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ISBARR Huddle: First-Year Medical Students Managing Critical Hypoglycemia as an Interprofessional Team

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Abstract

Introduction: Recognizing a patient requiring urgent or emergent care and initiating evaluation and management must include elements that support teams working and thinking together. Although team communication strategies exist, a standardized approach for communicating about patients with urgent or emergent conditions is lacking. This simulation was designed to provide first-semester medical students with the opportunity to deliberately practice the foundational teamwork skills required to think as a team while caring for a patient with critical hypoglycemia. **Methods:** Students were introduced to a team huddle that was structured using ISBARR (identify, situation, background, assessment, recommend, recap) to assist in synthesizing gathered information and arriving at a diagnosis and associated care plan. Students practiced in small groups with faculty coaches and then applied the skills learned to two cases of a patient with critical hypoglycemia followed by debriefing. **Results:** Two hundred eight first-semester medical students participated in the simulation course across three campuses. We surveyed a single campus subset of 172 students. One hundred thirty-three students completed a postevent survey. The majority felt that the difficulty of the simulation was appropriate for their educational level (94%) and that the training would be applicable to real-life clinical events (76%) and would improve the quality and safety of care (100%). Survey comments highlighted teamwork and the use of the ISBARR huddle communication tool. **Discussion:** The course provided first-semester medical students with standardized practice of a team-based approach using huddle communication to advance patient care.

Keywords
Cycle of Care, Hypoglycemia, ISBARR, Case-Based Learning, Communication Skills, Competency-Based Medical Education (Competencies, Milestones, EPAs), Endocrinology, Interprofessional Education, Simulation

Educational Objectives

By the end of the simulation, learners will be able to:

1. Work as a team to investigate possible causes of acute hypoglycemia through focused history, exam, and data review.
2. Huddle to ensure all team members contribute to the collaborative critical thinking to diagnose critical hypoglycemia.
3. Huddle to ensure all team members contribute to the collaborative critical thinking required to develop a treatment plan for critical hypoglycemia.
4. Work as a team to implement the care plan for a patient with critical hypoglycemia.
5. Reassess the patient's status after treatment for critical hypoglycemia.

Introduction

Most patient harm is linked to failures in communication and teamwork.[1] Therefore, the design of simulation-based deliberate practice for entrustable professional activities (EPAs) such as EPA 10, "recognize a patient requiring urgent or emergent care and initiate evaluation and management,"[2] must include elements that support teams to not only work together but also synthesize disparate bits of information gathered by team members. Strategies such as team debriefings or huddles focus

on enhancing collaboration, but the structure for the content of these communications is incomplete.[3-6] SBAR (situation, background, assessment, recommendation)[7] and its various adaptations, such as ISBAR (investigate, situation, background, assessment, recommendation) and ISBARR (identify, situation, background, assessment, recommend, recap), are tools used to structure communication. SBAR has been used to structure communication during handoffs from one clinician to another.[8,9] Bergman and Howell[10] used ISBAR to structure communication among team members; however, their content was developed for critical care nurses, pediatric fellows, and pediatric residents managing cardiopulmonary events in neonates. Our faculty identified the need to use a structured communication tool to not only work together in recognizing a patient requiring urgent or emergent care but also think as a team to arrive at a diagnosis and initiate management.

We selected the simulation cases included in this course to offer first-semester medical students deliberate practice with the clinical taskwork and teamwork skills needed to care for a patient with critical hypoglycemia, a clinical condition at the appropriate level for junior-learner practice, with relative simplicity of diagnostic evaluation and management. The curricular focus was on building the skills required to think as a team, which was facilitated through the introduction of a team huddle structured using ISBARR. Students first practiced these skills in a workshop and then applied them to interprofessional simulation cases.

