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Hybrid Educational Simulation Training for Parental Presence During Critical Situations in the Nicu: An Observational Study

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Research Article

Keywords:

Posted Date: July 12th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9836927/v1

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Additional Declarations: No competing interests reported.

Abstract

Background

Family-centred care promotes parental presence in the NICU, resulting in more frequent exposure to resuscitation events and invasive procedures. Family presence during paediatric resuscitation has been linked to improved outcomes and reduced parental anxiety and post-traumatic anxiety, even in case of adverse outcomes. Despite these benefits, some healthcare professionals remain reluctant to fully embrace this practice, often due to increased anxiety and insufficient training in communicating with parents. To address these challenges, we developed a hybrid simulation-based educational program to prepare NICU staff for parental presence during critical situations.

Methods

This pre–post interventional study evaluated the impact of a hybrid simulation program on healthcare professionals' perceived anxiety. The program included a preparatory educational video on communication strategies followed by in situ simulations involving actors portraying parents and a multidisciplinary debriefing with a psychologist. Anxiety levels were assessed using the short version of the State–Trait Anxiety Inventory (STAI-5) before and after the simulation.

Results

Seventy-six healthcare professionals participated in the study. State anxiety scores decreased significantly after the simulation, from a mean of 7.89/20 (± 2.39 SD) before the simulation to 6.44/20 (± 1.8 SD) after the simulation ($p < 0.001$). No significant difference in anxiety reduction was observed between nurses responsible for family support and those primarily involved in patient care.

Conclusion

To our knowledge, this is the first study evaluating the impact of a hybrid simulation program incorporating video-based preparation, communication training, actors portraying parents, and structured multidisciplinary debriefing on healthcare professionals' perceived anxiety during parental presence in critical NICU situations. The program was associated with reduced anxiety when managing family presence during critical events. However, given the absence of a control group, these findings should be interpreted with caution. Simulation-based training may help clinicians feel better prepared to manage family presence during high-stress situations in neonatal intensive care settings. Further studies including control groups and evaluating the impact on clinical practice and family outcomes are warranted.

What is already known on this topic

- Family presence in adult and paediatric resuscitations is clearly recognised as beneficial for patients and families, but healthcare professionals are sometimes still reluctant, mainly due to lack in communication skills and training. Family presence in the NICUs is strongly encouraged but not explored nor yet implemented in the context of critical situations or resuscitations.
- **What this study adds –**
- Education and training on communication skills and simulation can help decrease the perceived anxiety caused by family presence in critical situations in healthcare workers in neonatal units.
- Education and simulation may help implementing family presence during critical situations in neonatal units in real life. Studies on long-term outcomes on families, patients and healthcare workers are still warranted.

Introduction

Parental presence in the Neonatal Intensive Care Unit (NICU) is fundamental to family-centred care, significantly enhancing outcomes for both infants and parents [1, 2]. Despite the clear benefits observed in adult [3, 4] and paediatric [5] populations, the role of family presence during resuscitation, critical events, or invasives procedures in NICU settings remains underexplored [5–7].

During the hospitalization of a premature infant, parents may witness critical events such as neonatal resuscitation. These situations can generate significant emotional distress, including guilt and anxiety, potentially affecting parental well-being and early parent–infant bonding. Addressing these challenges is essential for fostering positive parent-infant relationships [8–10].

In this context, family presence during resuscitation has been associated with improved psychological outcomes for relatives without negatively affecting patient care [11]. Consequently, the European Resuscitation Council guidelines recommend that, when safe and adequately supported, families should be offered the option to be present during resuscitation [12–15].

However, some healthcare professionals (HCP) remain sceptical and may feel unprepared to handle these situations, which can generate anxiety [16–18], especially given the lack of specific training in communication with parents during neonatal resuscitation [19]. Therefore, the development and implementation of educational programs, institutional protocols for family presence, and the provision of dedicated family support staff are recommended [5, 14, 18].

In our institution, we implemented a simulation program to train NICU healthcare professionals in communication skills for managing family presence during critical situations. This study aimed to evaluate whether this program, combining an educational video and hybrid simulation, could reduce HCP anxiety in these situations.

