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High-Fidelity Simulation Meets Athletic Training Education: An Innovative Collaborative Teaching Project

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High-fidelity simulation is frequently used in nursing education to provide students with simulated experiences prior to and throughout clinical coursework that involves direct patient care. These high-tech exercises take advantage of the benefits of a standardized patient or mock patient encounter, while eliminating some of the drawbacks experienced when using healthy "live" mock patients. These same technologies have the potential to benefit athletic training students (ATSs). The purpose of our project was to expand a partnership of interdisciplinary education for ATSs and integrate simulated patient encounters for ATSs enrolled in a general medical conditions in athletic training class. The project is a collaborative teaching experience that combines an athletic training faculty member, a nursing faculty member, and a nursing simulation specialist for skill training and assessment of clinical integration proficiencies (CIPs). With the introduction of the updated (CIPs) in the Fifth Edition Athletic Training Competencies document, opportunities exist to utilize high-fidelity simulation for training and assessments that may not occur during a student's clinical experience. Our athletic training program utilized the nursing simulation laboratory equipped with a high-fidelity manikin to simulate a student-athlete who suffers an asthma attack. Athletic training students, under the supervision of their faculty member and a simulation specialist, engaged in hands-on simulations to demonstrate CIPs related to respiratory assessment and intervention. The opportunity to combine expertise in medical conditions with the availability of high-fidelity simulation manikins presents opportunities for ATSs to experience patient encounters with conditions not frequently presented or difficult to stage in real-time clinical training. In conclusion, our project showcases an interdisciplinary collaboration that provides ATSs with learning experiences using emerging technology. Athletic training students were satisfied with the opportunity to engage in simulated patient encounters in this medical conditions class.

Key Words: Interdisciplinary collaboration, clinical integration proficiencies, general medical conditions

Educational programs for health care majors such as nursing and athletic training are challenged to provide clinical education opportunities for their students in order to meet proficiency requirements. Athletic training students (ATSs), much like nursing students, have accreditation standards that dictate the type of clinical integration proficiencies (CIPs) that must be mastered. Providing these specific patient encounters to students in a limited educational timeframe is often difficult if not impossible. Thus, educational programs turn to alternative methods of providing these clinical encounters to their students.

Clinical encounters, outside of the typical "live" or "real-time" CIP evaluation, include simulated experiences. These simulations employ some type of technology or manikin and standardized patient (SP) scenarios that utilize other students or faculty who role-play as the mock patient. In clinical training programs such as nursing, medicine, and athletic training, a simulation is defined as a clinical situation in which a mock patient portrays an injury or illness for the purpose of training or evaluating clinical proficiency.[1] Advantages of simulation with high-fidelity (fidelity meaning the degree of realism) manikins include enhanced communication skills, critical thinking, clinical decision making, and technical skill practice.[2] However, some problems encountered with utilizing these high-tech simulators include laboratory space, technical support, and financial resources. The cost of high-fidelity manikins can reach $75 000 or more. A solution to the cost and space factors is for athletic training programs to partner with other allied health programs on the same or nearby campus to share resources and expertise in using the high-fidelity manikin.

The purpose of this manuscript is to provide an innovative strategy involving athletic training and high-fidelity simulation. Background on simulation, collaboration efforts, discussion of the particular scenario, and future ideas are also included.

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CONTEXT

Athletic Training Programs (ATPs) frequently utilize simulation with mock patients or SPs. One study of National Athletic Trainers Association (NATA) public and private institutions found that 79.7% of preceptors report using simulations involving mock patients (student peers or preceptors) to teach and assess clinical skills.[2] More than half of these instructors report using simulation as an evaluation method 50% of the time.[2]

