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Critical Cardiopulmonary Event Series: Four Simulations for Pediatric ICU Fellows, Critical Care Nurses, and Pediatric Residents

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Abstract

Introduction: Critical cardiopulmonary events arising from congenital or acquired heart diseases are infrequent in some pediatric critical care units but can be associated with significant morbidity and mortality when encountered. We developed four simulation cases for interprofessional pediatric critical care teams (fellows, residents, and nurses) to provide participants with high-acuity cardiopulmonary scenarios in safe learning environments. The included cases were coarctation of the aorta, Kawasaki disease, myocarditis, and tetralogy of Fallot. **Methods:** The simulations were typically 15 minutes in duration and took place within the pediatric intensive care unit. The scenarios began with handoff of the patient to the primary nurse, who recruited the assistance of resident physicians and ultimately a pediatric critical care medicine fellow as the scenario escalated. Upon completion, participants engaged in a structured, interactive debriefing session for 40 minutes. Afterward, they were asked to complete an anonymous feedback form that was collected and analyzed. **Results:** Based on aggregate postsimulation survey responses from 114 learners, participants reported that these simulation exercises improved their knowledge and ability to manage acutely deteriorating cardiac patients. Additionally, learners rated the impact of the simulation on their practice highly (average score >4 for each group of participants on a 5-point Likert scale). Feedback was analyzed and categorized into three domains: (1) Pediatric Medicine Learning Objectives, (2) Teamwork Strategies, and (3) Opportunities for Simulation Improvements. **Discussion:** This series advances self-reported learner knowledge and skills surrounding management of cardiopulmonary events while also providing opportunities to enhance teamwork and communication skills.

Keywords
Cardiopulmonary, Critical Care, Simulation, Teamwork, Interprofessional, Aortic Coarctation, Kawasaki Disease, Mucocutaneous Lymph Node Syndrome, Myocarditis, Tetralogy of Fallot, Communication, Pediatric Critical Care Medicine, Case-Based Learning, Clinical Teaching/Bedside Teaching, Clinical/Procedural Skills Training, Program Evaluation, Self-Assessment

Educational Objectives

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

1. Identify a neonate with critical coarctation of the aorta and demonstrate the correct management for a patient with hemodynamic compromise as a result of a ductal-dependent congenital heart lesion.
2. Demonstrate appropriate initial recognition of critical cardiac arrhythmias and implement the correct Pediatric Advanced Life Support pediatric cardiac arrest algorithm.
3. Initiate early inotropic support and limit fluid administration in the setting of cardiogenic shock.
4. Demonstrate appropriate initial management of a cyanotic episode in a child with tetralogy of Fallot by promoting right ventricular flow into the pulmonary circulation.
5. Utilize techniques (i.e., situation, background, assessment, recommendation, aka SBAR) and closed-loop communication to work as a highly effective team unit during resuscitation.

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Introduction

Cardiopulmonary events arising from congenital or acquired heart diseases are relatively infrequent in the scope of pediatric critical care practice but can be associated with significant morbidity and mortality when encountered.[1,2] Thus, there is an inherent need for pediatric critical care providers to be equipped with the skills required to recognize and manage such high-acuity/low-frequency events. The challenging paradox is that these events require high-functioning teams (rather than individuals) to avoid adverse outcomes. Despite mounting evidence of the impact of teamwork on patient safety, interprofessional education for licensed practitioners is not yet commonplace in the patient care arena.[3,4] Simulation education offers a safe, experiential learning opportunity in which participants can address knowledge gaps, refine relevant clinical decision-making and technical skills, and practice team-based communication.

Our simulation case library/curriculum was developed in 2011 primarily to bring simulation education to the pediatric critical care medicine (PCCM) fellowship as, at that time, simulation education was evolving into a standard educational modality in graduate medical education. Concurrently, an opportunity to improve nursing care for postoperative cardiac patients was identified, and nursing leadership requested simulation-based education for the pediatric intensive care unit (PICU) nursing staff. This convergence of educational needs gave rise to the launch of our PICU interprofessional simulation program (ISP). Our original cases for team learning centered around care of postoperative cardiac patients but have since expanded to include medical and surgical case scenarios, as well as scenarios around congenital and acquired heart disease.

