JOURNAL OF CONTEMPORARY MEDICAL EDUCATION, 2018
VOL 6, NO. 1, PAGE 24-28
10.5455/jcme.20170601011450

eJM eJManager

SHORT COMMUNICATION

Open Access

A refresher course combined with self-directed practice to improve neonatal resuscitation knowledge and skills in United States pediatric residents: Randomized pilot study

Chiamaka Umeh Aneji[1], John Chapman[1], Michelle Tatum[2]

[1]Division of Neonatal Perinatal Medicine, Department of Pediatrics, McGovern Medical School, University of Texas Health Science Center at Houston, Houston, TX, USA

[2]Neonatal Intensive Care Unit and Pediatrics, Memorial Hermann The Woodlands Texas, Houston, TX, USA

ABSTRACT

Purpose: The Accreditation Council for Graduate Medical Education mandates pediatric residents complete training and maintain competence in neonatal resuscitation. Demands on resident training time requires the development of effective strategies to address the longstanding problem of knowledge and skills attrition following standard neonatal resuscitation program courses. The study aims to assess whether an intensive neonatal resuscitation refresher training course improves resuscitation knowledge and skills of residents.

Methods: A prospective, cluster-randomized controlled trial of different training modules. The control group (CG) completed the traditional month long rotation. The intervention group (IG) got this in addition to an intensive neonatal resuscitation refresher course and also weekly self-directed skills practice over the course of the rotation month.

Results: The IG had a greater increase in resuscitation knowledge and skills from baseline compared to the CG by the end of the rotation month. There was no significant difference in knowledge at the end of the month (p = 0.92) or at 6 months (p = 0.16) between the two groups. There was a trend toward statistical significance (p = 0.047) at the end of the rotation month in skills between the two groups, but no significant difference in skills between the two groups at 6 months (p = 0.96) from baseline. Within the IG, there was however a significant difference in resuscitation skills at the end of the month (p = 0.00024).

Conclusion: The intervention led to improvement in neonatal resuscitation skills but did not appear to be superior to the traditional training model.

ARTICLE HISTORY

Received June 01, 2017
Accepted August 24, 2017
Published January 12, 2018

KEYWORDS

Neonatal; resuscitation; pediatric resident; simulation; education

Introduction

The Accreditation Council for Graduate Medical Education mandates pediatric residents complete training and maintain certification in neonatal resuscitation [1]. The neonatal resuscitation program (NRP), launched in 1987 by the American Academy of Pediatrics and the American Heart Association, is the accepted standard for teaching neonatal resuscitation [2]. Typically, newborn resuscitation is taught at the beginning of the residency-program training period. However, a significant time lapse from initial training to the time of neonatal intensive care unit (NICU) rotation can occur [3]. Retention of knowledge and skills learned in standardized courses has been shown to last only 6–12 months [4]. Demands on resident training time continue to evolve. The development of more effective and efficient training methods that ensure better retention is imperative. High fidelity simulation does not appear superior to low fidelity simulation [5]. Bender et al. [6] reported that a single simulation-enhanced booster session

Contact Chiamaka Umeh Aneji ✉ Chiamaka.Aneji@uth.tmc.edu Division of Neonatal Perinatal Medicine, Department of Pediatrics, University of Texas Health Science Center at Houston, 6431 Fannin Street, MSB 3.256, Houston, TX 77030, USA.

9 months after the initial NRP course measurably differentiated 15-month procedural skills and teamwork behaviors from those not receiving the booster [6]. Brief bedside booster cardiopulmonary resuscitation (CPR) training improves CPR skills retention [7].

The study objective was to assess whether intensive training which combines an instructor-led refresher course with a series of brief, self-directed skill practice sessions using a low fidelity mannequin during the NICU rotation improves neonatal resuscitation knowledge and skills of pediatric residents in one urban hospital.

Primary Hypothesis: The intervention group (IG) will have a greater change in their knowledge and skills scores by the end of the month when compared to the control group (CG).

Secondary Hypothesis: The IG compared to CG will show greater retention of both knowledge and skills at the end of 6 months.