Methods

Development

Simulation-based deliberate practice for the recognition, initial evaluation, and management of a patient requiring urgent or emergent care required delineation of the key aspects of the task.[11] To accomplish this, an interprofessional team of faculty and clinicians identified the teamwork and taskwork elements of EPA 10 as expected in clinical practice. The taskwork elements were adapted to a framework called the Cycle of Care, which included core activities of investigate, prioritize, plan, implement, and reassess (Appendix A). For teamwork, the theory and education modules associated with ISBARR handoffs were reviewed, and the content was adapted to structure a team huddle specifically for a patient requiring urgent or emergent care (Appendix B).

Faculty chose hypoglycemia as the clinical condition because of the relative simplicity of diagnostic evaluation and management for junior-learner practice. We developed a presimulation workshop (Appendix C) that included clinical scenarios of hyper- and hypoglycemia and allowed for repetitive practice

of an ISBARR huddle to arrive at a diagnosis and care plan. Finally, faculty designed two simulated cases (Appendix D) to provide students with practice working through the Cycle of Care and using an ISBARR huddle to care for a patient with critical hypoglycemia as part of an interprofessional team.

Two hundred eight medical students across three campuses participated in this event during week 7 or 8 of their first year of medical school. Each session lasted 2 hours and included a prebriefing, ISBARR practice, and two simulation cases, each followed by a debrief. One hundred seventy-two students from one of the campuses received the standard survey designed for all learners participating in simulation-based education to evaluate their perceptions of case difficulty for their learner level, their ability to translate cases to actual patient practice, and the value of debriefing and faculty feedback and support, as well as to offer recommendations for ongoing use of the simulation course for medical school training (Appendix E). Evaluation by the University of Kansas Medical Center Human Subjects Committee institutional review board determined this work to be quality improvement and not human subjects research.

Implementation

Students completed prework prior to the simulation cases, which included a review of a previously delivered lecture, didactic material for hyper- and hypoglycemia, and an introduction to the Cycle of Care (Appendix F). On the day of the simulation sessions, 16 students, two physicians, and two nursing faculty engaged in a prebrief and workshop, with subsequent group splitting for the simulation cases and debrief (Appendix G).

The prebrief included an orientation presentation introducing learners to the simulation center, codes of conduct, and expectations (Appendix H), as well as concepts for effective simulation-based learning: establishing a safe container for learning, risk-taking, agreement to a fiction contract, confidentiality, and the role of debriefing to identify and close performance gaps.[12] For the simulations, faculty granted learners professional licenses, empowering them to practice as fully trained providers able to make medical decisions as a team rather than having to wait for a senior or more experienced provider. Faculty then reviewed the Cycle of Care as a model for approaching the care of patients with acute concerns.

Continuing in the large group, we reviewed the ISBARR communication tool's structure and use. A workshop followed with written cases (Appendix C) paired with a cognitive aid that outlined treatments for both hyper- and hypoglycemia (Appendix B). A faculty member read the first case to the large group and asked learners to independently fill out an ISBARR

huddle template. Faculty then reviewed content that they felt was important and modeled using ISBARR to call a huddle and communicate their concerns to another faculty member. Faculty next described the positive effect of each ISBARR component in communicating concerns and expediting a care plan.

After the ISBARR demonstration, faculty divided learners into two groups of eight learners, one physician faculty, and one nursing faculty each for ISBARR practice. In this 20-minute session, learners worked in pairs to formulate and practice delivering ISBARR huddles in situations similar to the simulation cases that were to follow. Each pair independently read the case, wrote their ISBARR, and took turns providing an ISBARR huddle and receiving peer feedback. Faculty observed the exercise, providing additional feedback and answering questions. Faculty focused their feedback on prescribed teaching points (Appendix C), which included the importance of role identification, identification of the specific concern, providing concise background information, providing a specific diagnostic concern, making a recommendation, and seeking additional team input.

Following the ISBARR workshop, we led a just-in-time review of basic diagnostic considerations for hyper- and hypoglycemia,

including common symptoms and glucometer use (Appendix H). Faculty then provided role cards outlining the clinical tasks and actions for the encounter, including taking a history, performing an exam, and chart/data review, and leader scripts for assigning roles and completing the ISBARR huddle (Appendix B). Faculty emphasized the ISBARR huddle's importance in communicating as a team to reach a unified concern, updating the nurse to prioritize and implement a treatment plan, and updating any new persons who might arrive at the room.

