

# Exploring and Addressing Barriers to Multidisciplinary Simulation Training in Paediatrics

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## Article Info

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## Abstract

Multidisciplinary simulation training is crucial in paediatric education, providing a safe environment to enhance technical and non-technical skills, especially for high-risk, low-frequency events. Despite evidence of improved patient outcomes and reduced errors, widespread implementation faces significant barriers. This review explores current obstacles and strategies to overcome them, aiming to advance paediatric care.

Multidisciplinary simulation training demonstrably improves teamwork, communication, and clinical performance in paediatric acute care, leading to reduced medical errors and improved patient outcomes. However, pervasive barriers hinder its integration, including logistical issues (e.g., staff reallocation, coordination), financial constraints, and cultural resistance (e.g., fear of judgment, lack of psychological safety). Organisational challenges like insufficient leadership support and protected time, alongside educational complexities in curriculum design and debriefing, also limit effective implementation. Case studies highlight successful strategies, such as brief in-situ sessions, strong leadership advocacy, and fostering psychologically safe environments.

Overcoming these multifaceted barriers requires a concerted effort. Key priorities include securing sustainable funding, integrating simulation into routine workflows, promoting psychological safety, and gaining strong leadership buy-in. Future research should focus on evaluating long-term patient outcomes and developing standardised assessment tools to ensure multidisciplinary simulation training effectively prepares healthcare professionals and improves paediatric patient safety.

## Introduction

Simulation training is an increasingly acknowledged tool in paediatric medical education, offering a safe, immersive environment to practice clinical scenarios and develop both technical and non-technical skills<sup>1</sup>. This is vital in paediatrics, where high-risk, infrequent events limit learning opportunities. Evidence suggests simulation has noticeably improved patient outcomes, including error reduction in critical events and decreased neonatal complications<sup>2,3</sup>.

The complexity of paediatric care, often involving diverse interprofessional teams and significant parental/carer involvement, especially during emergencies, highlights the critical need for effective multidisciplinary collaboration. Failures in communication within these intricate care pathways are a leading contributor to medical errors, particularly impacting children with complex needs<sup>4</sup>.

Multidisciplinary simulation training (MDST), where professionals from different specialities train together, directly

addresses these challenges by fostering improved teamwork, role clarity, and communication in high-stress paediatric scenarios. Despite these clear benefits, research indicates that its widespread implementation is hindered by logistical, institutional, and resource-related barriers<sup>4</sup>. This literature gap highlights the need to explore these obstacles.

This review explores the current barriers to implementing effective multidisciplinary simulation training in paediatrics and examines case studies that propose strategies to overcome these challenges, with the goal of advancing paediatric care and improving clinical outcomes.

Data collection involved a thorough literature search using CINAHL and MEDLINE online databases. Boolean search strategies were applied with keywords including “multidisciplinary,” “interdisciplinary,” “simulation,” “education,” “barriers,” and “paediatric.” Titles and abstracts were screened to determine relevance to the study. If unable to establish relevance, the full text was reviewed. Although the focus of this review is on paediatric populations, the limited availability of studies led to broadening of inclusion criteria to include other relevant disciplines using MDST, including obstetrics, emergency medicine, and trauma and orthopaedics. Relevant findings from included studies were extracted and analysed thematically, allowing for identification and grouping of patterns into broader categories. These categories were refined into four key themes: the effectiveness of multidisciplinary simulation in paediatrics; identifying, analysing and addressing barriers; case studies; and future direction and research priorities.

### **Theme 1: Effectiveness of multidisciplinary simulation in paediatrics**

A substantial body of evidence underscores the efficacy of MDST in enhancing team performance and patient safety within paediatric acute care. This training modality effectively builds key teamwork skills by allowing professionals from various disciplines to build delegation, mutual respect and conflict resolution in a controlled, safe setting<sup>1</sup>.

Such engagement promotes a deeper understanding of interprofessional roles and responsibilities, fostering more collaborative and patient-centred care. This is consistent in the literature, linking effective teamwork, improved safety, reduction in errors and greater patient outcomes to MDST<sup>1</sup>.