Materials and Methods

The study is a prospective, randomized controlled trial of different training models. Pediatric residents rotating through the NICU at one large urban academic center in Houston, TX between December 2013 and December 2014 were eligible for enrollment. The training program traditionally assigns rotation blocks 1 year ahead and postgraduate year (PGY) 2 and 3 residents are simultaneously scheduled so the study could not match residents by year of training or length of time from NRP Course.

Each month, the residents on the NICU rotation were approached for enrollment in the study. A total of twelve sealed opaque envelopes, evenly divided into CG and IG assignments were placed in a box. The study instructor on day one of each NICU rotation month randomly selected and opened one envelope that randomized the group of residents for that month into either IG or CG. A database of 40 multiple choice questions to assess newborn resuscitation according to the 6th edition of NRP was developed and tested. Individual 10 item pre- and post-questionnaires were developed utilizing randomly selected questions from this database. Passing score was 80%.

A skill assessment simulation (SAS) check-off tool was developed from the advanced skills stations of NRP 6th edition to assess resuscitation skills. Three hospital-based NRP instructors completed a standardized 1-hour training before the start of the study using the SAS to ensure concordance in their grading of all skills sessions. The refresher course and all SAS sessions were administered by these three instructors using a low fidelity mannequin and all the necessary resuscitation materials. The mannequin was utilized for the simulation sessions and provides feedback when adequately ventilated using a bag and mask ventilator. Thirty-five out of forty-four points (80% of possible points) and correct performance of the six required skills were required to achieve a "passing" score.

Residents in the CG completed a pretest questionnaire on their first or second day of NICU rotation and their SAS1 administered by the instructor. No feedback was provided at the end of the skills session. They then completed the routine NICU rotation (see Figure 1). At the end of the month and at 6 months follow-up, they completed a posttest and SAS3 and 4, respectively.

Residents in the IGs each completed the pretest and SAS1 on their first or second day of NICU rotation month administered by the instructor. To review and practice resuscitation skills, the instructor then led the group in a hands-on intensive 1 hour NRP refresher course. The focus was on equipment check, initial steps in resuscitation, positive pressure ventilation, chest compressions, and medication administration utilizing the performance checklists 1, 2, 3, 4, and 6 from the NRP 6th edition Neonatal Resuscitation manual. They repeated a SAS2 at the end of this training. Feedback was provided after completion of both SAS1 and 2. In addition, the IG performed weekly 10 minutes self-directed skills practice sessions during their NICU rotation month. Utilizing the same standardized patient scenarios, the resident group would deliberately practice a mock code in the education room. At the end of the NICU rotation month, each resident completed a posttest questionnaire and SAS3 and 4. They repeated this at the end of 6 months (See Figure 2).

Statistics

Data analysis was performed using measures of central tendency, increase in knowledge and skills calculated for each study group and students *T*-test and paired *T*-tests were used for comparison.

Ethical Approval

The study was approved by the University of Texas Health Science Center at Houston Institutional Review Board HSC-MS-13-0456.