The specific simulation cases included in this cardiopulmonary series are coarctation of the aorta, Kawasaki disease, myocarditis, and tetralogy of Fallot (Appendices A-D). We compiled these four cases to represent a deliberately broad knowledge base of cardiac physiology that could be strengthened with this module. These four cases represent both congenital and acquired heart disease and span the wide age range for which pediatric providers bear responsibility. We included the case of coarctation to highlight that providers must consider a ductal-dependent, left-sided, obstructive heart lesion for the neonate presenting with shock refractory to typical interventions (i.e., fluid, antibiotics, inotropes/pressors).[5,6] We included Kawasaki disease because it represents the leading case of acquired heart disease in developed countries.[2,7] Most children with Kawasaki disease are cared for outside of the ICU, and those with coronary artery aneurysms may be observed in the PICU without team members fully appreciating the potential for rapid and catastrophic deterioration. We included a case of myocarditis to highlight the rather nonspecific presentation that these patients may have, their potential for deterioration from pump failure and/or dysrhythmia, and the judicious decision making and contingency planning they require.[1,8,9] Finally, we included the case of tetralogy of Fallot because it is the most common cyanotic congenital heart defect and to highlight the stepwise management of severe “tet” spells.[5,10,11] This series was specifically designed for pediatric critical care teams, which include but are not limited to PCCM fellows, critical care nurses, rotating pediatric residents, and PICU physician assistants. As a prerequisite to employment/residency matriculation, all learners were expected to have completed Pediatric Advanced Life Support (PALS) training.

There are individual resources published in *MedEdPORTAL* that cover similar topics (i.e., PALS algorithm, coarctation, cyanotic cardiac anatomy),[12-14] but this module differs in that we assembled four cases representing both congenital and acquired cardiac conditions covering a broad range of cardiovascular physiology and potentially spanning the gamut of the pediatric age range. Furthermore, our simulations are unique in that our nurses and physicians are given realistic, discipline-specific handoffs for each case. To highlight the importance of information sharing, sometimes a critical piece of information is withheld from one group, making effective communication between the two groups of learners even more paramount to the success of the case.

Methods

Development

We designed the simulations to provide experiential, clinical, and teamwork education opportunities in a safe environment for target learners (i.e., PCCM fellows, pediatric residents, physician assistants, and nurses) who lacked regular exposure in managing these rare cardiopulmonary emergencies. The simulations gave participants the opportunity to apply and synthesize what they had already learned about these topics during daily noon lectures, weekly morning conferences, and monthly morbidity and mortality conferences. We expected that all participants had successfully completed the PALS course.

Equipment/Environment

Participants utilized ICU-based equipment, including cardiopulmonary monitors, oxygen, ventilators, a fully stocked education code cart (Appendix E) with a working defibrillator, and disposable supplies housed in actual storage areas or in a simulation supply cart. If laboratory data or imaging was requested by the team during the simulation, one of the simulation instructors provided selected information after an appropriate delay to simulate real-life time challenges (Appendices F-G). Similarly, if a medication would typically have been provided from the pharmacy, the simulation instructors provided it after a delay to simulate typical delivery time.

Personnel

The simulations were overseen by two instructors (i.e., a pediatric critical care faculty member and a nurse educator) during nonclinical time. Typically, one simulation technician was necessary to operate the manikin (ranging from infant to child models) and the monitor. In all of our cases, a volunteer actor was present and portrayed the patient's parent/guardian. These volunteers not only relayed pertinent patient history (i.e., history of present illness, found in each simulation case template) but also frequently asked questions or communicated concerns, challenging the team to provide family-centered care. They were tasked to ask questions such as "Is my baby/child going to be OK?" or "Will someone please tell me what's going on with my baby/child?" In addition to the nurse educator, our simulation team included nursing simulation champions: senior staff nurses who assisted with bedside setup but also observed nursing tasks and contributed to the debrief discussion.

Implementation

The simulation team (physician/nursing educator, simulation technologist, simulation nurse champion, and volunteer actor) met and prepared the room and manikin 30-45 minutes prior to the start of the educational exercise.

The following is a general time line to suggest the amount of time needed for each section of the simulation (running time for one simulation: approximately 60 minutes):

- Introduction and ground rules: 2.5 minutes.
- Simultaneous handoffs: 3 minutes.
- Simulated case management: 15 minutes.
- Debriefing session: 40 minutes.
- Anonymous feedback surveys: 2 minutes.

