Pediatric Continuous Renal Replacement Therapy High Fidelity Simulation

Sara Hoatlin, BSN, RN, Katie Plomaritas, BSN, RN,
Kera Luckritz, DO, MPH

C.S. Mott Children's Hospital, University of Michigan Health, Michigan Medicine

Background

Continuous Renal Replacement Therapy (CRRT) is a low-use, high-risk therapy in many pediatric hospitals and requires specialized knowledge and skills. Due to its complexity, high fidelity simulation offers a realistic and safe environment for nurses to develop and refine their skills. Unit A is a high census CRRT unit, with about 65% of our institution's CRRT days, and Unit B is a low census CRRT unit with about 35% of our CRRT days.

Methods

Three clinical scenarios were developed modeling real and hypothetical clinical situations. Roles were assigned prior to each scenario and a debrief was completed after each scenario. Participants were asked to complete anonymous pre and post self-assessments of their confidence in 10 categories. Assessments were reported based on a 5-category Likert Scale of Not Comfortable to Very Comfortable. Wilcoxon rank-sum test was performed for pre-post responses with Stata 18.0. Aggregate scores were calculated for each category by average the numerical value of each response. Scores were compared pre- and post-scenario to calculate absolute and percent change scores.

Clinical Scenarios Highlighted core practices

- Safety checks
- Anticoagulation
- Interdisciplinary communication
- Machine alarms
- Clinical CRRT related emergencies

Roles Assigned prior to each scenario

- Bedside nurse
- Superuser
- Charge nurse
- Observer

Evaluation Self-reported confidence with tasks

1. Overall care of the CRRT patient
2. Adjusting flow rates
3. Troubleshooting pressure alarms
4. Troubleshooting weight/flow alarms
5. Documentation in EMR
6. Hourly fluid calculations
7. Titrating citrate and calcium infusions
8. Calling the pediatric nephrologist
9. Calling the superuser for assistance
10. Calling peers for assistance

Results

Results were analyzed in aggregate (Fig. 1) and by participant role (Superuser, Bedside Nurse for Unit A or B) (Fig. 2). Changes in pre-post responses were significant for all tasks ($p<0.005$) except calling the superuser or peers (Q9 & Q10). This finding was true for all respondent groups.

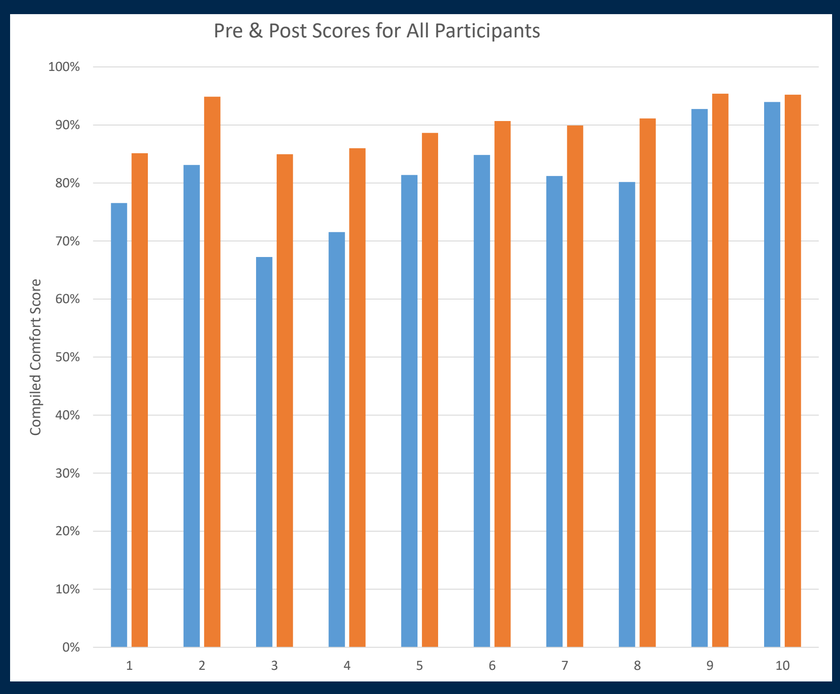

Figure 1. Self-reported pre and post confidence levels for all participants.

Pre-survey, Unit B nurses reported the lowest confidence in all tasks (Fig. 2b) and demonstrated the greatest improvement in scores.

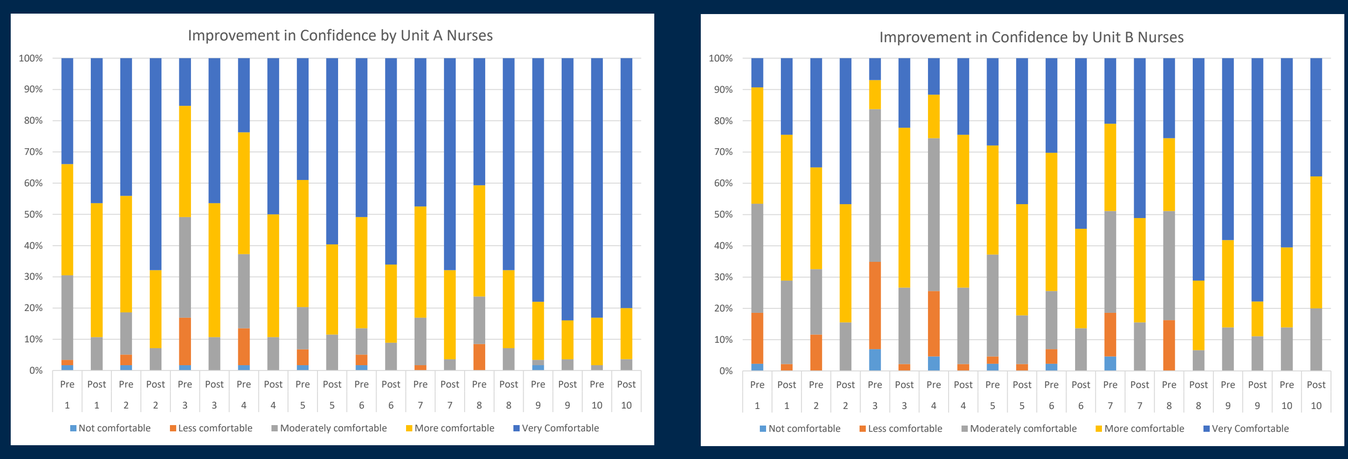

Figure 2. Self-reported confidence levels by nursing; a) Unit A, b) Unit B

Superusers had the smallest change in confidence levels and these differences were not statistically significant. This is likely due to their high self-confidence levels pre-simulation.

Conclusions

Nursing confidence levels related to the care of the pediatric CRRT patients improved for almost all tasks after participating in high fidelity simulation. Unit B, low CRRT census, received the greatest benefit from the simulation with the highest improvement in confidence scores. This suggests that simulation is a high-yield educational tool for maintaining nursing competencies in low volume settings.

The superusers are considered the subject matter experts and this likely explains the lowest improvement in their scores, as they were already self rating with high confidence levels. The finding of modest and statistically insignificant improvement for superusers suggests that superusers would more likely benefit from more advanced training than the typical bedside nurse.

Positive feedback was unanimously provided by participants. Limitations include the anonymity of respondents, precluding paired analyses or separation of findings by simulation session.

Contact Information: Sara Hoatlin, Pediatric CRRT Educational Nurse Coordinator, smaksym@med.umich.edu; Katie Plomaritas, Pediatric CRRT & TPE Clinical Care Coordinator, kspace@med.umich.edu; Kera Luckritz, DO, MPH, Medical Director Pediatric Dialysis, keral@med.umich.edu