

Strengthening Pediatric Trauma Readiness in Rural Critical Access Hospitals: A Simulation-Based Educational Intervention

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Problem

- Rural critical access hospitals provide essential emergency care but have limited access to pediatric specialty training. Pediatric trauma is a low-frequency, high-risk event, making it difficult for nurses to maintain competence (McCafferty et al., 2017).
- Unintentional injury is the leading cause of death in children ages 1–14 (CDC, 2025).
- Approximately 1 in 5 children live in rural communities where pediatric resources are limited (Bettenhausen et al., 2021).

PURPOSE

To evaluate whether an in-situ high-fidelity pediatric trauma simulation improves:

- Pediatric trauma knowledge
- Nurse confidence in managing pediatric trauma among emergency department nurses working in a rural critical access hospital.

Available Knowledge

- Current literature demonstrates:
 - Higher pediatric readiness is associated with lower pediatric mortality (Lieng et al., 2021).
 - Rural hospitals often have lower pediatric readiness because pediatric emergencies occur infrequently (Pilkey et al., 2018).
 - High-fidelity simulation improves knowledge, confidence, and clinical performance (La Cerra et al., 2019).
 - There is limited research evaluating simulation specifically in rural emergency departments and pediatric trauma.

Rationale

- Kolb's Experiential Learning Theory
- Simulation allows participants:
 - To safely practice rare pediatric emergencies
 - Reflect during debriefing
 - Transfer learning into clinical practice



Kolb's Experiential Learning (McLeod, 2025)

Methods

- **Context**

- Rural Midwestern Critical Access Hospital- Level IV Trauma Center
- County population ~15,000
- One emergency department serving the county
- Interprofessional emergency care team with limited staffing

- **Intervention**

- High-fidelity in-situ pediatric trauma simulation
- Simulated high-acuity, low-frequency pediatric trauma case
- Multiple sessions to accommodate staffing and provide interprofessional collaboration
- Followed INACSL simulation standards
- Debriefing completed after each simulation

Methods

- **Study of Intervention**

- RNs completed anonymous pre- and post-simulation surveys measuring pediatric trauma knowledge and confidence.
- Surveys were paired using a unique 6-digit code to maintain participant anonymity.
- Electronic surveys were completed via Google Forms

Data Analysis

- **Measures**

- Investigator-developed pre/post survey
- 2 demographic questions (RN experience and critical access hospital experience)
- 5 multiple-choice questions assessed pediatric trauma knowledge
- 5 items (0–10 scale) measured confidence in managing pediatric trauma
- 1 open-ended question explored perceived improvements in confidence