Materials and methods

This pre-post interventional study evaluated the impact of a hybrid simulation program on HCP anxiety.

Setup: hybrid simulation

An established in situ NICU simulation program (SimNeo) using high-fidelity mannequins (Premature Anne Task Trainer and Newborn Anne, Laerdal) at Geneva Children's Hospital was adapted to include two actors portraying parents, thereby simulating family presence during critical scenarios. These "in situ" simulations took place in the NICU, within the team's usual clinical environment (except delivery room). Four scenarios were developed: accidental extubation, severe apnoea during skin-to-skin contact, neonatal seizures, and severe necrotizing enterocolitis. These scenarios were drawn from real critical situations and developed together with actors, parents themselves, experienced in medical simulations, with predefined and standardised behaviours and reactions (e.g., guilt, anger, distress, or agitation in the Supplemental Digital Content Document 1).

For each session, two groups participated, each assigned a randomly chosen scenario, resulting in two simulations per session (Supplemental Digital Content Document 1). The study design is outlined in Fig. 1.

Prior to each simulation, participants viewed a 45-minute educational video developed with a psychologist and an attending physician introducing key communication strategies. This preparatory component was included following feedback from participants in our previous PICU study, who reported the need for more theoretical preparation before the simulation [20].Following the video, participants engaged in a simulated critical scenario. Each group included two physicians (one resident and one fellow), three nurses, and one nursing assistant, all performing their usual NICU roles. Assigned roles included the nurse responsible for the patient, the nurse preparing intravenous medications, and the nurse supporting the parents. Actors portraying parents were enacted predefined emotional responses and occasionally interfered with patient care to challenge participants' communication and management skills.

Each simulation was followed by a facilitator-led debriefing in a safe, non-judgmental learning environment [19]. The debriefing, led by a psychologist and the NICU physician responsible for the simulation program, addressed communication challenges observed during the scenario. Actors portraying parents also shared their perceptions and feedback regarding the support they received.

Program Evaluation

Participants filled out a demographic questionnaire and a pre-simulation questionnaire including healthcare profession, age, gender, years of experience since graduation, and years of NICU experience.

They also reported any previous experience with simulations involving parental presence prior to this updated program. Additionally, a post-simulation questionnaire was completed after the debriefing.

We used a validated short version of the State-Trait Anxiety Inventory 5 (STAI 5) questionnaire [21] for both the pre- and post-simulation evaluations with the latter conducted immediately after the debriefing (see Supplemental Digital Content Document 2). This 5 items questionnaire generates a score ranging from 1 to 20.

The pre-simulation questionnaire measured both "trait anxiety" and "state anxiety," while the post-simulation questionnaire focused solely on "state anxiety." Trait anxiety reflects baseline anxiety disposition, whereas state anxiety reflects situational anxiety at the time of questionnaire completion.

Study Outcomes

Primary outcome was the difference in perceived anxiety level before and after the simulation. The secondary outcome assessed the nurse's role (patient management family management) influenced experienced anxiety level.

Statistical analysis

Categorical variables are expressed as frequencies and percentages. Continuous variables are expressed as median and interquartile range (25th–75th percentiles) or mean and SD as appropriate. A Mann–Whitney test compared state anxiety scores between the pre-simulation and post-simulation groups, as individual pairing was not possible due to technical issues. A univariate logistic regression was performed to explore whether higher baseline trait anxiety was associated with a larger reduction in state anxiety after the simulation. Stata software version 11 (StataCorp. 2009. Stata Statistical Software: Release 11. College Station, TX: StataCorp LP) was used for statistical analyses.

Results

We carried out 16 simulations between June 2022 and April 2023. We obtained the demographic data of 76 participants and a total of 150 pre- and post- simulation questionnaires. One participant did not fill out the pre- and post- simulation form. The characteristics of our study population are detailed in Table 1. Nearly half of the participants were nurses (36 out of 76, 47.4%), followed by physicians (29, 38.2%) nursing assistants (11, 14.5%). Most participants were aged between 30 and 45 years and 63.2% of them had more than 5 years of training. Half of them had no prior experience with simulations involving actors, and only a small number had limited experience performing resuscitation in the presence of parents.