Next, each eight-person group completed the simulation-based practice, with two simulation rooms running simultaneously with identical cases. The nursing faculty oriented the learners to the simulation room (Appendix I) and identified themselves as both the safety monitor and standardized participant in the role of bedside nurse. The nursing faculty further divided the group into two smaller groups of four learners each, with one group participating in simulated patient care for the first instance while the other group observed. After the simulation, faculty facilitated a debrief, which was followed by another instance of the simulation case with the observer and participating groups switching places (refer to the Figure).
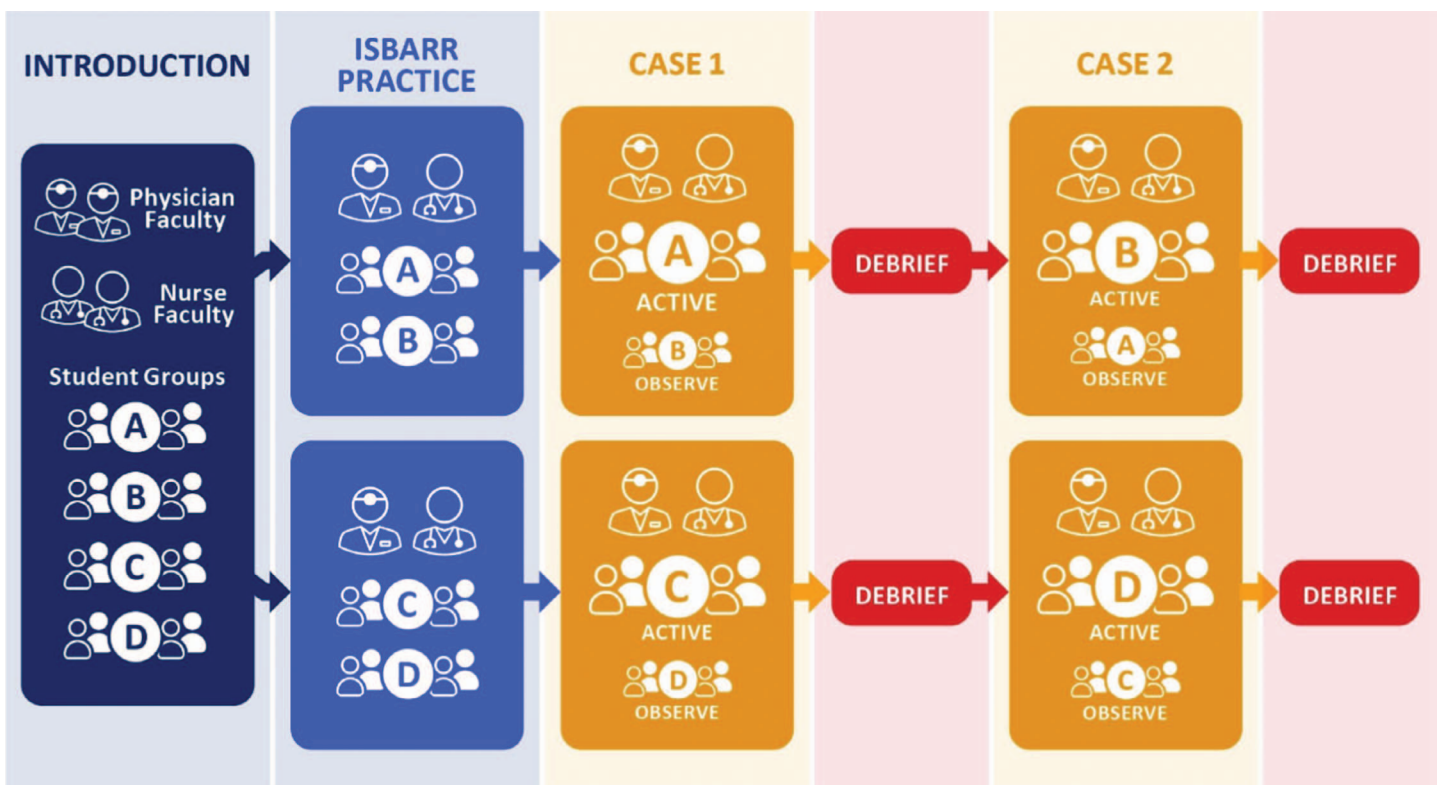