Standardized patient encounters often play a role in evaluation and assessment of clinical athletic training skills. This type of simulation involves highly standardized, scripted cases that are portrayed by "patients" that fit the gender, age, and physical profile described in the scenario. Standardized patients often undergo extensive training with the instructor to ensure that they act and answer questions in specific ways as reflected in a script. They must also portray the physical signs and symptoms inherent to the case (eg, anxiety).[2] A study by Walker et al found that 93.5% of instructors use mock patient simulations to evaluate clinical skills, while 81.4% of these instructors use these scenarios to assess clinical problem solving skills.[3] In the same study, 56.8% of preceptors used SP scenarios for clinical evaluations.[3]

Standardized patient encounters allow for learning and discussion throughout the evaluation process, using "time-in, time-out" methods, as well as allowing the student to repeat procedures.[4] While SPs offer standardization and a sense of realism, they are time consuming and costly to prepare. Standardized patients must be trained by preceptors and need a thorough knowledge of the condition they are portraying. Standardized patients must also be able to respond to a range of questions regarding medical history, history of the condition, and its impact on daily life and athletic performance, as clinical trainees may go down a wide range of paths in questioning and assessment.[4,5]

Over 50% of CIP assessments use simulation scenarios rather than real-time occurrence of clinical illness and injury.[4,5] Evaluation of clinical skills in real time is often limited by the infrequent and unpredictable occurrence of an injury. Among the ATP administrators surveyed, 75.4% see this as a barrier to real-time evaluation.[2] There is also a shortage in the occurrence of injuries and conditions in which students must be tested. Of the ATPs surveyed by Armstrong et al, 78.4% see this as a barrier.[2] Additionally, 24.6% of ATPs cite a shortage of support for clinical experiences by instructors as a major barrier.[2]

Standardized patient simulation is often an ineffective and unrealistic method of evaluating clinical skills; trainees often have a hard time connecting these simulations to real-life clinical experiences. Armstrong et al advocate for the development of "alternative methods of reliable and valid CIP evaluations."[2 (p. 638)] High-fidelity manikins are an ideal way to meet the demand for standardized, realistic clinical scenarios. This novel technology provides the same degree of rigorous standardization as SP encounters, which have been shown to develop superior knowledge and abilities, as well as enhanced professionalism, interpersonal communication skills, counseling skills, and problem-solving abilities among trainees.[4,5]

High-fidelity simulation can provide many of the same benefits as SP encounters, while eliminating the time and monetary costs associated with training mock patients. They also increase the realism of scenarios, while motivating student engagement. Simulation also allows for the reproduction of scenarios that would be unsafe to produce on healthy mock patients.[6] The use of manikins completely eliminates the possibility of injury or discomfort that SPs may incur.

HIGH-FIDELITY SIMULATION

Human patient simulators are life-sized manikins used in the health care arena to simulate patient situations. The degree of sophistication of these manikins has evolved into computerized patients that can perspire, talk, experience arrhythmias, blink, bleed, convulse, and even die.[6] Simulation is utilized widely in nursing education to provide students with simulated clinical experiences prior to and throughout clinical coursework that involves direct patient care. Nursing departments purchase moderate- to high-fidelity manikins for undergraduate and graduate nursing students to practice real-life clinical situations.

Simulation provides a plethora of benefits for the students such as opportunities to practice communication with clients and the health care team, critical thinking, clinical decision making, and technical skill practice,[7] in a safe, realistic, and controlled learning environment under faculty supervision.[8,9] Students may reenact a scenario multiple times, practicing the same techniques without the fear of harming a patient or an overwhelming need for speed and efficiency.[7] Simulation has been shown to improve clinical judgment and reduce errors while increasing safety.[10] In addition, simulation experiences provide realism, emotional arousal, excitement, and motivation to succeed.[11] With a large number of nursing students and limited clinical sites, simulation gives the students an alternate opportunity to practice clinical situations that they may not get to experience in the clinical setting. This same opportunity can be extended to other health care professional education programs, including athletic training. Athletic training students are also in need of similar clinical learning environments in which to practice required CIPs.