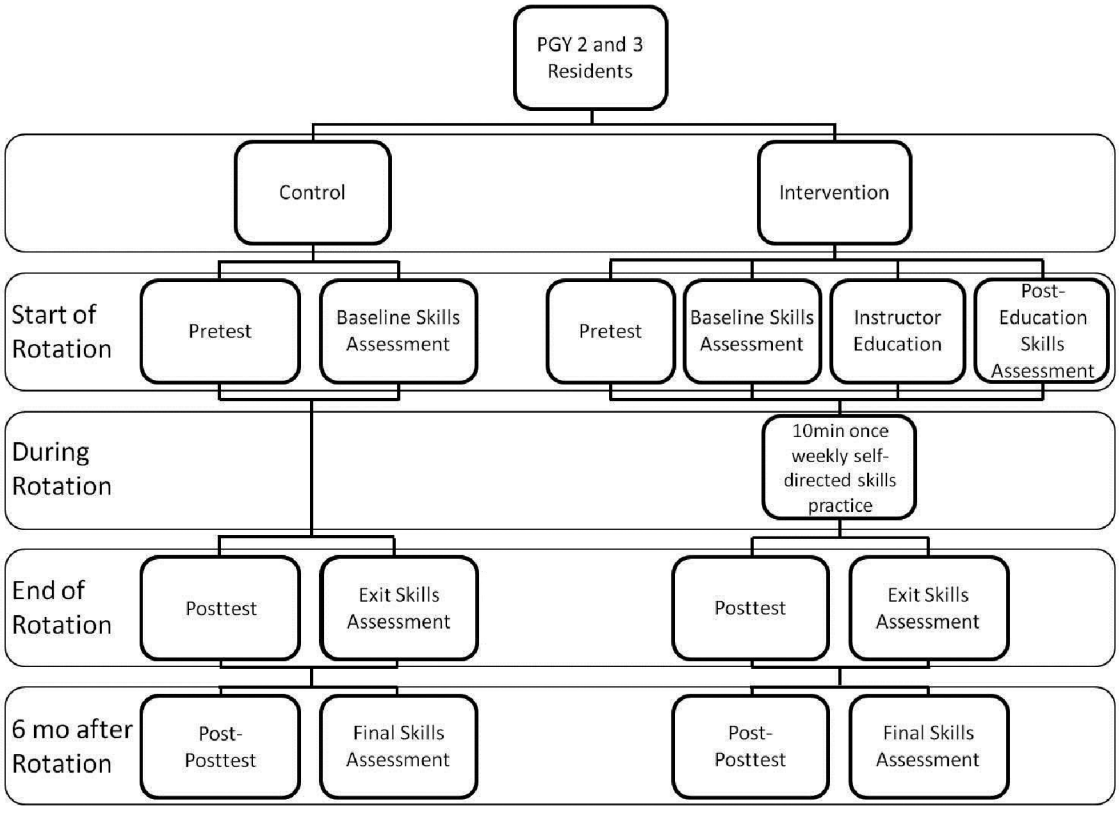

Figure 1. Routine pediatric neonatal resuscitation experience.