Figure. Overview of learner and faculty groups throughout the simulation course. Abbreviation: ISBARR, identify, situation, background, assessment, recommendation, recap. Image designed by Angie Diederich and used with permission.

Physician and nursing faculty instructors observing the students primarily focused on students' ability to use the ISBARR huddle to form a consensus regarding acute hypo- or hyperglycemia, inform the standardized participant of their concerns, and provide recommendations for the use of a glucometer to establish a diagnosis. Faculty also evaluated communication between team members (including the standardized participant) to discuss appropriate delivery of either glucagon or dextrose and confirmation of the nurse's ability to perform. Formative evaluations of learner performance, based on observations in the simulation, were discussed in the debrief session. We gave students a postevent survey (Appendix E) after the simulation session. Completion of the survey was voluntary.

Simulation Case Specifics
For each case, a faculty member took the participating group to a call room away from the simulation room, where the physician faculty reviewed a handoff sheet introducing the clinical scenario (Appendix J). The case involved a 54-year-old male patient with diabetes admitted for an infected right foot wound that required IV antibiotics and surgical debridement. The patient was NPO (nothing by mouth) for the procedure.

The physician faculty then left the room to join a simulation technician in the observation booth. Once the technician indicated the simulation was ready, the physician faculty called the call room in the role of the team's senior resident, asking the group to visit the patient's room due to concerns that the patient was not feeling well. The nurse met the learner team as they entered the room. The nurse then excused themself to address an urgent need for another patient but stated they would return.

As the learners entered the room, they completed the tasks of obtaining a history, performing an examination, reviewing the chart, and finding symptoms consistent with hypoglycemia. At a set time (either after 4 minutes had elapsed or when the team mentioned hypoglycemia, whichever came first), the nurse returned to the room to ask for an update. The learners provided an ISBARR huddle to the nurse outlining their concerns for hypoglycemia and recommended the nurse check a glucose level via glucometer, which the nurse then did. The nurse communicated the return of the critically low glucose with a specific value. The team then called a huddle and used the ISBARR framework to develop a plan based on the hypoglycemia algorithm.

Up until this point, both simulation cases were identical; however, at this stage, the two cases diverged in terms of management plans. In the first case, the patient had a working peripheral IV that was in place when the learners entered the room. As the patient was NPO, the students were expected to deliver IV dextrose based off the hypoglycemia algorithm previously reviewed and provided. In the second case, the students discovered that the patient, who was also NPO, did not have a working IV and thus required glucagon intramuscularly. The nurse affirmed student questions about IV access and medication availability.

Following treatment in both cases, the patient stabilized as evidenced by their vocal feedback and improvement in vital signs on the monitor. The faculty then arrived in the role of the senior resident and asked for an update, which learners were expected to provide in ISBARR format, leading to discussion about reassessment and further interventions. The full case content is listed in Appendix D.

Equipment/Environment
The case was run in a high-fidelity simulation room that replicated a medical/surgical hospital room including a patient monitor with blood pressure cuff, heart rate monitor, and pulse oximetry. The technicians programmed the simulation software with the initial set of vitals described in the case file (Appendix K). They also uploaded a patient chart including notes, labs, and prior vital signs into an electronic health record as a PDF file on the in-room computer desktop (Appendix J). A technician provided the patient's voice. Technicians recorded all sessions for postsession faculty review, but the recordings were not used in the debrief.