Simulation of real-life clinical experiences provides ATSs with an opportunity for critical thinking and decision making.[8] Simulation also mitigates barriers to real-time evaluation, including preceptor role strain, time demands, and a lack of opportunities. Athletic training students working with cutting-edge stimulation technology are given the opportunity to take on the role of certified athletic trainers making professional, real-time decisions without the possibility of adverse consequences or harm.[11] The goal of ATPs is to produce athletic trainers who have mastered and are able to apply clinical skills in real-life settings. This makes it important that knowledge and skill assessment replicate real-life scenarios as accurately as possible.[2] Opportunities for using simulation exist in the new Athletic Training Educational Competencies Fifth Edition in content areas such as prevention and health promotion (physical assessments, glucometer use, and peak flow meter use); clinical examination and diagnosis (standard examination techniques, developing differential diagnosis, and interpreting findings based on patients clinical presentation), and acute care of

injuries and illnesses (assessing body temperatures with rectal probe and wound and lesion assessment). [10]

COLLABORATIVE EXPERIENCE

The ATP at Indiana University of Pennsylvania consulted with the Department of Nursing and Allied Health Professions to seek opportunities to extend these simulation opportunities to ATSs and faculty in the ATP. Athletic training students enrolled in the ATP are required to complete a general medical conditions in athletic training course. This course recently underwent a revision to expand laboratory opportunities for ATSs and provide extended practice time with clinical CIPs, including various nonorthopaedic conditions typically encountered by athletic trainers in practice.

Athletic training programs nationwide use forms of simulation to evaluate CIPs. Program accreditation standards for ATPs have increased the requirements for teaching, documenting, and assessing CIPs by preceptors.[2] Faculty in these two departments collaborated to provide real-life, high-fidelity simulation scenarios for ATSs. One scenario programmed and executed by ATSs was a simulation involving a patient suffering from an acute asthma episode.

The Fifth Edition of Athletic Training Educational Competencies [10] states that ATSs must:

> *perform a comprehensive clinical examination of a patient with a common illness/condition that includes appropriate clinical reasoning in the selection of assessment procedures and interpretation of history and physical examination findings in order to formulate a differential diagnosis and/or diagnosis. Based on the history, physical examination, and patient goals, implement the appropriate treatment strategy to include medications (with physician involvement as necessary). Determine whether patient referral is needed, and identify potential restrictions in activities and participation. Formulate and communicate the appropriate return to activity protocol (CIP-5, p. 32).*

Furthermore, to demonstrate competence in this CIP, ATSs must be able to:

- Use standard techniques and procedures for the clinical examination of common injuries, conditions, illnesses, and diseases including but not limited to: respiratory assessments (auscultation, percussion, respirations, peak-flow) (CE-20g, p. 17).
- Explain the etiology and prevention guidelines associated with the leading causes of sudden death during physical activity, including but not limited to: asthma (PHP-17b, p. 13).
- Assist the patient in the use of a nebulizer treatment for an asthmatic attack (AC-31, p. 20).
- Instruct a patient in the use of a meter-dosed inhaler in the presence of asthma-related bronchospasm (AC-33, p. 21).
- Determine when use of a metered-dose inhaler is warranted based on a patient's condition (AC-32, p. 20).

A thorough and effective evaluation must assess not only psychomotor skills but also knowledge competencies that fuel a student's actions. The evaluation must also assess ATSs' communication and professional skills.[2]

Furthermore, the CIPs in the Fifth Edition of the Athletic Training Competencies require ATSs to demonstrate a range of competencies.[10] Unlike many orthopaedic assessments, general medical situations such as sudden collapse and other emergency conditions do not occur on a regular basis during a student's clinical experience. When those conditions arise, it is not the best time to test an ATS's ability to manage a situation, as a patient's life may be at stake. These new requirements make the use of high-fidelity simulation in athletic training even more relevant, as this teaching method removes all potential patient risk while allowing the student to go through the critical process of assessing and managing an acute scenario or emergency situation.