Data Analysis

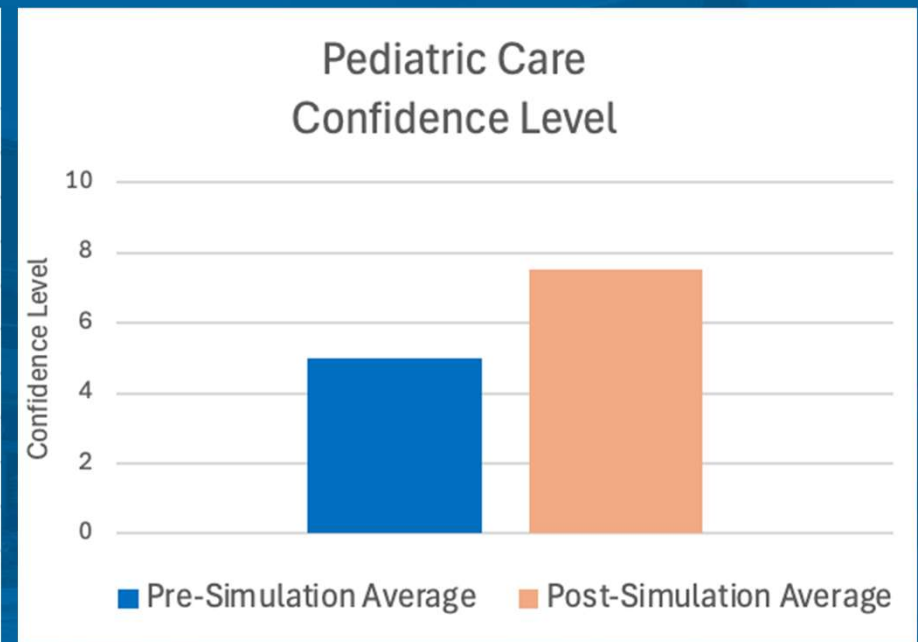
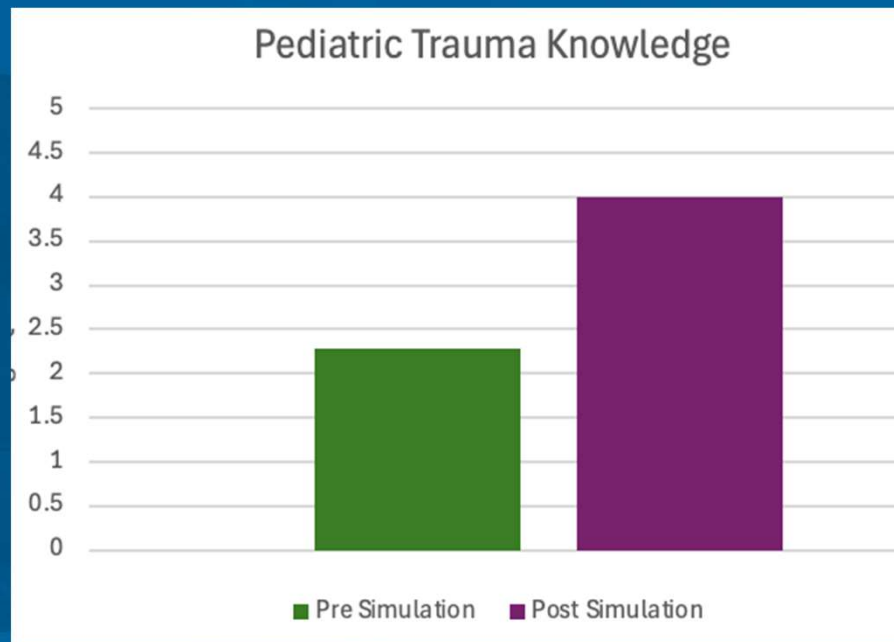
- **Data Analysis**

- Pre- and post-surveys were linked using a unique participant identifier.
- Descriptive statistics summarized participant characteristics and outcomes.
 - Means
 - Standard deviations
 - Ranges
- Paired *t*-tests compared pre- and post-simulation knowledge and confidence scores.
- Open-ended responses were analyzed for common themes.
- Data analyzed using Microsoft Excel.

Results

- Fourteen registered nurses completed both the pre- and post-intervention surveys and were included in the analysis.
- Following the in-situ pediatric trauma simulation, participants demonstrated statistically significant improvements in both confidence and knowledge.
- Mean confidence scores increased from **5.00** to **7.53** ($t = -5.79, p = .01$), while mean knowledge scores increased from **2.29** to **4.00** ($t = -4.31, p = .001$).
- Participants also reported increased confidence with pediatric trauma skills, including chest tube setup, intraosseous (IO) access, and use of the Broselow tape.

Results



Discussion

- In-situ pediatric trauma simulation significantly improved nurses' knowledge and confidence in managing pediatric trauma.
- Simulation provided a realistic, hands-on learning experience within the participants' own emergency department, promoting clinical decision-making, teamwork, and skill development.

Discussion

- Findings support simulation as an effective educational strategy for preparing rural emergency department nurses for low-frequency, high-risk pediatric emergencies.
- This project adds to the growing evidence supporting simulation-based education in rural critical access hospitals, where pediatric trauma cases are encountered infrequently.

Discussion

- This project has identified limitations:
 - Small sample size ($n = 14$)
 - Conducted at a single rural critical access hospital
 - Outcomes measured immediately after the simulation; long-term retention was not evaluated

Conclusions

- In-situ pediatric simulation is an effective educational strategy for rural critical access hospitals.
- Simulation is a feasible and sustainable educational strategy that can be implemented in rural settings without dedicated simulation centers.
- Simulation improved preparedness for low-frequency, high-risk pediatric trauma events.
- Future efforts should:
 - Incorporate routine pediatric simulation
 - Evaluate long-term knowledge retention
 - Expand to additional pediatric emergency scenarios
 - Assess impact on patient outcomes

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