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Original Research

Perspectives on Simulation-Based Pediatric Critical Care Transport Team Education: Qualitative Analysis of Interviews With Transport Program Leaders in the ImPACTS Transport Simulation Study

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A B S T R A C T

Objective: Pediatric critical care transport (PCCT) teams are expected to manage a wide spectrum of pediatric high-acuity conditions. PCCT program leaders may have unique insights into transport team training, including opportunities, experiences, and barriers. The purpose of this study was to understand how PCCT program leaders perceived the role of simulation in PCCT team education.

Methods: PCCT medical directors or administrators from 12 ImPACTS (Improving Pediatric Acute Care Through Simulation) sites were recruited to participate in a 30-minute interview with trained facilitators. A semistructured 7-question interview guide on the barriers, supports, and opportunities presented by

Meetings: Results were accepted in part as a poster presentation at the 2023 American Academy of Pediatrics National Conference & Exhibition in Washington, DC.

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transport simulations was used. Interviews were digitally recorded, and transcripts were organized using Dedoose qualitative software. A grounded theory approach was used to identify themes.
Results: A total of 11 interviews were conducted with 5 PCCT medical directors (45%) and 6 administrators/clinical managers (54%) from 11 participating ImPACTS health facilities. Themes on participant experience with simulation, simulation feeling real, value of simulation, planning simulations, and logistical challenges were identified.
Conclusion: In general, although PCCT program leaders acknowledge logistical difficulties with planning simulations, they feel that transport simulations, particularly conducted in situ in a transport vehicle, are a helpful educational tool for PCCT teams.

Pediatric critical care transport (PCCT) teams play a vital role in managing a diverse array of high-acuity pediatric emergencies, including asthma, bronchiolitis, pneumonia, seizures, septic shock, appendicitis, diabetes mellitus, prematurity, and cardiac congenital abnormalities.[1] Although programs are regionally disparate and primarily serve the areas surrounding their affiliated children's hospitals, the drive to establish quality benchmarks may be a unifying effort.[2,3] Recently, consensus-based quality metrics have been proposed for neonatal and pediatric transport teams to benchmark their systems' performance and guide continuous quality improvement efforts.[4] Efforts to align reporting metrics and use consistent definitions are also underway, which would allow for international registries of PCCT quality metrics.[5,6] Moreover, health care simulation, a technique that creates a situation or environment to allow persons to experience a representation of a real event for the purpose of practice, learning, evaluation, and testing or to gain an understanding of systems or human actions, has emerged as a crucial tool to leverage the Plan-Do-Study-Act cycles found to be essential to continuous quality improvement.[7-14] In situ simulation, which takes place in the actual patient care setting or environment to achieve a high level of fidelity and realism, is particularly suitable for difficult work environments due to space constraints or noise. With this, in situ health care simulation likely represents an excellent mechanism to bridge the gap between quality benchmarking metrics and individual PCCT team care advancements.[7-13,15]

The ImPACTS (Improving Pediatric Acute Care Through Simulation) initiative is a national collaborative network that connects pediatric academic medical centers with community hospitals. This program focuses on in situ simulation, education, and quality improvement efforts to enhance pediatric emergency preparedness and the quality of care for acutely ill and injured children through the emergency care continuum. Through its successful implementation, ImPACTS has demonstrated that its model can be effectively replicated in a variety of community emergency departments and pediatric primary care settings. The primary goal is to reduce disparities in the quality of care provided to acutely ill and injured infants and children.[16-22] Most recently, ImPACTS efforts have quantified the care provided by PCCT teams involved in interfacility transport, which revealed variability in teams' performance as measured through in situ simulated scenarios.[23]

The primary role of PCCT program leaders is to ensure the delivery of patient-centered care while promoting continuous quality improvement.[24,25] Within the realm of critical care interfacility transports, these individuals often serve not only as leaders but also as active members of the transport team.[26] As such, they possess unique insights into the PCCT team training, including opportunities for improvement, personal experience, and challenges faced. This study aims to explore how PCCT program leaders perceive the role of simulation-based education for PCCT teams in the context of a national study on PCCT simulation.