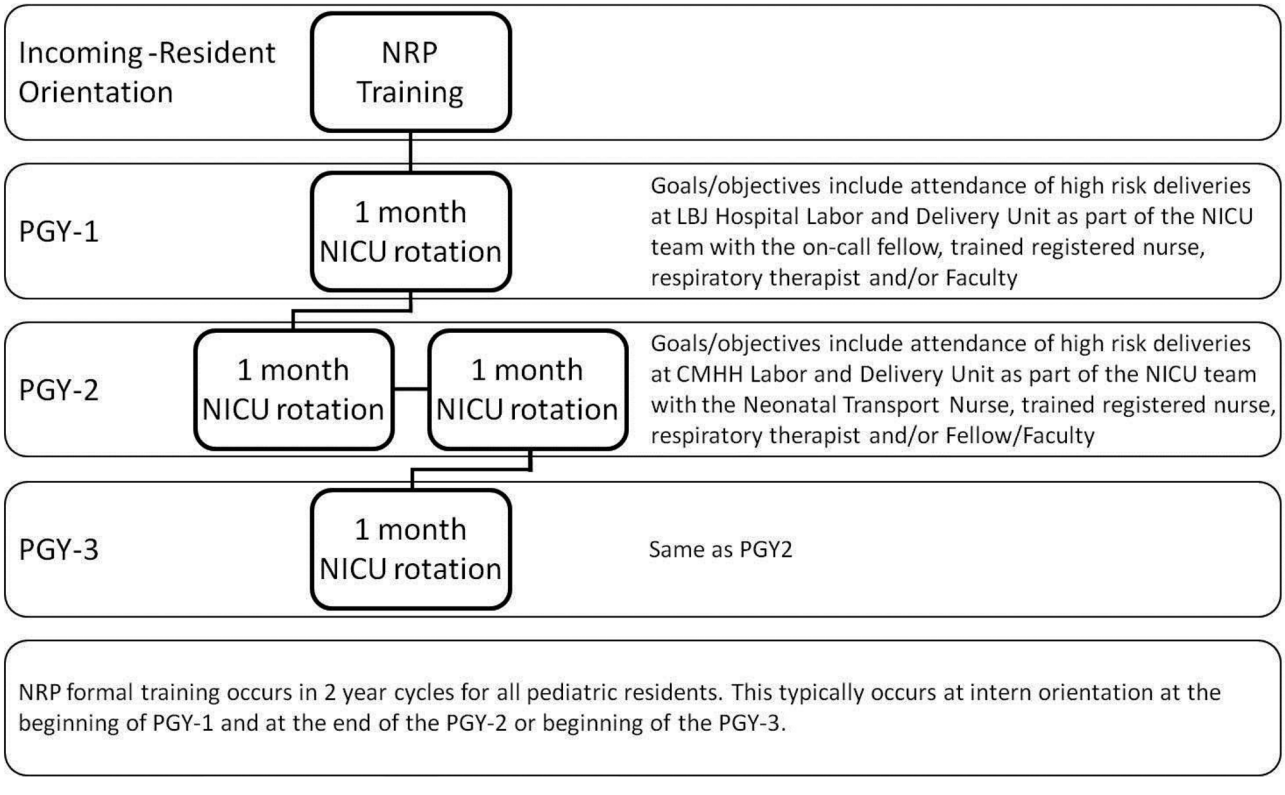

Figure 2. Study protocol.

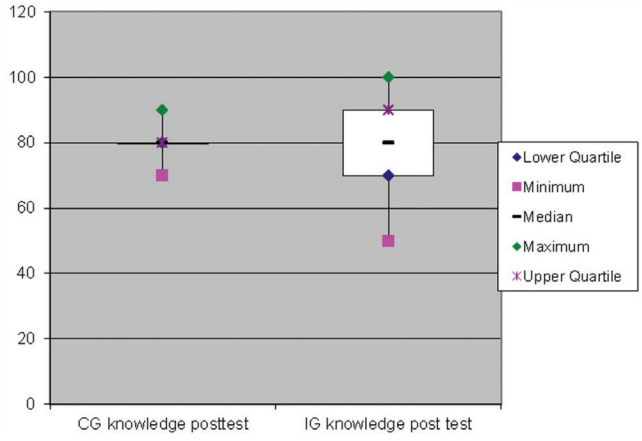

Figure 3. Resident knowledge scores at end of the month.

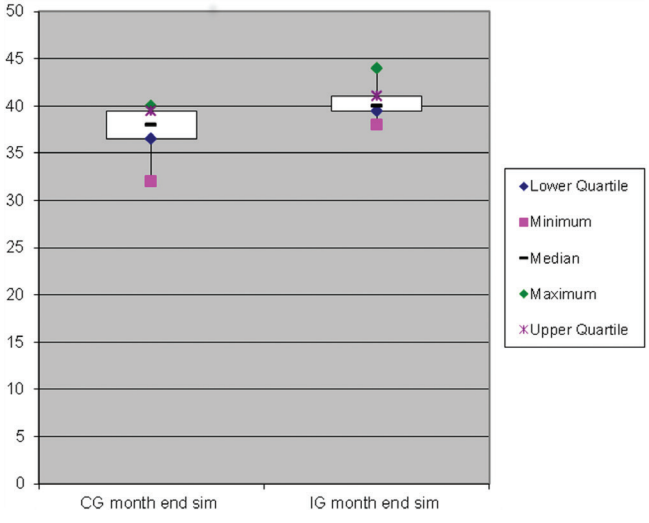

Figure 4. Resident skills scores at the end of the month.

Results

The study enrolled a total of 27 residents which is 56% of the eligible participants. Fourteen randomized to the CG and 13 to the IG. Of these, 17 were PGY 3 and 10 were PGY 2 residents. The two groups were comparable by year of training but not matched by length of time from NRP provider course.

There was an increase of 22% in knowledge scores in the IG compared to only 6.5% increase in the CG knowledge from baseline by the end of the rotation month (Figure 3). The IG neonatal resuscitation skills improved by 33% compared to only 4.7% in the CG group at the end of the month from baseline (Figure 4). A greater proportion of the IG attained passing scores in knowledge and skills, 100% and 83%, respectively, compared to only 67% for both knowledge and skills among the CG at 6 months follow-up.