MDST helps develop the advanced communication and decisiveness skills paramount for effective paediatric teams, offering structured practice in active listening, clear exchanges and information sharing to enhance care coordination and reduce medical errors<sup>1,5</sup>.

Through Connolly et al<sup>6</sup> narrative synthesis, MDST was

found to clarify and reduce preconceptions of professional roles whilst strengthening interpersonal relationships and communication, supporting collaborative clinical decision making. These participants in MDST further reported greater confidence in task delegation and appreciation for various professional roles, facilitating shared leadership<sup>6</sup>. Such positive experiences are commonly cited in the literature, e.g. nursing and medical students reported how MDST enhanced their knowledge and interprofessional collaboration skills<sup>7</sup>.

Multiple studies demonstrate the positive effects of MDST on clinical practice and patient outcomes in paediatric settings. Within a paediatric ICU, Colman et al<sup>5</sup> noted significant improvements in communication, situational awareness, decision-making and role clarity following regular MDST, with structured debriefing being key to enhancing team performance. Similarly, Gilfoyle et al<sup>8</sup> identified that single simulation teaching improved adherence to Patient Advice & Liaison Service guidance, reducing time to chest compressions and defibrillation. This study also confirmed a strong correlation between teamwork and protocol adherence, supported by validated tools and standardised scenarios<sup>8</sup>. Hazwani et al<sup>9</sup> reported faster response times, CPR initiation and drug delivery within ward based paediatric arrests, paired with improvements in communication and team dynamics, suggesting MDST supports skill retention and collaboration. Comparable benefits are seen in fields like obstetrics, where MDST have yielded significant improvements in perinatal outcomes<sup>3</sup>.

Collectively, these studies provide compelling evidence that MDST is a powerful tool for refining critical aspects of team performance in paediatric acute care. Consistent themes of improvements in interprofessional communication and role clarity, alongside more efficient clinical response times, are exemplified by the reduced intervals to initiating chest compressions reported by Gilfoyle et al. and Hazwani et al.<sup>8,9</sup>. Such advancements are foundational to achieving better clinical outcomes and potentially reducing paediatric morbidity and mortality.

However, despite this accumulating evidence supporting the benefits of MDST in paediatrics, a notable gap exists in the literature concerning the barriers to its widespread implementation. Understanding and addressing these barriers is crucial for developing effective strategies that support the broader adoption and integration of this valuable training method into paediatric healthcare settings.

### **Theme 2: Identifying, analysing and addressing barriers**

Despite the well-documented benefits of multidisciplinary simulation in paediatrics, there continues

to be barriers that hinder its widespread implementation. Across the literature, key patterns relating to these barriers were identified and refined into five main themes which are summarised in Table 1 and discussed in further detail below.

**Table 1.** Themes and sub-themes identified from literature on barriers to MDST in paediatrics.

Theme	Subtheme
Logistical Barriers	Staffing and scheduling Resource-intensive preparation Facilitator demands
Financial Barriers	High costs for equipment set-up and maintenance Staffing costs
Cultural Barriers	Engagement and motivation Hierarchy and psychological support Facilitator influence and role
Organisational and Policy Barriers	Lack of institutional support Leadership influence
Educational Barriers	Curriculum Integration Simulation fidelity and design Debriefing challenges Evaluation and assessment Inclusivity and blended learning

### Logistical Barriers

Logistical constraints are among the most frequently cited barriers to implementing multidisciplinary simulation training. The requirement for participants to be removed from their clinical responsibilities creates operational challenges, particularly in resource-constrained settings. This often necessitates temporary staff reallocation or reduced service capacity, placing additional strain on healthcare systems<sup>7</sup>. Additionally, the need to coordinate simulation activities across different clinical teams, each with varying schedules and unpredictable clinical demands, further complicates the complexity of planning joint training sessions.

The development and delivery of simulation scenarios is also resource intensive. High-quality simulations require significant time investment for scenario design, equipment setup, space coordination, and simulation debriefing. Facilitators must remain current with technical competencies, as well as debriefing techniques, including principles of adult learning, which requires further time and resources for professional development<sup>1,7</sup>.