We designed each of the four cardiopulmonary cases to be as immersive as possible. To maximize nursing participation, cases were delivered prior to and immediately following nursing shift change. Ideally, each simulation included three to five nurses, one to two residents/physician assistants, and one PCCM fellow. PCCM fellows participating in evening simulations did so absent clinical responsibilities. Fellows participating in night simulations and all physician assistants and residents did so during work shifts. PCCM fellows and nurses were assigned to take part in the respective simulations by the critical care faculty member/facilitator and nurse educator based on individual need to complete specific scenarios within our predefined simulation curriculum. Pediatric residents and physician assistants participated in the simulation if they were scheduled to work on the day/night of the simulation. Learners were provided advance notice days to weeks before simulations occurred to afford them the opportunity to manage their personal workflow. Prior to every simulation exercise, we held a prebrief wherein we acknowledged the inherent limitations of simulation and encouraged all participants to suspend disbelief to maximize the educational value of the exercise (Appendix H).

Immediately prior to the start of the case, we provided the nurses and the physician staff a separate, discipline-specific patient handoff as a transition in care. The faculty member signed out to the physician staff, and the nurse educator signed out to the nurses. Handoff included selected information about the patient's history of present illness, workup, and management thus far. At certain times, a critical piece of information was deliberately withheld from one group; consequently, the potential success of the case management relied heavily on communication and information sharing. The simulation typically began with the primary nurse at the patient's bedside, who assessed and recruited the assistance of other nurses, resident physicians/physician assistants, and ultimately a PCCM fellow as the scenario escalated. The interprofessional nature of this teaching and staggered availability of additional staff encouraged participants to practice effective teamwork and communication skills, as vital information needed to be conveyed to each new team member entering the room for the team to maintain a shared mental model. If labs, imaging, or medication were requested by the team during the simulation, the simulation instructors provided selected items after an appropriate delay to simulate real-life time challenges (Appendices F-G). Each simulation scenario lasted approximately 15 minutes. Upon completion of the simulation scenarios, participants engaged in interactive debriefing sessions that highlighted the pertinent clinical concepts specific to the case, as well as reviewing teamwork and communication (Appendix I). This debriefing session lasted approximately 40 minutes. Following the debriefing session, learners were asked to complete an anonymous feedback form (Appendix J).

Assessment

Critical, expected actions included pertinent history taking, a focused physical examination, cardiac rhythm recognition, scenario-specific medical interventions, cardiopulmonary resuscitation, and defibrillation, among others. During the simulation, the instructors took note of actions that were performed well and actions that could be improved upon;

these highlights were then discussed in more detail during the debriefing process.

Debriefing

Upon completion of the simulation scenarios, participants engaged in interactive debriefing sessions at the bedside or in a separate space led by the pediatric critical care faculty member. The debriefings highlighted the pertinent clinical concepts specific to the case, as well as reviewed teamwork and communication (Appendix I). The debriefing sessions employed the use of the PEARLS (Promoting Excellence and Reflective Learning in Simulation) framework to guide discussion.[15]

Every session began by asking the group of participants, "How do you feel?" or alternatively "How did that scenario go?" After learners were given an opportunity to share their emotional response to the experience, they were asked to summarize the case, including the differential and favored diagnosis.

We transitioned to this portion of the discussion by asking a participant (other than the team leader) to summarize the case and the care the simulated patient received using the SBAR communication tool. The acronym stands for situation, background, assessment, and recommendation. SBAR is a structured communication rubric that can be applied when care needs to be escalated or a provider is calling for additional help/support.[16]

An example of SBAR follows:

- Situation ("We have a 3-week-old with refractory shock despite antibiotics, fluids, and inotropes").
- Background: highlights of presentation, examination findings, and care up to the point of escalation ("The child presented with 2 days of lethargy, decreased oral intake and urine output, and progressive lethargy. He remains poorly perfused with cap refill of 5 seconds and profound metabolic acidosis despite 60 cc/kg of fluid, broad spectrum antibiotics, and initiation of epinephrine infusion").
- Assessment: the callers' assessment of the patient and situation ("We now suspect a ductal-dependent, acyanotic heart lesion, and this child's care needs to be escalated further").
- Recommendation: what the caller believes needs to be done now ("We need to start Prostin, consider intubation, and call cardiology").

During this segment, the depth of the team/leader's differential diagnosis, critical thinking, and diagnostic errors were revealed and addressed. Care was taken to ensure that both physician and nursing staff had a full understanding of the diagnosis and management before transitioning to the next segment of the debrief. The case-specific physiology and pathophysiology teaching points are were highlighted in each case.