Prior to implementation of the high-fidelity simulation experiences, faculty in the nursing program provided guest lectures on asthma during this general medical conditions in athletic training course. Nursing faculty shared research conducted on issues related to asthma and school-aged children with the ATSs.[11] These experiences provide a foundation upon which to share family/caregiver concerns with ATSs who may encounter athletes with asthma in their practice settings. Athletic training students often pose questions to both the nursing and ATP faculty that demonstrate a desire to experience some real-life or simulated practice with the skills needed by student athletic trainers in caring for such athletes.

When the nursing program acquired high-fidelity simulators, the program's faculty collaborated with the ATP faculty to identify the necessary CIPs that may lend themselves to constructing a simulation with an acute asthmatic episode. Athletic training students may have many interactions with patients during their training but never experience providing for an actual patient with asthma under the supervision of a faculty member.[2] Furthermore, faculty note that the situations ATSs may encounter are not typically replicated in a consistent manner,[12] making it difficult to expose all ATSs to the same learning situation that may produce some level of competence with meeting the athletic training required CIPs.

SIMULATION SCENARIO

The nursing program at Indiana University of Pennsylvania has a state-of-the-art simulation laboratory containing 12 moderate- to high-fidelity manikins representing various age groups. These high-fidelity simulators are housed in two areas that resemble a critical care room. Each simulation room is adjacent to a control room with a 1-way mirror that allows faculty to observe ATSs throughout the scenario. The control room contains audio-visual equipment, computers with simulation software, and microphones for live voice response. Not all ATSs participate during the simulation scenario. The ATSs observing the experience are in another room watching their peers live on video. All ATSs then participate in a collaborative debriefing.

The simulation scenario created for the ATSs was an athlete experiencing an asthma attack. We provided the initial case to all of the ATSs enrolled in a general medical conditions in athletic training course (see Table 1 for the complete scenario). Instructors offered an orientation to the manikin, which allowed the ATSs to interact with the new technology in order to master the basic skills and functions necessary to carry out the scenario.

Table 1. Case

Case background: Adam Clayton, 17 years old, is a junior at the local high school. He is very athletic and plays football. You are the athletic trainer watching the football practice. Suddenly, Adam collapses on the field. What do you do?

We solicited student volunteers from the class to "act" in the roles of the athletic trainers, coach, or teammate, while the remaining ATSs were seated in a conference room watching the scenario unfold via a live video feed. We provided ATSs with the "situational background" of the case, which included the name, background information, and location simulated, which was the high school football practice field. Once the scenario started, the manikin began experiencing an acute asthma episode with physical symptoms of wheezing, increased respirations, increased heart rate, elevated blood pressure, and decreased SpO_2. The goal of the scenario was to have ATSs correctly perform an initial assessment and, through their findings, determine the need to administer an albuterol inhaler, in compliance with the recommended treatment guidelines.[10] Following the initial administration of albuterol, the scenario required that the ATSs recognize the need for a follow-up administration of albuterol. With correct care of the client, the vital signs stabilized, and the ATSs returned to their peers for debriefing.

After the first implementation of this simple scenario, ATP and nursing faculty expanded the simulation to a second scenario immediately following the first. This second scenario involved a student whose asthma episode extended into a severe prolonged attack that required engagement of emergency services. When ATSs in this second scenario failed to engage emergency medical services (EMS) in a timely manner, the athlete's (manikin's) condition rapidly deteriorated and experienced respiratory arrest.

We created a list of expected interventions for this simulation in Table 2. In a nursing simulation, a list of critical events is compiled for students to complete during the scenario.[8] This list also acts as a checklist for faculty with which to track the successful completion of important aspects of the scenario.[13] These checklists are being adapted for use within ATPs while faculty are concurrently developing CIP assessment instruments.