Addressing these logistical barriers requires the exploration of flexible solutions such as integrating simulation into routine clinical workflows, implementing brief in-situ simulations, and utilising virtual simulations to minimise time away from clinical care. Simulation schedules should be tailored to accommodate varying shift patterns and fluctuating clinical demands. This can be achieved with short in-situ simulations during quieter clinical workload and offering sessions across different shifts to accommodate for varied rotas.

### Financial Barriers

Financial constraints pose significant barriers for the successful implementation of MDST, especially in resource-limited settings. High-fidelity mannequins, infrastructure, and technology require substantial upfront investment, alongside maintenance, consumables and staff time costs<sup>1</sup>. Additional expenses arise when staff are removed from duties, increasing the burden of shift coverage. Despite being a commonly cited barrier, MDST cost is an underexplored area in the literature with only 6% of MDST studies mentioning cost, and just 1.6% comparing it to alternative training methods<sup>10</sup>.

Evidence suggests that long-term savings outweigh initial costings. Theilen et al<sup>11</sup> found that regular MDST reduced PICU admissions by 334-day beds annually, saving £801,600, exceeding the £74,250 programme cost. While financial returns are important, the primary goal is for MDST to improve patient safety, reducing adverse events and time spent in hospitals<sup>2</sup>.

Potential cost-saving strategies include, securing grants, partnering with tech companies, exploring low cost MDST models and reusing clinical equipment<sup>1,7</sup>.

### Cultural Barriers

Cultural and attitudinal barriers can significantly influence the success of multidisciplinary simulation in paediatrics, especially when such training is newly introduced. Resistance or reluctance from healthcare professionals to fully engage may limit the educational value. To optimise the learning outcomes and maximise educational gain, participants must recognise the relevance of the training and approach it with openness and willingness to engage<sup>7</sup>.

Engagement with simulation is shaped by fidelity, facilitator behaviour, learner seniority, and psychological safety. In a qualitative study, Newhouse and Polwart<sup>12</sup> found that healthcare professionals often avoided sessions due to unclear objectives and fear of exposing knowledge gaps, particularly in front of colleagues. Concerns about judgment, reputational risk, and hierarchy further discouraged participation. Lack of structure heightened anxiety and altered clinical behaviour, while power imbalances between facilitators and learners hindered open discussion—highlighting the critical role of psychological safety<sup>12</sup>.

Psychological safety, defined as the belief that one can take interpersonal risks without fear of negative consequences, has been linked to better patient outcomes and fewer errors<sup>13</sup>. Multidisciplinary simulations have improved participants' confidence to speak up across roles, with nurses feeling more empowered to challenge doctors<sup>6</sup>. However, Haviland et al<sup>13</sup> found no overall improvement

in psychological safety after repeated simulation, with doctors consistently reporting lower levels than nurses. This suggests that simulation alone cannot overcome entrenched hierarchies and that broader cultural change is needed.

To address these barriers, simulation must create a supportive environment where mistakes are viewed as learning opportunities, not failures<sup>1</sup>. Facilitators should model openness and vulnerability to foster trust, and debriefings must be psychologically supportive and constructive<sup>12</sup>.

### Organisational and Policy Barriers

Institutional support is crucial for successful implementation of multidisciplinary simulation training. Lack of protected time for education, limited engagement from leadership, and inadequate infrastructure can hinder the sustainability of simulation programmes. In contrast, Theilen et al<sup>14</sup> found that attendance records for a paediatric multidisciplinary simulation programme were above 95% due to strong leadership advocacy and protected teaching time.

Beyond organisational culture, policy-level frameworks play an important role in shaping institutional uptake of simulation. In the UK, the Royal College of Paediatrics and Child Health<sup>15</sup> identifies simulation and interprofessional learning as essential to paediatric training. This aligns with the Health Education England's national framework for simulated-based education, which sets out principles for governance, quality assurance and resources<sup>16</sup>. However, translation into practice is inconsistent with simulation often not embedded into job plans or backed by dedicated funding, leaving initiatives vulnerable to competing service pressures. Some progress has been made through national strategies. For example, the NHS England's simulation strategy has supported regional simulation networks, leadership engagement, and funding, offering a model for sustainable adoption and integration<sup>17</sup>.