Table 1
Demographic characteristics of participants (n = 76)

Participants		**n**	**%**
		76	**100**
Role	Physician	29	38.2
	Advanced practice registered nurse	18	23.7
	Registered nurse	18	23.7
	Nursing assistant	11	14.5
Gender	Female	63	82.9
	Male	13	17.1
Age (years)	20–29	19	25.0
	30–45	52	68.4
	> 45	5	6.6
Work experience (years)	0–5	28	36.8
	6–10	25	32.9
	11–15	13	17.1
	16–20	3	3.9
	21–25	4	5.3
	> 25	3	3.9
Work experience in neonatal care(years)	0–5	55	72.4
	6–10	11	14.5
	11–15	3	3.9
	16–20	4	5.3
	21–25	3	3.9
	> 25	0	0.0
Prior participation in simulations with parental presence	No	37	48.7
	Yes, < 6 months	11	14.5

CPR: cardiopulmonary resuscitation.

Participants		n	%
		76	**100**
	Yes, > 6 months	28	36.8
	0	18	23.7
	1–5	39	51.3
Number of CPR episodes with family presence in the past	6–10	10	13.2
	> 10	9	11.8
CPR: cardiopulmonary resuscitation.			

The median trait anxiety score was 8/20 (interquartile range [IQR] 6.0-9.5). A statistically significant decrease ($p < 0.001$) was observed in the mean state anxiety after the simulation, dropping to 6.44/20 (± 1.8 SD) from a pre-simulation mean of 7.89/20 (± 2.39 SD) among all participants (Fig. 1). No difference in the post-simulation median state anxiety score between nurses in charge of the parents (6.18/20) and nurses who were only in charge of the patient (6.20/20). However, nurses in charge of the patient orally expressed relief at knowing that the responsibility for parental support and communication was assumed by another team member. According to the univariate logistic regression analysis, participants with higher traits anxiety score (STAI ≥ 10, 75th percentile) exhibited a higher difference between the pre- and post-simulation anxiety levels.

Discussion

This study showed that a hybrid simulation program for parental presence during critical NICU situations was associated with a 20% reduction in healthcare professionals' perceived anxiety.

Our results align with those of our previous PICU study, which also reported reduced HCP anxiety related to parental presence during critical events [18]. Similarly, simulation programs incorporating actors and structured debriefing have been associated with improved clinician comfort when communicating difficult information to families in paediatric emergency settings [22]. However, in the absence of a control group, the reduction in anxiety should be interpreted with caution, as it may also reflect non-specific effects such as simple relief after completing the scenario, familiarisation with the situation, or a Hawthorne effect related to participation in a training exercise. Surprisingly, no significant difference in anxiety reduction was found between nurses responsible for family support and those primarily involved in patient care, possibly reflecting the limited sample size. Indeed, feedback from debriefing sessions suggested that having a dedicated HCP supporting the family allowed HCP involved in patient management to focus on clinical tasks, which may contribute to reducing perceived anxiety.

Participants' baseline trait anxiety scores were generally low, suggesting that most did not meet criteria for clinically significant anxiety [21]. This may reflect the relatively high level of experience in our cohort, as two-thirds of participants had more than five years of NICU practice and many had prior exposure to clinical simulation. Participants with higher baseline trait anxiety showed greater reductions in state anxiety after the simulation, suggesting that such training may be particularly beneficial for clinicians with less prior exposure to these situations, such as more junior staff.

The presence of a dedicated "family facilitator" to support parents during critical situations is considered a key factor for successful family presence, as recommended by medical societies [13–15]. In our study, this role was assumed by a nursing assistant or a nurse not directly involved in patient care and designated early by the team leader. This aligns with North American guidelines, where social workers or clergy often take on this role [14]. Although medical expertise is not required, the person supporting the family must feel comfortable in this role. Once the patient's condition stabilised, physicians and/or nurses managing the patient delivered appropriate medical updates to the parents.