Finally, we addressed human factors by asking, "What do you think went well?" followed by "What do you think could be improved?" When not addressed by participants, we asked prompting questions or provided directive feedback to address team leadership and followership, role clarity and fidelity, closed-loop communication, situation monitoring/situational awareness, information sharing, and the presence/absence of a shared mental model. The debriefing sessions were brought to a close after every participant had shared with the group one unique takeaway from the simulation. These sessions usually lasted 35-40 minutes. After the debriefing session, we asked learners to complete an anonymous feedback form (Appendix J).

Results

For the purposes of this publication, we reviewed the feedback data for each one of the cardiac simulations conducted over the past 4 years. Overall, feedback data from 114 learners over 15 individual simulations were compiled and analyzed. Each case has been used with pediatric critical care teams (with seven participants on average) anywhere from four to eight times since 2014. Each individual simulation ideally included three to five nurses, one to two residents/physician assistants, and one PCCM fellow.

On the feedback form, participants were asked to rate their agreement with statements on a 5-point Likert scale (1 = *strongly disagree,* 2 = *slightly disagree,* 3 = *neutral,* 4 = *slightly agree,* 5 = *strongly agree*). The following statements were of particular interest to simulation faculty, who believed that they reflected the overall impact of the simulation experience:

- This simulation improved my knowledge required for this type of patient.
- This simulation improved my ability to evaluate and manage a critically ill child.
- The simulation will change how I practice.

For each of the four separate cases, the average rating of nurse participant responses, the average rating of pediatric resident responses, and the average rating of PCCM fellow responses to each of the aforementioned statements were between 4 (*slightly agree*) and 5 (*strongly agree*), suggesting overall agreement with them (Table 1).

Table 1. Cardiopulmonary Event Series Participant Feedback Results (*N* = 114)

Statement[a] and Simulation Type	Nurse Average	Resident/PA Average	PICU Fellow Average	Total Average
This simulation improved my knowledge required for this type of patient.				
Coarctation of the aorta[b]	4.63	4.46	4.60	4.57
Kawasaki disease[c]	4.30	4.75	4.33	4.41
Myocarditis[d]	4.73	4.88	4.60	4.77
Tetralogy of Fallot[e]	4.43	5.00	5.00	4.67
This simulation improved my ability to evaluate and manage a critically ill child.				
Coarctation of the aorta[b]	4.26	4.38	4.20	4.30
Kawasaki disease[c]	4.50	4.75	4.33	4.53
Myocarditis[d]	4.62	4.76	4.60	4.67
Tetralogy of Fallot[e]	4.43	5.00	5.00	4.67
The simulation will change how I practice.				
Coarctation of the aorta[b]	4.58	4.69	4.80	4.65
Kawasaki disease[c]	4.90	4.75	4.67	4.82
Myocarditis[d]	4.65	4.65	4.60	4.65
Tetralogy of Fallot[e]	4.57	4.67	5.00	4.67

Abbreviations: PA, physician assistant; PICU, pediatric intensive care unit.
[a]Participants rated their agreement with each statement on a 5-point Likert scale (1 = *strongly disagree,* 2 = *slightly disagree,* 3 = *neutral,* 4 = *slightly agree,* 5 = *strongly agree*).
[b]Coarctation of the aorta comprised five separate simulations involving 37 total participants (19 nurses, 13 residents, and five PICU fellows).
[c]Kawasaki disease comprised three separate simulations involving 17 total participants (10 nurses, four residents, and three PICU fellows).
[d]Myocarditis comprised five separate simulations involving 48 total participants (26 nurses, 17 residents, and five PICU fellows).
[e]Tetralogy of Fallot comprised two separate simulations involving 12 total participants (seven nurses, three residents, and two PICU fellows).

At the close of each feedback form, participants were encouraged to provide open-ended comments; this feedback has proven to be most useful in refining each case for subsequent use. We categorized these responses into the following three domains: (1) Pediatric Medicine Learning Objectives, (2) Teamwork Strategies, and (3) Opportunities for Simulation Improvements. We then compiled and include here selected responses for each case (Table 2).

Pediatric Medicine Learning Objectives referred to case-specific teaching points. For example, in the tetralogy of Fallot case, one participant mentioned learning “importance of knees to chest and phenylephrine” to promote blood flow into the lungs for oxygenation. Furthermore, in the coarctation case, one learner found it valuable to consider “placing sat[uration] probe on different [right] hand” when evaluating the possibility of a coarctation. Many participants found it extremely worthwhile to review the indications for and general use of the defibrillator during the Kawasaki case.