Equipment used in the cases included the following:

- Adult manikin
- Hospital bed
- Hospital gown
- Patient wristband
- Moulage for foot wound with dressing
- Peripheral IV with drain bag
- Nursing supply cart
- Glucometer
- Alcohol pads
- Lancets (predischarged)
- 10-ml saline flushes
- Cotton balls
- Glucometer test strips
- 21-gauge needles
- Dextrose 50%
- Glucagon 1 mg/ml in a 2-ml syringe

Personnel

For each group of eight participants, there was one physician faculty and one nursing faculty. Both faculty provided feedback during the ISBARR workshop. For the main simulation cases, medical faculty observed from the technician booth and played the role of the senior resident calling the medical team and later joining for an ISBARR update. The nursing faculty served as the safety monitor in addition to playing the role of the standardized participant. Each room required one technician who also voiced the patient.

Debriefing

At the end of each session, the physician faculty facilitated 15 minutes of structured debriefing. Each debriefing started with learners sharing their initial reactions and experiences after the simulation followed by a brief review of the medical facts of the case, including symptoms of hypoglycemia, glucose value, and method of treatment chosen. Faculty provided formative feedback through the advocacy-inquiry debriefing model to identify performance gaps in the contribution of each team member towards investigation, implementation, and reassessment (Appendix L). For performance gaps observed, faculty focused on communication related to the ISBARR huddle framework and its role in advancing learners through the Cycle of Care. Similar to the coaching tips outlined in the workshop (Appendix C), faculty emphasized use of the ISBARR huddle in inviting collaborative communication of the situation, establishing a diagnosis, providing recommendations, and implementing treatment, including confirmation of tasks. Nursing faculty were present at all debriefs to provide additional feedback about interprofessional collaboration and answer questions from the medical students about nurses' roles and perspectives. Faculty invited the students observing the simulation to contribute their perspectives.

Results

We conducted 12 simulation sessions for 172 first-year medical students. One hundred thirty-three students completed a postevent survey (77% response rate). Most respondents (94%) indicated that the simulation was at an appropriate level of difficulty, and most (83%) felt the length of the session was appropriate. Most respondents (87%) felt the instructors were "extremely effective" in supporting student learning through coaching and feedback, with the remainder (13%) reporting that the instructors were "very effective." The majority (76%) felt either "extremely confident" or "very confident" in their ability to apply the content of the simulated cases to a real-life clinical event, and all respondents (100%) felt the training would

contribute to improving quality or safety of care in the clinical setting.

Survey comments included feedback about the course and its educational objectives. Using a framework coding approach, we categorized comments as either "understanding" (comments consistent with the learning objectives being achieved) or "still has uncertainty with respect to the learning objectives" (comments reflecting areas for possible improvement; refer to the Table for examples). Most positive comments concerned thinking and working as a team (67%) and were mainly directed at the positive aspects of teamwork and communication practice. This category also garnered the largest amount of uncertain comments (47%), reflecting students' difficulty in understanding their individual roles, such as using the patient chart. We reviewed ISBARR comments closely, as a higher percentage of comments seemed to reflect uncertainty (14%) compared to understanding (10%). Most comments on possible improvement related to learners' desire for more practice time with ISBARR. Additional comments about case content included desire for increased variation between the two cases.

Discussion

We developed this simulation to provide an opportunity for first-semester medical students to practice standardized communication using a team-based approach to stabilize a patient with an urgent condition. In this case, a newly acquired communication skill, ISBARR, was used to form a huddle to share collaborative thinking in the face of time-sensitive patient needs. Faculty developed the simulation-based case at the appropriate learning level for first-year medical students, and students perceived that the learning would be transferable to the clinical setting. We also succeeded in creating a safe environment where learners felt oriented, understood their objectives, and felt supported in their learning through coaching, feedback, and teaching from faculty.

In reviewing our educational objectives, we found the simulation was most successful in facilitating the learners' ability to use an ISBARR huddle to develop a successful initial diagnosis and initiation of a treatment plan as an interdisciplinary team. Most of the students appreciated the opportunity to use the ISBARR huddle tool in the simulation, although some highlighted the challenges in transitioning ISBARR use from the workshop to the simulated clinical situation.