In lower income countries, policy frameworks are often absent. MDST is rarely embedded in health workforce strategies, leaving programmes reliant on donor funding. Although the World Health Organization's (WHO) global patient safety action plan recognises simulation as a key tool for patient safety, practical strategies for resource-limited contexts remain underdeveloped<sup>18</sup>. Without explicit policy support, MDST risks remaining fragmented and unsustainable.

Addressing these barriers requires leadership advocacy at institutional level and embedding simulation into national strategies and frameworks, linking training to patient safety governance, workforce development strategies and quality improvement agendas<sup>6,7</sup>.

### Educational Barriers

Integrating simulation into existing curricula requires careful planning and faculty buy-in, often challenging traditional teaching models and facing resistance from staff and leadership<sup>1</sup>. In paediatric multidisciplinary settings, varied learner roles and experiences complicate the creation of scenarios that are both inclusive and educationally relevant<sup>6</sup>. Some participants question the realism of simulation, noting they may lack the emotional intensity, complexity, and unpredictability of real-life clinical care, raising concerns about skill transferability<sup>1</sup>. Fidelity is key to engagement; participants report that realistic simulations enhance learning and transfer of skills<sup>6</sup>. Yet achieving high fidelity while remaining cost-effective and inclusive remains a persistent challenge.

Debriefing is also complex. Hierarchies and interpersonal dynamics may limit open discussion in multidisciplinary settings<sup>6</sup>. While separate debriefings may reduce fear of judgment, joint sessions promote mutual understanding and teamwork. Effective programmes focus debriefings on early recognition, escalation, communication, and interprofessional collaboration<sup>14</sup>.

The educational quality of simulations varied across the literature. Many studies lacked standardised learning objectives or outcome measures. Facilitator preparation also differed substantially, with inconsistent training in learning theory, communication skills, and feedback strategies. These differences likely contribute to inconsistent learner engagement and skill transfer, highlighting need for rigorous design, standardised evaluation tools and faculty development.

In addition, standardised tools for assessing multidisciplinary simulation remain limited. TeamSTEPPS, for example, provides a structured framework, including the Team Performance Observation Tool to assess team dynamics and performance<sup>1</sup>.

Blended learning approaches, combining simulation with clinical experience, may enhance skill transfer. Inclusion of faculty from all disciplines enhances relevance and inclusivity transfer, while standardised tools are essential for evaluating outcomes, refining programmes and improving patient safety and educational benefits<sup>1</sup>.

### Summary

In summary, multidisciplinary simulation in paediatrics is hindered by multiple barriers, frequently interconnected and overlapping. Addressing logistical, financial, cultural, organisational, policy, and educational barriers requires a multifaceted approach. Key priorities include integrating simulation programmes into routine clinical activity, securing sustainable funding, creating psychologically safe and inclusive learning environments, and aligning

simulation with institutional and national priorities. Investment in faculty development, interprofessional collaboration, and standardised outcome measures is essential to maximise educational value and clinical benefit of multidisciplinary simulation in paediatrics. Ultimately, efforts should remain focused on improving patient safety and enhancing multidisciplinary team performance through sustainable simulation programmes.

### Theme 3: Case studies

Despite the numerous barriers to implementation, several case studies have demonstrated the successful implementation of paediatric multidisciplinary simulation training programmes. These studies highlight not only the feasibility of simulation within a busy healthcare environment but also its potential benefits in improving clinical practice.

Price K et al<sup>19</sup> successfully implemented a multidisciplinary simulation program in a Melbourne emergency department. A total of 164 healthcare professionals were involved including doctors, nurses, nurse practitioners, medical and nursing students. A core scenario focused on the management of paediatric anaphylaxis, aiming to reduce adrenaline-related medication errors and improve multidisciplinary response to anaphylaxis. Simulations were conducted weekly and scheduled during quieter clinic periods, which increased participation whilst minimising disruption to clinical care. Sessions were kept brief, aiming for five-minute simulation and five-minute debrief. Whilst timings were not strictly followed, sessions had a total median duration of twelve minutes which was found acceptable by participants and balanced the educational benefit with minimising clinical disruption. A key enabler to the programme's success was senior leadership endorsement, addressing organisational barriers and allowing protected time for simulation education. Additionally, the collaborative learning approach likely contributed to reducing cultural barriers, thereby enhancing participant engagement<sup>19</sup>. However, the study did not evaluate whether simulation outcomes translated into improved clinical management of reduced error rates. Additionally, only 23 of the 52 sessions conducted over 15 months focused on anaphylaxis, limiting broader generalisability.