A key strength of our program was the multidisciplinary debriefing involving HCP, actors, and a psychologist, specialised in emergency situations. The psychologist facilitated reflection on communication strategies and emotional responses during critical situations and underscored the importance of nonverbal communication, while actors portraying parents provided feedback on the support they received. This process helped participants better understand parents' perspectives and reflect on their own emotional reactions in a psychologically safe learning environment, which may have contributed to the observed reduction in anxiety, although this was not specifically evaluated.

Another strength of our program was the educational video, developed in collaboration with a psychologist and an attending physician. This video aimed to equip participants with essential communication strategies before the simulation. Its inclusion was a direct response to strong requests from participants in our previous PICU study, particularly those who reported elevated anxiety levels, due to the lack of theoretical support prior to the simulation.

Ideally, including a comparison group receiving only the educational video would have allowed us to evaluate the specific impact of this component. This study also has several limitations. Due to a technical error, individual pre- and post-simulation questionnaires could not be linked, preventing paired analyses and limiting our ability to precisely estimate within-person changes in anxiety. Another major limitation was the absence of a control group, which limits our ability to determine whether the observed reduction in anxiety was directly attributable to the hybrid program or to other factors, such as completing the simulation itself. Nonetheless, repeated training has been shown to increase participants' confidence [23].

Conclusion

In conclusion, this hybrid educational simulation program might alleviate HCP perceived anxiety during critical situations involving parental presence in a neonatal setting. Simulation-based training combining

communication preparation with a video, actors portraying parents, and multidisciplinary debriefing may help clinicians feel more prepared to manage family presence in high-stress clinical situations. Further studies including control groups and evaluating the impact on clinical practice as well as on patients' and parents' outcomes in the NICU are needed.

Declarations

Ethics approval and consent: This study involved exclusively healthcare professionals and collected no patient data, biological material, or health-related personal data. It therefore falls outside the scope of the Swiss Federal Act on Research involving Human Beings (HRA; RS 810.30, Art. 2) and did not require ethics committee approval. All participants provided written informed consent prior to enrolment. Participation was voluntary and data were handled anonymously throughout. **Consent for publication**: not applicable.

Availability of data and materials: All data are drawn from the questionnaires we used in our study and are available on request, by emailing the corresponding authors.

Competing Interests: no competing interests

Funding: no external funding

Authors' contributions:

C.F.C. and F.B.M. made substantial contributions to the conception and the design of the work, led all the simulation sessions, wrote the main manuscript, this is the reason why they share the first authorship.

T.C. made substantial contributions to the conception and the design of the work, participated in the simulation sessions, and wrote the draft of the manuscript.

F.C. contributed to the conception and the design of the work, analysed the data and prepared figure 2-3, and reviewed the manuscript.

A.P. analysed and interpreted the data and revised the manuscript critically.

A.B. contributed to the conception and the design of the word, participated in simulation sessions, prepared figure 1, and critically revised the manuscript.

All authors reviewed and approved the manuscript and agreed to be accountable for all aspects of the work.

Acknowledgements: We thank the "Fondation Privée des HUG" for funding our simulation program with actors.