Methods

This prospective, qualitative project was reviewed and approved by the Seattle Children's institutional review board (IRB#STUDY00003366). PCCT program leaders (medical directors or administrators) were recruited by purposive sampling from 12 participating ImPACTS sites to participate in 30-minute interviews with trained facilitators through Zoom video conference.[23] A semistructured interview guide consisting of 7 questions was used to explore the barriers, supports, and opportunities associated with PCCT, including the role of transport simulations in enhancing PCCT team education (Supplementary Appendix A). One interview occurred for each site. All interviews were digitally recorded and subsequently transcribed for qualitative analysis. To analyze the data, we used Dedoose software and a grounded theory approach, allowing us to identify themes that represent the elements of practices, thoughts, and beliefs of all participants.[27] This method aimed to better understand how PCCT program leaders perceive PCCT education and training using simulation.

Results

A total of 11 interviews were conducted with PCCT program leaders. Of the 11 interviewees, 5 (45%) were medical directors and 6 (54%) were administrators/clinical managers. Two administrators interviewed had the specific role of transport team educator. The interviewees were mostly physicians (5 [45%]) and registered nurses (3 [27%]).

Themes on (1) participant experience with simulation, (2) simulation feeling real, (3) value of simulation, (4) simulation planning, and (5) logistical challenges were identified (Fig. 1).

Participant Experience With Simulation

This theme was characterized by the PCCT program leaders' desire for participants to be exposed to a range of challenging clinical situations, including both technical and nontechnical skills. Such exposure would enable them to experience the mental and emotional impact of difficult transport events so that when they encounter real events, they would be more likely to be adequately prepared. The interviewees described it as follows:

> I think one of our goals [for] simulation for our transport team is to have them interact with and face really difficult situations . . . in a safe learning environment.—Medical Director

> We want them to experience challenging situations mentally, sometimes emotionally. We have actors that come [in] and sometimes play parents or other caregivers [which is] designed to meet certain objectives. What I tell my team is that "I want the sim sessions to be the most difficult things you face because I want everything else in the real world to seem easy."—Medical Director

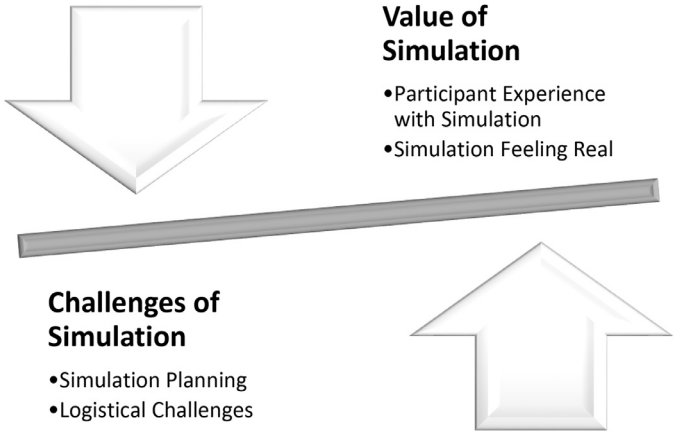

Figure 1. Perspectives of pediatric critical care transport program leaders on the value and challenges of transport simulations.

> I think perhaps team dynamics is another one that can be challenging because often, people are kind of partnered with who they usually are partnered with when they're doing actual transport but may not be for sim.—Medical Director

Simulation Feeling Real

Program leaders were clear that it was important for the simulation to "feel real" or authentic to participants so that they could engage fully with the educational opportunity. The perception was that conducting the simulations "in situ" in the back of an ambulance or in a patient room in an emergency department was conducive to eliciting this realism. In situ simulations leverage environmental fidelity, which is the degree to which the simulated environment (manikin, room, tools, equipment, moulage, and sensory props) replicates the real environment.[14] Having the transport team use their equipment enabled them to mentally rehearse on how they might rapidly prepare medication and fluids for administration and locate supplies during actual patient transports. Some representations of the in situ experience include the following expressions:

> Once we got into the back of that truck, it was very interesting to see how much more realistic it becomes for them versus the sim [center], which we've been doing for probably 10 years. They're really looking forward to getting more out of in the truck, but it definitely changed even our in-person sim in the simulation center. I felt a different vibe from the team after that.—Administrator

> The team really enjoyed being in the back of the truck and utilizing their own equipment and thinking through where they would grab something if this event were to really happen.—Administrator

> If we can do things in the actual environment where the transport team is [an] ambulance, helicopter, [or] fixed-wing airplane- I think that'll be helpful, and I think that's where [these sims] helped us out a lot.—Medical Director

Value of Simulation

Program leaders perceived the "value of simulation" to transport teams in enabling them to learn from the simulated events and each other, emphasizing the importance of teamwork and mutual support. They felt that it was helpful for guideline creation and understanding the PCCT team's work environment and subsequent workflow. In addition, simulation provides an opportunity for program leaders to connect and better understand the teams they direct.

> I think that [simulation] is incredibly valuable, and that's one of my—has been one of my—goals for our transport team is to really give them difficult situations that hopefully they'll never have to face in real life. If they can do it in the simulated environment, in a safe environment where we can learn from each other, and it's respectful and sometimes fun, then hopefully, everything else in real life seems easy and more straightforward.—Medical Director

> I think it helps me be better [as a medical director] because it helps me write their guidelines better. It helps me understand their workflow and their work environment better. Then it's also a chance for me to just connect with the teams, and we can give each other feedback in real time about those sim experiences.—Medical Director

> As a medical director, for me, it's very helpful to watch the crews work through those clinical practice guidelines. How are they accessing it with their mobile devices? How does it read to them? What's the interface like? Are the guidelines feasible in the transport setting?—Medical Director

Planning of Simulations

Interviews revealed that the act of planning a simulation scenario allowed for testing of new guidelines, and multiple PCCT program leaders often incorporated simulations into the process of implementation of new guidelines. Simulations were also planned as part of quality improvement processes to address educational opportunities and systemic issues identified in clinical transport events.

> If we maybe rolled out a new clinical practice guideline (CPG) within that year—for example, we started a pediatric stroke CPG within transport— . . . or maybe we've made significant changes to an old CPG within the department—we will actually sim that for our experience so that the new crew members can get their hands on the new CPG and we can go through it and do some teaching with it.—Medical Director

> About every six months every team runs through a couple of simulated scenarios that we write up based on quality improvement work that we've done throughout the year . . . [it's] through the

quality improvement process [that] we usually identify patterns within the system that we need improvement on.—Medical Director

Logistical Challenges

Transport program leaders consistently identified that a common barrier to frequent simulation events was the difficulty of scheduling simulations given limitations in staffing and supplies.

One of the biggest challenges is scheduling. We're short-staffed and so making sure that we have a lot of time for our crew members to be able to participate in the experience and not be pulled to staff the department or the team.—Medical Director

It's hard to open fresh supplies and get into your packs when supplies are limited, and so, getting your hands on the actual equipment that you would use in real life during a simulation experience is sometimes challenging.—Medical Director

Discussion

This study evaluated the unique perspectives of PCCT program leaders regarding opportunities, experiences, and barriers to PCCT team education using simulation. Several themes emerged, including participants' experience with simulation, the importance of simulation feeling "real," the value of simulation training, the act of planning simulations, and logistical challenges.

One of the most vibrant themes to emerge was the importance of creating a "real" simulation experience. The fidelity or degree to which the simulation replicates the real workplace includes physical, psychological, and environmental elements.[28,29] The extent to which the simulated environment evokes the underlying psychological process necessary in the real-world setting may depend on the degree to which the scenario has conceptional fidelity, that is, all elements of the scenario realistically relate to each other so that the case makes sense as a whole to the learners.[28,29] Another approach is through using in situ simulation to support environmental fidelity. Participants noted that one of the most effective ways to achieve this was by conducting simulations in the teams' own ambulances, rather than in conventional simulation centers. This allowed transport team members the opportunity to engage both physically and psychologically with the simulated scenario, making the experience more authentic. For example, team members were able to consider their seating positions relative to supply cabinet locations, as well as space and lighting constraints typical of care delivery in an ambulance compared with a hospital setting. This immersive environment allowed team members to recognize latent safety threats and site-specific challenges in care and likely fostered a safe learning environment due to the familiarity of the setting.[8,12,30] Compared with simulation events performed in dedicated simulation centers, in situ simulation likely leverages the impact of the transport environment to meet the needs of the transport team members to suspend disbelief and thus make the simulation feel realistic.[30-32] It would seem as though performing the scenarios in their own unique work environment, that is, their own ambulances with the equipment they would use were it to be a real patient encounter was the most impactful way to encourage participants to suspend their disbelief, meaningfully engage in the scenario, and encourage a sense of realism during the experiences.

Another significant theme that emerged was creating a psychologically safe and nonjudgmental learning environment, particularly highlighted by the participants' experiences with simulation. Transport program leaders expressed the desire to challenge transport teams in the simulation setting to make real-life medical scenarios feel less intimidating. Although more research is needed on the best practices for optimizing psychological safety in the context of formative or summative simulations, achieving this requires team members to feel secure enough to fully engage in the simulation activities, allowing them to participate in a manner reflective of their performance in actual clinical situations.[33] Moreover, team structure and composition were emphasized, highlighting the importance of including clinicians in their traditional roles. This alignment helps to reinforce teamwork and communicate strategies that are vital in crises. By fostering a genuine and supportive simulation environment, participants are better equipped to translate their training into practice, ultimately improving outcomes in PCCT.

One of the greatest values of simulation, elucidated by the transport program leaders, was the ability to observe the transport team as they implement new or revised clinical practice guidelines. Simulations can be used to support health care system process evaluation and quality improvement.[34,35] Transport simulations allowed the program leaders to monitor crew resource management responsibilities, priorities in workflow, accessibility of equipment, and the utilization of online and paper-based references. Several PCCT program leaders noted that there can be differences between how they envision a team executing a clinical practice guideline and how the team interprets and applies the guideline or uses online or paper-based references under the pressure of real-time scenarios. This offers a potentially high-yield learning experience for novice transport program leaders that could be incorporated into their initial training or agency orientation programs.[24,26]

Logistical challenges surfaced as a significant barrier to conducting in situ simulation. Many PCCT program leaders commented on staffing shortages, which were especially pronounced given the timing of these simulations relative to the coronavirus disease 2019 pandemic. Staffing shortages affect the ability to schedule simulations. Other considerations include staff pay, coordination of simulation time with facilitators, reserving the simulation center space and or equipment, and working with clinical supervisors to set up simulations in clinical spaces. To alleviate these challenges, some have suggested integrating in situ simulation during on-shift periods, especially during historically lower-volume times of the day or year, or focusing on shorter, simpler simulations that offer substantial value, particularly in terms of developing a culture of a safe learning environment.[30] Shorter simulations are often less time intensive in terms of preparation and execution, as compared with more elaborate, large-scale scenarios. Although more quantitative research is needed, given resource limitations, using shorter simulations (perhaps 10 minutes) performed in situ would likely still be beneficial. Shorter simulations also allow for the opportunity to be performed on-shift between requests for transports, or perhaps immediately before or after change of shift, and could cycle through team members rapidly. Regarding the challenge with inventory and opening fresh supplies during the simulations, collecting expired medication or supplies to use during simulations could help alleviate this. In addition, engaging product or device sales representatives may provide an opportunity for samples for training purposes.

Limitations

Despite the valuable insights provided by this qualitative study on the perceptions of PCCT program leaders on simulation-based learning, this study has some limitations. For example, it was conducted with a limited number of PCCT centers involved in the larger ImPACTS study. Although this sampling approach aimed to capture the perspective of PCCT teams actively engaged in simulation, it may not fully represent the views of PCCT program leaders nationwide. Despite these limitations, this study contributes valuable information to the field of PCCT, shedding light on opportunities for integrating simulation education into PCCT activities to enhance the quality of care provided to acutely ill and injured children during interfacility transports.

Conclusion

In general, PCCT program leaders acknowledge logistical challenges with planning simulations; however, they also believe that transport simulations, particularly those conducted in situ within an actual transport vehicle, serve as an effective educational tool for PCCT teams. Despite the barriers, there is a consensus among program leaders that the benefits of in situ simulations can significantly enhance the training and preparedness of transport teams. These findings support the need for quantitative studies to evaluate the impact of this approach of transport simulation on outcomes for pediatric patients during interfacility transfers.

Declaration of competing interest

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CRediT authorship contribution statement

Devin A. McKissic, Ingrid M. Anderson, Daniel J. Scherzer, Kamal Abulebda, Erin Montgomery, Christopher Kennedy, Snimarjot Kaur, and Rachel Umoren designed the study. Devin A. McKissic, Ingrid M. Anderson, Daniel J. Scherzer, Erin Montgomery, Christopher Kennedy, Snimarjot Kaur, and Rachel Umoren collected data. Lauren M. Maloney, Devin A. McKissic, Ingrid M. Anderson, Daniel J. Scherzer, Erin Montgomery, Snimarjot Kaur, and Rachel Umoren analyzed the data. Lauren M. Maloney, Rachel Umoren, and Snimarjot Kaur drafted the manuscript, and all authors contributed substantially to its revision. Lauren M. Maloney takes responsibility for the paper as a whole.

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Supplementary materials

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