COLLABORATIVE DEBRIEFING

Debriefing is a reflective process conducted at the conclusion of a simulation scenario and is an important piece to the simulation experience.[14] The ATSs had no previous experience with this level of simulation prior to this scenario. To ensure an effective debriefing, ATP faculty, nursing faculty, and a simulation specialist conducted the process. Initial discussion focused on ATSs' reactions to the utilization of a high-fidelity manikin. The debriefing included a discussion of the quality of the ATSs' interventions, strategies to improve ATSs' future performance with "real" athletes, and a discussion of student's reactions to the simulation scenario. We then repeated the scenario two more times utilizing new student volunteers to provide additional opportunities to practice CIPs. We altered the scenario each time in order for the ATSs to experience a different set of circumstances with unique triggers and outcomes.

Table 2. Critical Intervention

Initial assessment
Respiratory assessment
Obtain vital signs
Apply O_2
Administer albuterol $\times 1$
Reassess vital signs
Reassess lungs
Administer albuterol $\times 2$
Reassess vital signs after second administration
Reassess lungs after second administration
Ask student history
Communicate effectively

Anecdotal student feedback regarding this experience revealed that they enjoyed this learning experience. Student comments included items such as, "I thought that the experience that was gained could be extremely beneficial to an athletic trainer," and, "I thought it was helpful, it put us in a situation we don't normally get to see on an everyday basis." Athletic training students also requested that additional opportunities with other similar scenarios could be incorporated into the semester's schedule.

When the ATSs failed to rescue the athlete who suffered respiratory arrest, ATP faculty included debriefing questions such as: "Since the athlete did not survive, what would your initial response and/or statement be to the athlete's teammates?" and:

> *As this scenario unfolds, what type of activities would the [athletic trainer] need to consider to keep teammates away from this rapidly deteriorating medical condition to allow emergency services personnel unobstructed and clear access to the student upon arrival?*

These types of questions resulted in a robust discussion of how the athletic trainer is often "in charge" of the situation until EMS services arrive.

CLINICAL ADVANTAGES

Simulation provides a quality alternative or supplement to traditional clinical experiences for ATSs. The challenge of acquiring general medical clinical placements,[10] coupled with a lack of controlled exposure to various medical emergencies with athletes, can prove problematic to ATP faculty. Simulation provides faculty with a teaching and learning strategy to bridge these gaps in clinical experiences.

The CIPs that relate to a student's critical thinking, clinical decision-making, skill application, and overall ability to function in real patient situations need further assessment. Within a simulation scenario, there is a correct sequence of tasks that must be completed, as would be carried out by an expert. Simulation scenarios also provide "distracter" paths, incorrect or nonideal courses of action, placed in the midst of this scenario which encourages trainees to discriminate between various paths of action and hone their expertise and professional skills.[12] This also allows for assessment and testing of skill proficiencies. The need for student assessment

in athletic training mirrors student learning outcomes assessed during simulation exercises in the nursing department.

APPLICATION

Our future plans include continued work with the nursing faculty to expand the high-fidelity simulation collaboration to include scenarios in various "sudden collapse" situations (ie, sudden cardiac death, hyperthermia, hyponatremia, diabetic emergencies). Future simulations will serve two purposes. First, ATSs can be tested on psychomotor skills associated with specific, defined conditions. Specifically, the ATSs will go into the simulation knowing that the "patient" is experiencing a certain condition, and they then have to successfully manage it. Secondly, once ATSs become comfortable with basic psychomotor skills and management algorithms, they will be presented with an emergency scenario with limited background information. The ATS will be forced to correctly perform an assessment leading to a differential clinical diagnosis and an appropriate management plan. During these scenarios, "real-life" situations can be presented to the student in a controlled and safe environment.

CONCLUSIONS

Athletic training programs' use of nursing programs' high-fidelity simulation manikins could enhance learning and alleviate some strain experienced by ATP faculty and preceptors by creating interdisciplinary learning experiences. Athletic training program faculty whose university also houses a nursing program equipped with a moderate- to high-fidelity simulation laboratory may have access to quality training and assessment resources that help meet general medical competencies and clinical proficiency requirements. Partnering clinical nursing knowledge with ATP faculty expertise provides a collaborative educational experience for ATSs.

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