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Figures

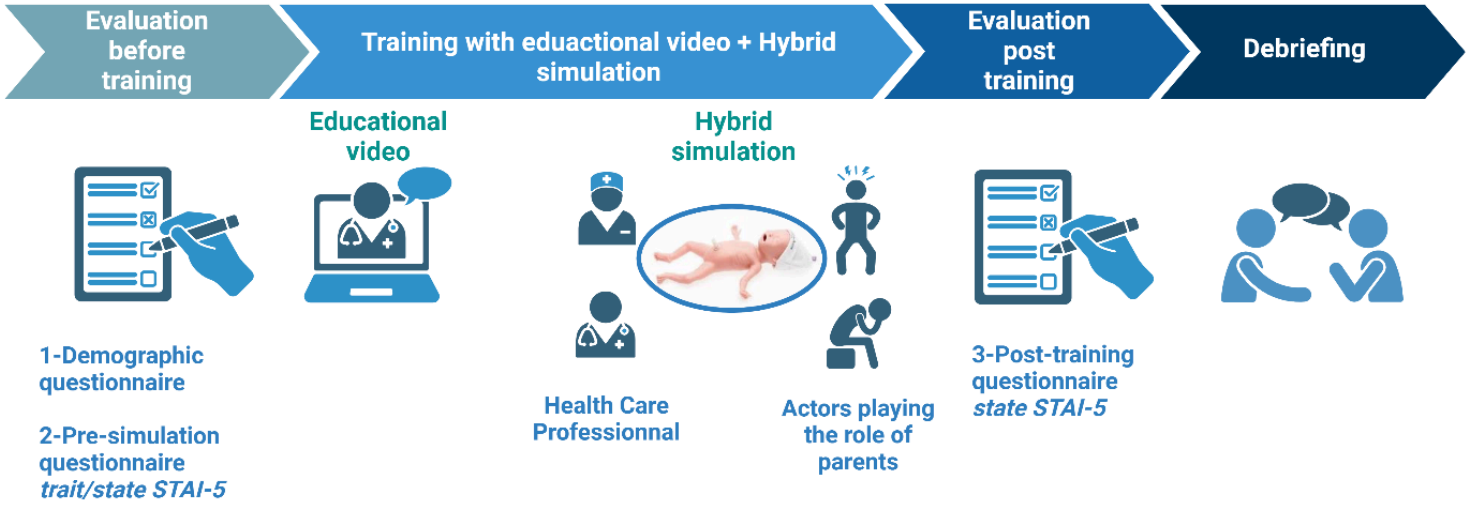


Figure 1

Study design.

