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## Bridging burn care education with modern technology, an integration with high fidelity human patient simulation

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### ABSTRACT

**Objective:** The Advanced Burn Life Support (ABLS) program is a burn-education curriculum nearly 30 years in the making, focusing on the unique challenges of the first 24 h of care after burn injury. Our team applied high fidelity human patient simulation (HFHPS) to the established ABLS curriculum. Our hypothesis was that HFHPS would be a feasible, easily replicable, and valuable adjunct to the current curriculum that would enhance learner experience.

**Methods:** This prospective, evidenced-based practice project was conducted in a single simulation center employing the American Burn Association's ABLS curriculum using HFHPS. Participants managed 7 separate simulated polytrauma and burn scenarios with resultant clinical complications. After training, participants completed written and practical examinations as well as satisfaction surveys.

**Results:** From 2012 to 2013, 71 students participated in this training. Simulation (ABLS-Sim) participants demonstrated a 2.5% increase in written post-test scores compared to traditional ABLS Provider Course (ABLS Live) ( $p=0.0016$ ). There was no difference in the practical examination when comparing ABLS-Sim versus ABLS Live. Subjectively, 60 (85%) participants completed surveys. The Educational Practice Questionnaire showed best practices rating of  $4.5 \pm 0.7$ ; with importance of learning rated at  $4.4 \pm 0.8$ . The Simulation Design Scale rating for design was  $4.6 \pm 0.6$  with an importance rating of  $4.4 \pm 0.8$ . Overall Satisfaction and Self-Confidence with Learning were  $4.4 \pm 0.7$  and  $4.5 \pm 0.7$ , respectfully.

**Abbreviations:** HFHPS, high fidelity human patient simulation; ABA, American Burn Association; ABLS, Advanced Burn Life Support; NLN, National League of Nursing; EPQ, Educational Practices Questionnaire; SDS, Simulation Design Scale; SSSCL, Student Satisfaction and Self-Confidence in Learning scale.

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*Conclusions:* Integrating HFHPS with the current ABLS curriculum led to higher written exam scores, high levels of confidence, satisfaction, and active learning, and presented an evidenced-based model for education that is easily employable for other facilities nationwide.

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## 1. Introduction

Severe burns present as a complex cascade of injuries with the potential to quickly overwhelm unprepared medical teams and result in poor outcomes. Often, burns are accompanied by polytraumas such as fractures, traumatic brain injuries, and inhalation injuries. The care provided in the first 24h after injury may impact long-term outcome; during the initial response to burned patients, health care providers in the field and in emergency departments must be well-equipped to provide comprehensive treatment prior to transfer to a regional burn center [1]. The American Burn Association's (ABA) Advanced Burn Life Support (ABLS) course was developed to improve outcomes by training health care professionals how to assess and stabilize burn patients during this critical window.

The ABLS Provider course, which was developed in 1967 by the ABA, is comprised of 8h of traditional lectures in the classroom, followed by case discussions and a review of indications for transferring a patient to a burn care center. The course is concluded with a written assessment and practical hands-on assessment of burn care skills (i.e. vital sign/laboratory/radiographic information interpretation, acute procedural management, and documentation) (Appendix A) [1,2]. Overall, the ABLS Provider Course (ABLS Live) demonstrated a measurable improvement in both the skill and confidence levels of participating providers following course completion [2-4]. The ABA recently began offering the course using online modules through a platform called "ABLS Now," which makes the class more accessible but results in the loss of the opportunity to apply, through case discussion and hands-on assessment, the key skills and concepts learned through the course [4].

A notable shortcoming of the in-person ABLS Live course is the design of the practicum portion of the course [4-6]. The hands-on assessment exercises have traditionally utilized either low fidelity mannequins or blow-up dolls as "practice patients". This compromises the quality of education because participants have difficulty suspending disbelief and are unable to practice several skills that are critical in real-life situations. For instance, participants cannot engage in continually assessing, providing medical interventions, and reassessing a patient during a rapidly evolving scenario. Furthermore, they cannot practice technical skills such as obtaining intravenous access, administering medications, intubating a patient, and performing urinary catheterization during a high-stress clinical encounter. ABLS emphasizes an individual approach, whereas team-based simulations more closely mimic the medical team environment. One method that some ABLS Live courses have used to overcome these shortcomings is the use of volunteers that are "moulaged" to appear as if they have actual burn injuries for the assessment portion of the course [7,8]. While this increases scenario

realism, using human volunteers creates variability from course to course, as some volunteers tend to act out their roles more than others. Additionally, using moulaged volunteers creates a significant burden in terms of time, manpower, and cost, and can present a challenge with regards to scheduling. Additionally, variability among instructors has been demonstrated [8,9]. Each instructor had different teaching and testing styles with different expectations for his or her students.

We have seen several of these shortcomings manifest in ABLS training within our burn center, compromising the educational objectives of the course. Given the challenges associated with the ABLS course, we sought a solution to decrease inconsistencies, augment learning, and enhance clinical practice. We began our evidence-based initiative using the Iowa Model of Evidence-Based Practice to Promote Quality Care to determine if implementation of high fidelity human patient simulation (HFHPS) may improve the quality our ABLS courses [10].

HFHPS consists of a computerized manikin, which can be connected to monitors to display parameters such as vital signs and cardiac telemetry. Autonomic response measures can be programmed or manually manipulated to produce a faithful replication of how a real patient would respond to clinical interventions. Psychomotor skills, including the ability to palpate a pulse, establish IV access, and perform endotracheal intubation can be assessed by instructors. Through HFHPS, learners are able practice multiple technical skills through a team-based approach in a safe and controlled setting [11]. This is a particularly effective educational modality for adult learners, who have been noted to be primarily problem-centered, self-directed, and interested in immediate application of knowledge [12]. HFHPS directly allows participants to engage in concrete, problem-focused clinical experiences. Following simulation, learners are able to "debrief" on an encounter, which provides an opportunity for reflective learning as they consider successes as well as areas for improvement and growth.

## 2. Theory

The primary objective of our project was to develop evidence-based simulation training using HFHPS that would seamlessly integrate with the existing ABLS Live curriculum. Our hypothesis was that HFHPS would result in similar post-exam assessment and be a feasible and valuable adjunct to the didactic curriculum based on user feedback.

## 3. Methods

This performance improvement initiative used an evidence-based practice methodology to educate the burn care team at a Level 1 trauma and burn center. This study was conducted as

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