Another example by Lee et al<sup>20</sup>, involved a case-series in an emergency department less experienced with paediatric care. In-situ, multidisciplinary simulation scenarios involving doctors, nurses and emergency department technicians were conducted over 12 months. Five in-situ scenarios were developed including respiratory failure, asystole, ventricular tachycardia, supraventricular tachycardia, and sepsis. Scenarios were carefully designed to avoid traumatic content, such as

simulated patient deaths, to minimise emotional burden. Faculty were trained using a low-cost, six-hour course. Clinical performance, teamwork and communication skills were assessed at baseline, six months and twelve months. Although no significant improvement was noted in clinical performance, there was an improvement in teamwork and communication scores measured using the TeamSTEPS tool. Simulations were kept short, with a mean time of 11.2 minutes, with 7.2 minutes for debriefing<sup>20</sup>. These short sessions enhanced feasibility but potentially limited the number of achievable learning outcomes. However, shorter sessions allow for more frequent exposure to a wider range of clinical scenarios. The study demonstrated that effective multidisciplinary simulations and debriefs could be delivered in under 20 minutes within real-time clinical settings, highlighting their feasibility and educational value<sup>20</sup>.

A further successful case study by Natarajan et al<sup>21</sup> evaluated the impact of high-fidelity, multidisciplinary simulation on teamwork during the resuscitation and transport of extremely preterm neonates in a neonatal intensive care unit. Over five months, seven teams, each consisting of a neonatal fellow, two neonatal nurses, and a respiratory therapist, participated in three simulation scenarios. Due to scheduling conflicts, all teams completed the first two scenarios, but only four participated in the final scenario. Each simulation, including debriefing, lasted one hour and was video recorded for evaluation. A Clinical Teamwork Scale was developed to assess communication, situational awareness, decision making, role responsibility and overall teamwork. While real-time teamwork scores improved significantly during resuscitations, Clinical Teamwork Scores did not show statistically significant change, potentially due to small sample size and variability in team composition across scenarios. This variability however reflects the reality of clinical resuscitations, where team members often work with unfamiliar colleagues. Encouragingly, the teams showed reduced time to complete key resuscitation tasks and some of these improvements were statistically significant. Teams led by junior fellows showed greater improvement in teamwork, possible due to increased clinical exposure by the end of the intervention period<sup>21</sup>.

These case studies demonstrate the feasibility of implementing multidisciplinary simulation in paediatrics. By deliberately designing brief simulation sessions, the studies addressed common logistical challenges by minimising disruption to clinical duties and reducing need for additional staffing, thereby enhancing overall feasibility and cost-efficiency. Scheduling simulation during periods of lower clinical activity, as demonstrated by Price et al<sup>19</sup>, further supported integration into routine workflows. The simulations maintained a strong educational focus, with

concise debriefings involving the entire multidisciplinary team, aimed at maximising learning within a limited timeframe. Although direct financial costs were not reported, the time-efficient design likely supports effective resource utilisation. The use of in-situ simulation by both Price et al<sup>19</sup> and Lee et al<sup>20</sup> and highlights the practicality of this approach within actual clinical settings.

#### Theme 4: Future direction & research needs

Although MDST in paediatrics is increasingly recognised for enhancing teamwork and clinical outcomes, the evidence base remains limited. Further research is needed to address barriers to sustainable implementation, especially in high-acuity scenarios involving anaesthetic, transport, and obstetric teams.

Persistent logistical challenges, such as time constraints, staffing shortages, and coordination difficulties, warrant investigation into how simulation can be integrated into routine clinical workflows. Organisational support, including protected teaching time and leadership engagement, is essential and should be evaluated within national structural policies and training frameworks. Research should examine whether national policies are effectively embedded into curricula and commissioning decisions at regional levels in high-income settings. In low-income settings, exploration is needed on how WHO's patient safety global action plan could support national adoption of simulation<sup>22</sup>. Comparative analyses across high and low resource settings would clarify whether barriers arise from under-enforcement of existing policies, or absence of supportive frameworks.