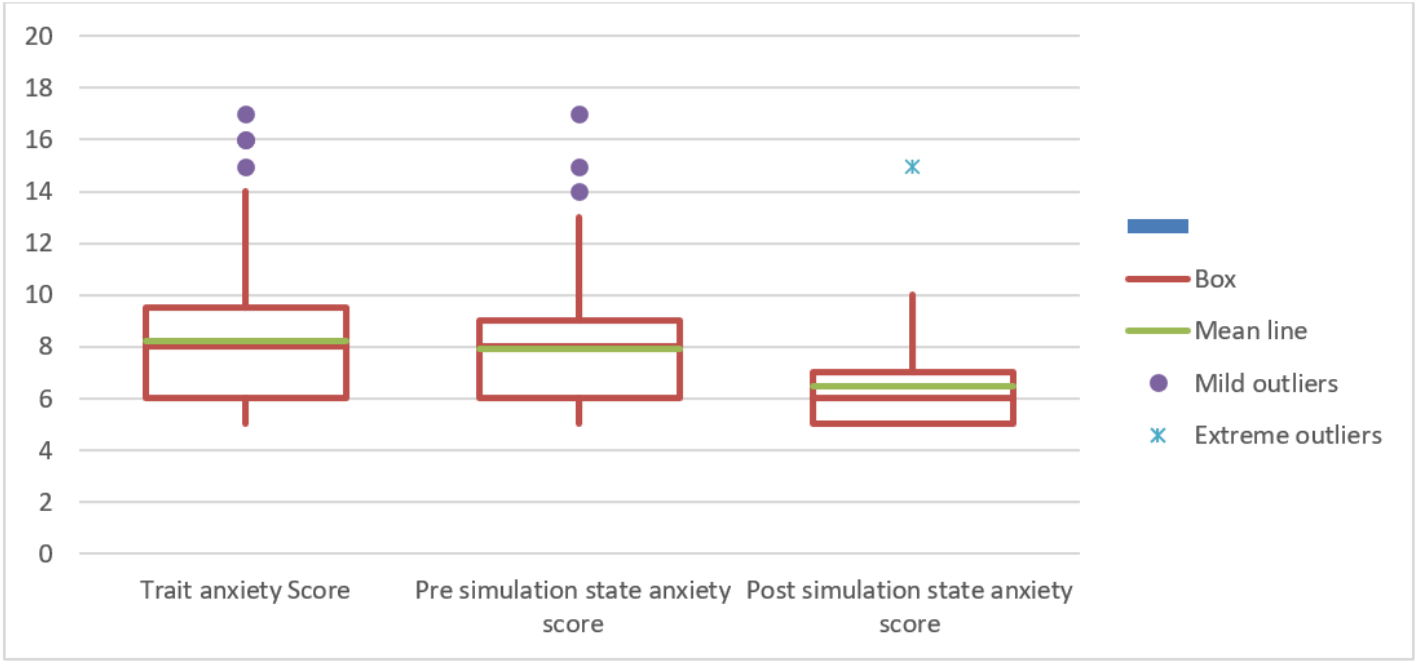


Figure 2

mean trait anxiety score and mean pre and post simulation state anxiety score.

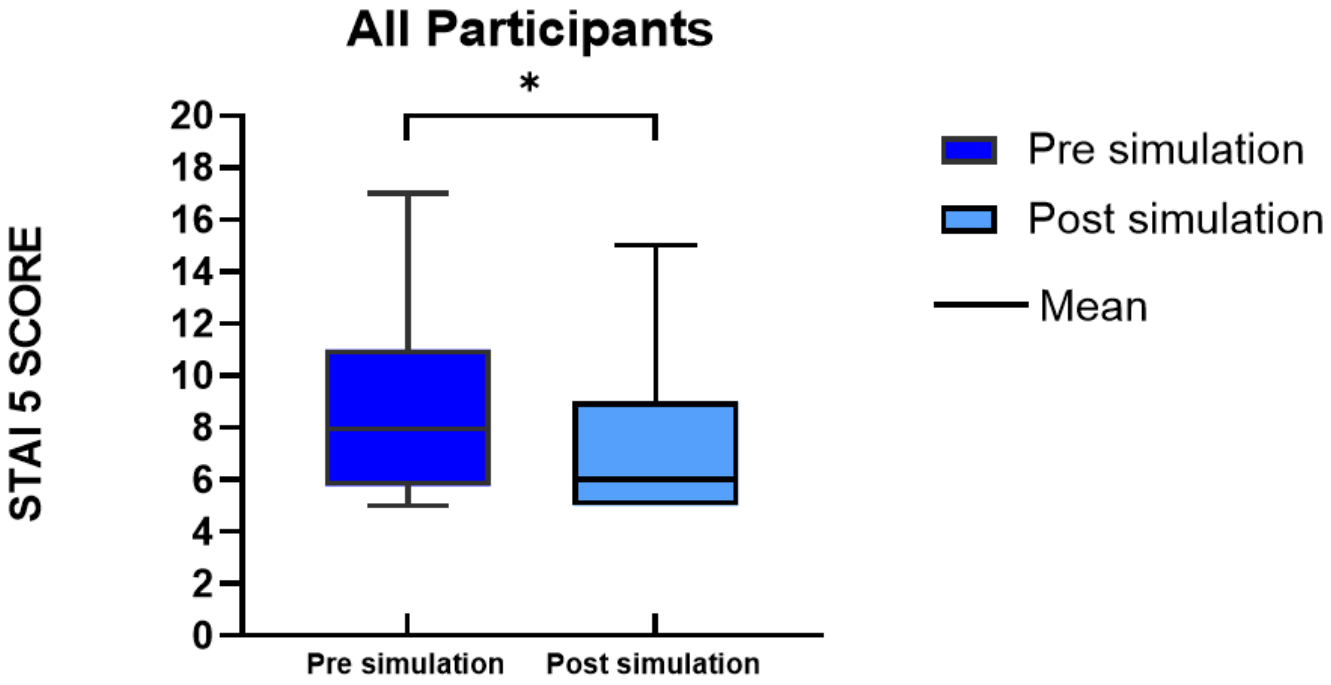


Figure 3

comparison between pre- and post- simulation anxiety score for all participants.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementarymaterialNICUsimulation.docx