the instructor may play the part of a distraught family member and tell the students a key piece of information in this role (e.g., Why is he so blue? Why are his hands and feet so cold and clammy?). The instructor may switch roles and then feed the students more information (e.g., by play-acting as the fire chief or incident commander). The students seem to enjoy this style of teaching more than the traditional style. However, it is more difficult to make sure all the teaching points are covered with this style. In general, this method of teaching is more difficult for the instructor.

From observations and student feedback, it seems that probably the best teaching style is a style that uses a mixture of both interactive and traditional styles.

NDLS Instructor Workshop. The NDLSF conducts an NDLS Instructor Workshop to provide quality educators the opportunity to be recognized as NDLS faculty. The instructor portion of the ADLS Human Patient Simulation Skills Station consists of a didactic session that reviews essential adult learning principles, simulation-scenario flow and management, small group interactions, and simulator function. This workshop also includes a hands-on interactive session operating and implementing disaster clinical scenarios, role-playing as student and instructors, in-depth demonstration of the clinical simulator functions, and practice time with question-and-answer session.

Summary

Disaster response is a complex endeavor, requiring many different people with many different backgrounds to interact together. The ADLS class teaches an approach for health care providers to effectively integrate into the overall disaster response. The addition of simulation into the ADLS class has helped us reach this goal. We have had great success with integrating simulation into the ADLS class. We have run the ADLS class in approximately 30 different states with over a thousand students having taken the class. All of the feedback has been very positive; all of the students believed/indicated that the simulation station added a significant benefit to the ADLS class. We have found simulation to be extremely beneficial to the students. We hope that this article will help others implement simulation into similar classes.

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