Teamwork Strategies spanned all cases and focused on important communication and leadership skills. Common themes included the importance of assigning specific roles to each team member (i.e., role clarity and role fidelity), utilizing closed-loop communication, and summarizing/recapping frequently to promote a shared mental model. A recurring sentiment offered primarily by nursing participants involved developing the confidence and feeling empowered to speak up and share one’s thoughts/observations.

Opportunities for Simulation Improvements included comments from learners such as “please make these simulations earlier in the day” and “[the simulation] would be better with more staff.” Participants also commonly commented on the inherent limitations of using a manikin simulator; as one learner lamented, “it is hard to assess mental status/responsiveness in the [manikin].”

Discussion

We developed these four simulation cases to teach interprofessional pediatric critical care teams (i.e., fellows, residents, and nurses) about pathophysiology and management of a broad range of cardiopulmonary events in the setting of congenital/acquired heart disease. This simulation series advances self-reported learner knowledge and skills while also providing opportunities to improve communication and teamwork skills.

The cardiopulmonary cases were specifically designed for use in training PICU teams at a teaching, tertiary academic facility. Given the agreement from participants that the series improved knowledge and ability to manage children with specific cardiopulmonary conditions, we believe that the simulations have achieved their core purpose. We are confident that these simulations can be successfully utilized by other PICUs with access to simulation educators, high-fidelity simulators, engaged interprofessional learners, and, ideally, standardized patient volunteers or actors. Moreover, our simulation templates can be adapted for use in many different academic settings with

Table 2. Feedback Takeaways

Domain	Coarctation of the Aorta	Kawasaki Disease	Myocarditis	Tetralogy of Fallot
Pediatric Medicine Learning Objectives	• "I didn't think of placing sat probe on different hand (right hand)." • "Made me think about why patient not fluid responsive/ broaden differential." • "Better understanding of coarct." • "In decompensated shock that is not improving think ductal dependent lesions or CAH!" • "Always keep ETCO2 at bedside—ETCO2 use during intubation." • "Will apply the rule of 50s to my future practice." • "Importance of SOAPME."	• "Shockable rhythms; management of different rhythms; PEA rhythm." • "Knowing that PEA normally looks like normal sinus rhythm without a pulse and v-tach is wide complex either with or without a pulse." • "How to treat tachy dysrhythmias with and without pulses." • "I need to go back through PALS; I felt pretty uncomfortable with cardiac problems." • "Starting compressions immediately." • "Connect patient to defibrillator." • "It was a good practice to do hands on of the defibrillator to know the difference of cardioversion/defibrillations."	• "Learned that I should start amiodarone with epinephrine in setting of arrhythmias with myocarditis." • "Thanks for the vasoactive review!" • "I like going over the defibrillator." • "SOAPME—I do it, but didn't know it was a mnemonic." • "Shock ASAP, use etomidate in myocarditis." • "Do not trust [patient] w/ myocarditis." • "Never turn your back on a patient w/ myocarditis, put pads on early."	• "Learned of importance of knees to chest and phenylephrine." • "Great to learn more about tet spells and the ways to help manage patients with this." • "Learned patho of TOF & meds needed to calm and help pumping of heart." • "Beta blocker resort if other meds don't work."
Teamwork Strategies	• "Make sure to close loop with team for meds given." • "Speak directly to the team leader." • "Speak up with ideas." • "Make sure people hear me when I say something." • "Designating roles." • "Primary nurses are one of the main points of contact, and can/should delegate roles." • "Situational awareness of everyone involved." • "Practice running busy patient with less hands."	• "I think we did a good job [with] communication and assigning roles." • "Communication is key, importance of delegating even with [less] than optimal staff." • "Shared mental model and taking time to make sure everyone is on the same page; not to be scared to speak up." • "Speak up when compressions are not being done appropriately; also speak up when I can not hear team leader." • "Working together under short staff environment."	• "Closed loop communication was very effective." • "Will improve my SBAR communication in communicating critical needs." • "Good reinforcement of things we mostly already know—communicate and speak up." • "I can always improve my communication + be more confident and not 'hint and hope.'" • "I need to be more direct when asking questions." • "Try to make sure whole team understands scenario." • "Listen to recaps even when busy in role."	• "Great communication + efficient teamwork." • "Closed loop communications." • "Being more communicative in my role as primary RN." • "Through sim am learning that I need to give more explicit roles. We had great teamwork, but I need to give more direct roles." • "Updating the team." • "Keep calm."
Opportunities for Simulation Improvements	• "Volunteer Phil did a great job as dad, he was a realistic and effective participant; made the simulation more valuable." This Sim would be better without: • "It occurring in the conference room—better to be in patient room." • "So many people." • "Unrealistic patient room/premade supplies." • "Sim ran late." • "Red herrings on the mannequin exam like an extra heart sound." • "It is hard to assess mental status/responsiveness in the mannequin."	This Sim would be better without: • "Going down the incorrect pathway by accident." • "Would be better with more staff." • "The audience." • "Question of physical findings." • "Chaos and limitations of people in roles." • "So few people." • "Actor mom."	• "I really liked the subject matter of the Sim and thought it touched on matters I want to know more about. " This Sim would be better without: • "Some things are hard to simulate, i.e., EPOC machine." • "Would have been good to review medical knowledge/basis in more detail." • "Please make these simulations earlier in the day. Thanks." • "Difficult to hear airway." • "Would be better if bed locked." • "Stretcher kept moving + valves falling off wall."	• "The situation was realistic in that it was stressful because the initial interventions did not work immediately." • "We see a good amount of cardiac patients so it was extremely helpful + knowledgeable." This Sim would be better without: • "A small # of nurses." • "More clear guidelines of mannequin usage (where to place IV, etc.)."

