Enhancing Resident Preparedness and Confidence for Care of the Critically Ill Newborn: Development of a Novel Simulation-Based Bootcamp

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Background

Recent ACGME changes have reduced pediatric residents' exposure to intensive care settings, leading to potential skill and knowledge gaps.

Simulation is an effective method for enhancing clinical preparedness and confidence in high-acuity settings. Management of respiratory decompensation in neonates requires especially rapid and skilled intervention. On a pre-intervention survey, pediatric residents recruited in this study identified simulation and case-based discussion as a preferred method of learning.

Objective

A 3-hour neonatal intensive care unit (NICU) simulation bootcamp was developed to prepare first-year pediatric residents for their second-year NICU rotation.

Methods

Participants: 20 first-year pediatric residents. The bootcamp was run Spring 2024 and Spring 2025.

Intervention: Simulation bootcamp featuring high-fidelity scenarios focused on neonatal respiratory emergencies. Participants rotate through three cases:

a) Pneumothorax requiring needle decompression
b) Acute Respiratory Distress Syndrome requiring intubation and surfactant administration
c) Advanced neonatal resuscitation requiring intubation, compressions, and code medication administration

Assessment: 12-item Likert-scale skills survey (1 = I am unable to complete this to 5 = I can complete this without supervision), administered pre- and post-intervention. The survey assessed confidence in tasks such as NRP implementation, PPV, intubation, ventilator management, and x-ray/blood gas interpretation. A 10-question knowledge-based quiz focused on the same topics was also administered pre- and post intervention

Data Analysis: Paired t-tests conducted on survey responses and question-level scores; 95% confidence intervals computed to assess for statistical significance.

Results

Table 1: Readiness Survey Results

Skill Assessed	Pre-Mean	Post-Mean	p-value	95% CI Diff
Implementing NRP in the delivery	2.65	3.3	0.002	(0.26-1.07)
Preparation of the radiant warmer in the delivery room	3.25	3.65	0.017	(0.07-0.7)
Administering PPV	2.9	3.75	<0.001	(0.53-1.2)
Performing intubation on neonate	1.3	2.65	<0.001	(1.02-1.69)
Placement of a laryngeal mask airway	1.35	2.0	0.001	(0.31-1.09)
Providing chest compressions	2.25	3.45	<0.001	(0.83-1.49)
Placement of umbilical lines	1.15	1.8	0.002	(0.26-1.03)
Interpreting neonatal chest x-ray	2.65	3.65	<0.001	(0.66-1.34)
Interpreting blood gas results	3.15	4.05	<0.001	(0.63-1.17)
Determining MV initial settings	1.75	2.85	<0.001	(0.81-1.49)
Adjusting MV settings based on BG, XR, clinical change	1.95	2.95	<0.001	(0.65-1.35)
Identifying abnormal vital signs for neonates	2.8	3.5	0.027	(0.09-1.29)

Table 2: Knowledge Assessment Results

Mean Difference	8.4%
Standard Deviation	21%
n	20
T-Statistic	1.77
P-Value (2-tailed)	0.093

Conclusions

There was a statistically significant improvement in self-reported confidence ($p < 0.05$) for all skills on the readiness survey. Although there was a mean increase of 8.4% in knowledge assessment results, this increase was not statistically significant ($p=0.093$).

Next steps

This study will be strengthened by increasing sample size and introducing a control group.

Future direction will include longitudinal follow up with participants, continued data collection with cohort three, and comparative analysis with interns who did not complete the bootcamp.

References

Weiner, G. M., Zaichkin, J., & American Academy of Pediatrics. (2021). *Textbook of Neonatal Resuscitation (NRP)*, 8th edition. American Academy of Pediatrics.