

SHORT REPORT

Multidisciplinary simulation-based training in pediatric emergency scenarios: experience over a two-year period

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Abstract

Introduction and objectives: Pediatric emergencies are rare but critical events requiring a well-coordinated, multidisciplinary team. Multidisciplinary simulation-based training (MST) has been shown to improve team performance, adherence to resuscitation protocols, and both technical and non-technical skills. This study describes the implementation of MST in a level II Pediatric Emergency Department and the resulting improvements in the service. **Methods:** From 2022 to 2024, 17 MST sessions were conducted, focusing on cardiac arrest, septic shock, and anaphylaxis. Scenarios were age-specific, involving infants, school-age children, and adolescents. A total of 174 healthcare professionals (77 physicians, 68 nurses, and 29 healthcare technicians) participated. Observational data and satisfaction surveys were analyzed. **Results:** MST reinforced skills such as patient monitoring, intraosseous access, emergency medication prescription, and algorithm adherence. Communication, teamwork, and familiarity with the resuscitation environment improved. Institutional changes followed, including emergency cart reorganization, standardization of documentation, and trainer certification. Satisfaction surveys revealed high acceptance, especially among physicians and nurses. **Discussion:** MST strengthened pediatric emergency preparedness, team coordination, and clinical decision-making. Despite limitations in objective outcome measures, the perceived benefits support MST as a sustainable strategy. Future training should expand participation and include standardized evaluation tools to assess individual and team performance improvements.

Keywords: Pediatrics. Emergency medical services. Resuscitation. Simulation training. Pediatric education. Interprofessional relations.

Formação multidisciplinar por simulação em emergências pediátricas: experiência de dois anos

Resumo

Introdução e objetivos: As emergências pediátricas são eventos raros mas críticos, que exigem uma equipa multidisciplinar altamente coordenada. O treino multidisciplinar baseado em simulação (MTS) melhora o desempenho da equipa, a adesão aos protocolos de reanimação e o desenvolvimento de competências técnicas e não técnicas. Este artigo descreve a experiência dos autores com MTS e as melhorias subsequentes no serviço, com base em observação qualitativa e feedback dos participantes. **Métodos:** Entre 2022 e 2024, realizaram-se 17 sessões de MTS sobre paragem cardiorrespiratória, choque séptico e anafilaxia, com a participação de 174 profissionais de saúde (77 médicos, 68 enfermeiros e 29 técnicos auxiliares).

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Foram analisadas métricas de desempenho e inquéritos de satisfação. **Resultados:** O MTS foi associado a melhorias percebidas em comunicação, coordenação da equipa e cumprimento dos algoritmos de suporte avançado de vida. Foram praticadas competências como monitorização, colocação de acesso intraósseo e prescrição medicamentosa. Verificaram-se ainda melhorias organizacionais e elevada satisfação entre médicos e enfermeiros. **Discussão:** O MTS reforçou a preparação para emergências pediátricas. Futuros programas deverão incluir instrumentos de avaliação pré e pós-intervenção para medir o impacto real nas competências da equipa.

Palavras-chave: Pediatria. Serviços de Urgência. Simulação. Educação médica. Relações interprofissionais.

Keypoints

What is known

- Pediatric emergencies in hospital emergency departments often present as high-stakes and time-sensitive situations that require rapid assessment and orchestrated intervention.
- Training healthcare professionals to manage these emergencies through multidisciplinary simulation sessions has been increasingly recognized as a cornerstone of quality improvement in pediatric care.

What is added

- This project introduced into our practice a structured model of multidisciplinary simulation sessions tailored to pediatric emergencies. It emphasized team communication, decision-making, and adherence to evidence-based protocols, bridging gaps between theoretical knowledge and practical application in real-life scenarios.

Introduction and objectives

Pediatric emergencies require well-coordinated, multidisciplinary teams to optimize patient outcomes. Multidisciplinary simulation-based training (MST) has proven effective in improving adherence to resuscitation protocols and team performance. Research shows MST enhances recognition and management of critical conditions, leading to faster interventions and improved care^{1,2,3}.

Pediatric resuscitation room admissions constitute a small fraction of emergency department visits. In Portugal, there is limited data regarding pediatric resuscitations, but available studies suggest most cases involve respiratory failure, seizures, trauma, or septic shock⁴. At our institution, 175 children (0.1% of 182,876 emergency admissions) were admitted to the resuscitation room between 2018 and 2022, aged between three days and 17 years old. The main reasons for admission were seizures (38.9%), trauma or intoxications (16.6%), respiratory failure (10.9%), and septic shock (7.4%). Only nine cases (5.1%) were cardiac arrests, with just one survivor. This data underscores the rarity of pediatric resuscitations and the need for structured training to maintain clinical competency.

This project aimed to train the Pediatric Emergency Department team, including physicians, nurses, and healthcare assistants, to enhance their performance during emergencies. It also sought to standardize emergency protocols and assess participant perceptions to refine future MST sessions. MST provides a structured environment for practicing high-risk,

low-frequency scenarios, bridging the gap between theoretical knowledge and real-world application.

Methods

MST sessions were conducted monthly from December 2022 to July 2024 in the Pediatric Emergency Department of a level II hospital. Each session lasted two hours and included real-life staff. Seventeen MST sessions were carried out: six on cardiac arrest (focused on infants), five on septic shock (adolescents), and six on anaphylaxis (school-aged children).

The participants included 174 professionals (77 physicians, 68 nurses, and 29 healthcare assistants). Many attended multiple sessions.

Sessions were scheduled during periods of lower patient flow. Emergency staffing was reinforced to ensure that clinical operations were uninterrupted.

The sessions included a briefing, the execution of the scenario, and a debriefing.

- Briefing: Case objectives, team roles, and safety protocols were presented. Simulations used pediatric mannequins (medium fidelity), expired but authentic disposable materials, the real emergency cart (opened and used), and simulated medications.
- Simulations: These included the preparation of medications (including ampoule rupture and dose calculations), execution of intraosseous access, and fluid administration (simulated via prescription and workflow).
- Debriefing: This followed the PEARLS model, lasting 30 minutes, led by certified instructors (American Heart

Questionário de Avaliação de Sessão de Formação

No âmbito do Workshop “Reanimar na Urgência Pediátrica”, e com o intuito de compreender opinião da temática e identificar onde melhorar futuramente, solicitamos o preenchimento deste questionário de avaliação da sessão. O anonimato e respeito de todos os participantes neste questionário estão assegurados.

Assinale a sua categoria profissional:

Médico Enfermeiro Assistente Operacional

Por favor, assinale para cada item da tabela um (X) com a sua resposta preferida: Insuficiente, Suficiente, Bom, Muito Bom, Excelente.

	Insuficiente	Suficiente	Bom	Muito Bom	Excelente
Relativo à Sessão					
<i>Pertinência do tema</i>					
<i>Duração da Sessão</i>					
<i>Pertinência do conteúdo para a prática clínica</i>					
Relativo ao(s) Formador(es)					
<i>Clareza na comunicação</i>					
<i>Domínio dos conteúdos</i>					
<i>Capacidade na transmissão de conhecimentos</i>					
Comentários/Sugestões de melhoria					
Que outros temas gostaria de ver desenvolvidos?					

Gratos pela Colaboração,

Figure 1. Satisfaction evaluation grid.

- Association and Instituto Nacional de Emergência Médica), covering technical and non-technical performance. Additional targeted training was delivered:
 - For nurses (five sessions): Medication administration, double-check procedures, allergy verification, dilution, and reconstitution.
 - For healthcare assistants (six sessions): Material identification, emergency cart handling, and assistance with team coordination.
- Performance was assessed qualitatively via facilitator observations. Satisfaction questionnaires (Fig. 1) focused on the perceived relevance, session structure,



Figure 2. Satisfaction survey data of the sessions. The applied scale ranges from insufficient to excellent.

realism, and trainer effectiveness. No formal pre- or post-evaluation tools were used.

Ethics approval was granted by the institutional review board. Data was processed using Microsoft Excel®.

Results

Across the 17 MST sessions, multiple key areas showed perceived improvement:

- enhanced closed-loop communication;
- improved team coordination and role clarity;
- increased familiarity with emergency materials;
- smoother execution of resuscitation algorithms;
- greater confidence in medication prescription and safety.

Clinical tools and resources used during simulations included clinical decision-support posters, emergency protocols, and pediatric assessment frameworks.

Feedback and participation: Satisfaction surveys revealed high perceived relevance and educational quality, especially among physicians and nurses. Healthcare assistants expressed more variable opinions, often citing limited applicability to their role (Fig. 2).

Organizational improvements: The MST initiative led to service enhancements:

- Emergency cart reorganization and protocol creation;
- Standardized documentation for critical patients (see Supplementary data);
- Trainer certification in Basic and Advanced Pediatric Life Support;
- Display of instructional posters (drug dosages, airway equipment sizing, and intraosseous techniques).

Discussion

This two-year MST program appeared to enhance the perceived technical and non-technical skills among pediatric emergency staff. These results are consistent with prior literature supporting the value of simulation in team coordination and protocol adherence^{5,6}.

Although structured and repeated, this program did not include objective assessments before and after it took place, limiting its scientific robustness. Observed improvements were qualitative and based on facilitator impressions. Future iterations will include validated evaluation grids to assess knowledge retention and behavioral changes.

The limited inclusion of all team members and the lack of assessment in certain training segments (nurse- or assistant-specific sessions) were noted limitations. The selection of scenarios, though focused on critical complexity, did not fully reflect the most frequent pediatric emergencies. Additional scenarios will be incorporated moving forward.

Despite its limitations, MST demonstrated a potential to sustainably improve pediatric emergency preparedness. We recommend the adoption of similar programs, with integrated assessment tools, in other healthcare settings.

Supplementary data

Supplementary data is available at DOI: 10.24875/PJP.25000021. This data is provided by the corresponding author and published online for the benefit of the reader. The authors are wholly responsible for the contents of supplementary data.

Author contributions

C. Franquelim: review or other type of work or paper; acquisition of data from patients, research studies, or literature; analysis or interpretation of data from patients, research studies, or literature; drafting the article; final approval of the version to be published. J. Bastos: analysis or interpretation of data from patients, research studies, or literature; drafting the article; final approval of the version to be published. A. Horta: idea behind, and design of, the study, report, review, or other type of work or paper; acquisition of data from patients, research studies, or literature; analysis or interpretation of data from patients, research studies, or literature; drafting the article; final approval of the version to be published; agreement to be accountable for the accuracy or integrity of the paper. R. Marques: idea behind, and design

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Conflicts of interest

None.

Ethical considerations

Protection of human subjects and animals. The authors declare that no experiments on humans or animals were performed for this research.

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from all patients, and secured approval from the Ethics Committee. SAGER guidelines have been followed as applicable to the nature of the study.

Declaration on the use of artificial intelligence (IA). The authors declare that no generative artificial intelligence was used in the writing or creation of the content of this manuscript.

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