Financial implications also require further study, particularly in under-resourced settings. Future studies should compare the costs of simulation with potential savings from reduced adverse events and shorter admissions and explore cost-effective or shared-resource models, particularly in low-resource settings.

Cultural barriers like fear of judgment and lack of psychological safety hinder participation. Strategies to promote safety, including inclusive pre-briefings, emotionally sensitive debriefings, peer support, and continuity in facilitator-learner relationships should be explored and evaluated<sup>22</sup>.

Designing simulations that challenge and benefit all disciplines remains difficult. Future studies should explore inclusive scenario design, compare debriefing formats, and develop standardised curricula and assessment tools<sup>7</sup>.

Most literature centres on acute care. Research should expand to outpatient, chronic, and long-term paediatric care. While some studies show improved outcomes with simulation, robust evidence on its direct impact in paediatrics is still lacking<sup>1,6</sup>.

#### Limitations

This review has several limitations. Firstly, although the primary focus was on paediatric multidisciplinary simulation, the limited number of paediatric-specific studies necessitated the inclusion of evidence from other related disciplines. While thematically relevant, this may affect the specificity of findings for paediatric practice.

Secondly, most included studies were conducted in high-income countries, where resources, funding, faculty and institutional support are more readily available. Studies from low-income countries was limited, limiting the generalisability of findings to resource-constrained settings where barriers such as cost, staffing shortages, and lack of infrastructure are more pronounced.

Inconsistencies in simulation design, delivery, and evaluation limited comparability of programmes. Absence of standardised outcome measures reduced the ability to assess programme quality or determine which models are most effective. Long-term follow up data was infrequently reported, making it difficult to draw conclusions on longer-term impact on clinical outcomes. This makes it difficult to advocate for widespread adoption based on the current evidence base.

Finally, methodological variability across the literature and lack of formal quality appraisal in this review, restricts the strength of conclusions that can be made. Future research should prioritise consistent evaluation frameworks, longer-term outcome measures, and the development of scalable, low-cost models that are feasible in low-income environments.

#### Conclusion

Multidisciplinary simulation training offers many promising benefits in paediatric healthcare, particularly in improving teamwork, communication, role clarity and clinical performance during acute, high-stress scenarios. These improvements have potential to positively influence patient care and contribute to reductions in morbidity and mortality. Despite these recognised benefits, there continues to be significant barriers limiting the widespread implementation and sustainability of multidisciplinary simulation in paediatrics.

Key ongoing challenges include logistical complexities in coordinating different teams, financial constraints, cultural resistance, and organisational gaps with a lack of protected teaching time and leadership support. In addition, variability in learner needs, technological limitations and the lack of standardised assessment tools further limit the consistent and effective delivery of multidisciplinary simulation.

Addressing these challenges will require a multifaceted approach and clear policy frameworks. Senior leadership

must prioritise protected teaching time, foster a psychologically safe and supportive learning environment, and invest in faculty development. Sustainable simulation models must be developed to accommodate for increasing clinical demand, with consideration to cost-effective and flexible approaches. These may include in-situ and brief simulations, integration of virtual technology, and blended-learning formats.

Future research should prioritise evaluating the long-term impact of multidisciplinary simulation on patient outcomes, as well as the development and validation of standardised assessment tools. These steps are crucial for development and refining of simulation programmes to ensure they effectively prepare healthcare professionals for real-life clinical practice.

Ultimately, this review highlights the importance of recognising multidisciplinary simulation training in paediatrics as an essential component of clinical governance and patient safety. To fully appreciate its benefits, it is essential to identify and address the persistent barriers that hinder participant and implementation. Embedding simulation within national and institutional policy frameworks is essential to ensure sustainability across high and low resource settings. Only by overcoming these barriers can healthcare teams engage in shared learning, strengthen multidisciplinary collaboration, and advance the quality and safety of paediatric care.

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