There was no significant difference in knowledge at the end of the month (p = 0.92) or at 6 months (p = 0.16) between the two groups from baseline. There was a trend toward significance p = 0.047 at the end of month in skills between the two groups, but no significant difference in skills between the two groups at 6 months (p = 0.96) from baseline. There was, however, a significant difference in resuscitation skills within the IG at the end of the month (p = 0.00024).

Discussion

The study found greater increase in the knowledge and skills of the IG compared to CG at the end of the month, showing that actively instituting a refresher resuscitation course combined with more frequent but shorter duration self-directed learning are useful learning tools. The small sample size may account for why the differences between groups were not statistically significant. However, there was significant improvement in skills within the IG following the intervention suggestive of good uptake of the course.

Though we found retention in both knowledge and skills with the intervention, there was better retention of knowledge at 6 months. This is similar to the findings by Patel et al. [3] who noted that knowledge appeared generally better retained than skills.

Finally, the smaller increase in knowledge and skills at 1 month for the CG suggests that the routine NICU rotation was not comparable in efficacy to the intervention received by the IG, given that the IG had consistently greater increase in knowledge and skills.

The study limitations include small sample size secondary to the inability to enroll all eligible residents due to scheduling challenges. There were some baseline differences between the groups which may be explained by length of time elapsed between their NRP training and their last NICU rotation prior to study enrollment. The participants may have experienced a ceiling effect in their learning. The self-directed sessions were tracked only by resident self-reports. Some of the participants' 6 months follow-up was incomplete due to PGY 3 graduation prior to study completion. The Residency Program conducts its provider course every 2 years during the course of the residency which occurs at the end of second year or beginning of third year. This would positively affect retention of skills and knowledge, and the magnitude of the effect would be difficult to calculate or determine. This affected nine residents. To mitigate the effects,

the questionnaire was sent prior to the NRP test date, and the skills portion was completed prior to the NRP refresher for all 9 participants. Also, the knowledge test taken by the residents at 1 month and 6 months was unmonitored, making it possible to use an open book approach rather than to answer from recall.

The study strengths include having a CG which made it possible to compare the current practice of how the residents rotate through the NICU and the proposed intervention. Otherwise, we would not be able to observe the improvement during the NICU rotation month in the absence of this intervention.

The study intervention resulted in an improvement in neonatal resuscitation skills but did not appear to be superior to the traditional training model. However, the findings of greater change in knowledge and skills in the IG by the end of the rotation month compared to CG, in addition to the IG's improved retention of both knowledge and skills at the end of 6 months relative to the CG are promising. Further studies with larger sample sizes and in multiple sites are needed to assess superiority of monthly refresher NRP courses with monitored self-directed practice sessions over traditional teaching methods.

References

[1] Accreditation Council for Graduate Medical Education Pediatric Residents Required Competencies. IV.A.5.a to c [Internet]. Available via http://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/320_pediatrics_2016.pdf (Accessed 05 April 2017).

[2] Halamek LP. Educational perspectives: the genesis, adaptation, and evolution of the neonatal resuscitation program. Neoreviews 2008; 9:142–9.

[3] Patel J, Posencheg M, Ades A. Proficiency and retention of neonatal resuscitation skills by pediatric residents. Pediatrics 2012; 130(3):515–21; doi:10.1542/peds.2012-0149

[4] Duran R, Aladag N, Vatansever U, Kucukugurluoglu Y, Sut N, Acunas B. Proficiency and knowledge gained and retained by pediatric residents after neonatal resuscitation course. Pediatr Int 2008; 50(5):644–7; doi:10.1111/j.1442-200X.2008.02637.x

[5] Cheng A, Lin Y. The role of simulation in teaching pediatric resuscitation: current perspectives. Adv Med Educ Pract 2015; 6:239–48; doi:10.2147/AMEP.S64178

[6] Bender J, Kennally K, Shields R, Overly F. Does simulation booster impact retention of resuscitation procedural skills and teamwork? J Perinatol 2014; 34(9):664–8; doi:10.1038/jp.2014.72

[7] Sutton RM, Niles D, Meaney PA, Aplenc R, French B, Abella BS, et al. Low dose, high-frequency CPR training improves skills retention of in-hospital pediatric providers. Pediatrics 2011; 128(1):e145–51; doi:10.1542/peds.2010-2105