Over time, we determined that the ISBARR's recommendation component was critical to integrating clinical information to ensure the patient received the needed interventions. We found

Table. Student Comments Related to Understanding Course Concepts

Theme	No. (%)			Comments	
	Total[a]	Comprehending[b]	Unanswered Questions[c]	Comprehending[d]	Unanswered Questions[e]
Think like a team: how to think and work as a team	171 (42)	133 (78)	38 (22)	"I appreciated being able to lead the healthcare team and also learned the importance of communication." "I learned what working in a team of physicians looks like and how to improve my patient care skills in an acute setting."	"Focusing on how to communicate to the team lead and how to be effective under pressure would have been even more helpful." "Going more over team roles before."
Hypoglycemia: investigate symptoms and causes of hypoglycemia	83 (20)	64 (16)	19 (23)	"To be aware of fluctuations in blood sugar for patients with diabetes who are getting surgery." "I liked that we had training on how to treat hypoglycemia before."	"Perhaps adding some focus on symptoms and diagnosis, but overall great." "Logic of why you choose one treatment over another."
ISBARR: use ISBARR to collaborate	61 (15)	54 (89)	7 (11)	"I learned what ISBARR is and how it can lead to effective communication." "I liked being able to practice ISBARR several times with a partner before the simulation."	"I would focus on what the difference is in the role of the ISBARR from the nurse to the intern, and from the intern to the attending." "I wish I could have practiced ISBARR more."
Performance: analyze performance	51 (12)	37 (73)	14 (27)	"I also liked the discussion afterwards to really dissect what we need to do." "I learned the importance of learning from your mistakes and how to improve."	"I wish we had more time to discuss and even practice the simulation." "[Have] the debrief be a little less structured."
Patient: communicate with a simulated patient	45 (11)	33 (73)	12 (27)	"Communication is the key to safe patient care." "How to navigate a hospital room for patient comfort and care."	"Inform patient on procedure happening." "I think we need more practice in… the appropriate way to approach a patient as a group."
Totals	411 (100)	321 (78)	90 (22)		

Abbreviation: ISBARR, identify, situation, background, assessment, recommend, recap.
[a]Frequency of all comments associated with themes (% is the percentage of the grand total).
[b]Frequency of comments associated with "comprehends objective" (% is the percentage of the theme total).
[c]Frequency of comments associated with "has unanswered questions associated with the objective" (% is the percentage of the theme total).
[d]Sample learner comments associated with "comprehends objective."
[e]Sample learner comments associated with "has unanswered questions associated with the objective."

that students were often hesitant to share recommendations because they felt uncertain whether they were correct. An important coaching theme was to encourage students to share their thinking, especially when they were uncertain, so team members could collaborate or provide recommendations. Standardized participants assisted with this during the simulations by asking elucidating questions related to the specifics of the treatment plan.

Limitations included the degree to which junior students understood the various clinical tasks needed to care for the patient with hypoglycemia, namely, history, examination, and chart review. Based on this feedback, we created role cards (Appendix B). Additionally, this was the students' first encounter with our courses in the context of the larger curriculum. This required an increased focus on orientation to the simulation environment. To make time for additional orientation without compromising course content, we added the Cycle of Care introduction, hypo- and hyperglycemia introduction, and ISBARR introduction to students' prework so that they could have an opportunity to review this information before the course (Appendix F).

We will continue to deliver this simulation-based event on an annual basis with modifications prompted by student and faculty feedback. Based on our most recent student feedback, we will spend more time orienting students to the simulation environment to ensure that they are optimally prepared to learn. We will continue with the current case complexity and duration; however, we plan to revisit the clinical content to increase variation between the first and second cases. Lastly, we need to better assess how well the students perform the ISBARR huddle and how quickly they recognize and initiate treatment for the patients. We did not measure these in prior iterations of this exercise, but we will pursue more objective assessment of the students' performance and learning going forward.

Appendices

All appendices are peer reviewed as integral parts of the Original Publication.

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