Abbreviations: CAH, congenital adrenal hyperplasia; EPOC, portable blood gas, electrolyte, and critical care analyzer; ETCO2, end-tidal carbon dioxide; PALS, Pediatric Advanced Life Support; PEA, pulseless electrical activity; SBAR, situation, background, assessment, recognition; SOAPME, suction, oxygen, airway, positioning, medications, equipment (intubation checklist mnemonic); TOF, tetralogy of Fallot.

different learner groups depending on the educational objective. For example, medical students who have not yet completed PALS can still benefit from reviewing the underlying pathophysiology of these cases.

In the 8 years since the launch of our PICU ISP, there have been several challenges and lessons learned. The feedback received has been instrumental in generating iterative refinements of the overall simulation educational experience. In response to concerns about pulling nurses away from important patient care activities, tandem simulations are now run in the evenings immediately before and after change of shift; the evening nurses participate in the simulation before the start of their shift, and the daytime nurses participate in the simulation immediately after their shift. Although residents and fellows are exposed to the conflict between patient care and education beginning in medical school, our present paradigm transiently generated the sense that one learner group (i.e., nurses) was more important than others (e.g., residents). In the course of time, we believe that we have overcome this misimpression and that our learners have come to value the opportunity for interprofessional learning. Additionally, the instructors utilize the common important themes revealed in the Pediatric Medicine Learning Objectives and the Teamwork Strategies to structure the interactive discussion during subsequent debriefing sessions. We have come to have a deepened appreciation of the power of interprofessional education, specifically when individuals learn with and from one another rather than simply from an instructor.

Limitations inherent in our program and in simulation education in general include the inability to create perfectly realistic scenarios and/or staging, technical difficulties with monitors and/or manikins, and heavy reliance on participant buy-in. There are several potential and actual limitations specific to our process. The first is the fact that these educational activities have the potential to conflict with patient care because physician learners are pulled away from clinical duties. At present, improvement in learner knowledge is self-reported rather than objectively measured. At the time we launched our ISP, we did not utilize a team-performance checklist during our simulations. However, case-specific checklists are in development and should serve to enhance the quality of the debrief and in turn the rigor/value of the educational exercise while acting as a foundation for assessing team performance. Such a tool should be particularly useful for novice simulation educators.

The importance for learners and participants to practice skills within the context of a team-based approach to patient care cannot be overstated. In true emergencies, excellent care is predicated heavily on successful team dynamics, whereas failures of communication lead to compromised care and patient harm. Considering that it is impossible to predict exact group compositions before a true emergency, one of the greatest benefits of performing in situ simulations is practicing how to function successfully within the construct of a team that would organically form in response to an actual medical crisis.

Appendices

A. Coarctation Case.docx
B. Kawasaki Case.docx
C. Myocarditis Case.docx
D. Tetralogy of Fallot Case.docx
E. Crash Cart Items Sample.docx
F. Lab Sheet.docx
G. Images.docx
H. Sim Disclaimer.docx
I. Debriefing Questions.docx
J. Simulation Session Feedback Form Example.docx

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

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Ethical Approval
Reported as not applicable.

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