The quality of infant CPR during training class with a comparison between performance levels between specialists and non-infant professionals

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Abstract

More than 10 years of past studies have shown that the quality of cardiopulmonary resuscitation (CPR) correlates to patient survival and has been the basis of the AHA guidelines emphasizing quality of CPR. Although part of regular CPR training, little emphasis has been placed on the quality of infant CPR. The objective of this study is to examine the quality of infant CPR performance using high a fidelity feedback simulator during regularly scheduled CPR training at AHA training centers. Data was collected to examine whether there was a difference in quality of CPR performance between infant specialists and non-infant specialists.
A total of 170 participants who are required to take PALS/Neonate or basic infant CPR as part of their normal recertification were examined. Everyone was tested using infant training simulators that provided highly accurate digital measurement for all parameters of chest compressions and ventilations. A blind pre-test was administrated. Visual feedback was available during the post-test and participants we required to demonstrate a score of 70% for chest compressions and 60% for ventilations.
The Pre-Test showed that both groups performed poor quality CPR with no significant differences: infant specialist compression scores were 14.37% and non-infant specialist compression scores were 12.65%; specialist ventilation scores were 10.17% and non-specialist ventilation scores were 6.695%. The Post-Test required a target achievement level in order to have their certificate signed, but not all participants reached the target score with the feedback simulator. The Post-Test showed that the compression and ventilation scores were statistically significant between the two groups; infant specialists compression scores were 76.97% and non-infant specialists compression scores were 67.78%; specialist ventilation scores were 67.43% and non-specialists ventilation scores were 62.60%.
This study showed that both infant specialist and infant non-specialist need better infant CPR training as both groups fell far below acceptable performance levels. The data demonstrated that specialist with a focus on infants outperformed non-infant related specialists, however this study did not examine specific causes for this. We speculate it could be due to specialists' nature and detail for infant care, or having received more than one infant training sessions every two years such as taking the additional PALS course. This should be examined further in a future study.

Introduction & Purpose

Much research focuses on adult resuscitation, CPR quality, and neurological outcomes, and understandably so as cardiac arrest occurs far more frequently in adults than children. Nevertheless, thousands of children are admitted annually to hospitals nationwide due to sudden cardiac arrests. Overall consensus on CPR quality on adults and children points to the need to improve. Various studies reported issues with CPR quality performance by professionals, with one highlighting difficulty of performance in pediatric chest compression during resuscitation(1), and even lower performance in younger patient(2), with leaning on chest compressions being common(3). Few other studies found hyperventilation is prevalent in pediatrics mock codes(4), older children and adolescents(5), as well as adults(6). A small number of studies provide detailed data on pediatric CPR performance for before and after training(7,8,9). This study aims to provide up-to-date data on whether CPR quality for infants has improved since those earlier studies, and we examine whether there is a different between how pediatric specialists perform and non-pediatric specialists during their regular recertification training.

The purpose of this study is to examine infant CPR quality performed during regularly scheduled CPR training within AHA training centers between professionals who deal with infants (infant specialists) and professionals who don't deal with infants but are required to take a BLS course which includes infant CPR (non-infant specialists). This study uses a standard pre-test post-test design where the intervention is training with a high fidelity visual feedback manikin. The post-test set a required target threshold score to be achieved.

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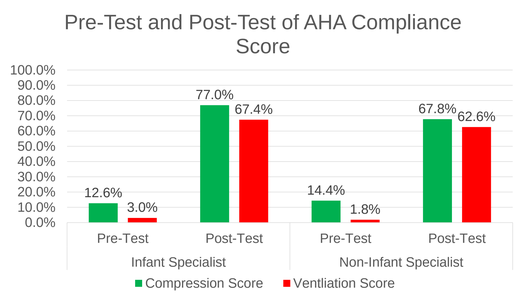
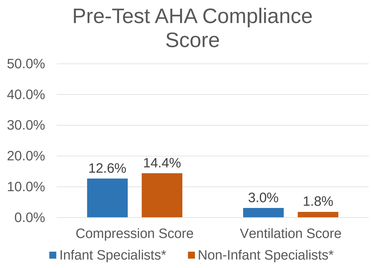
Materials & Methods

Over two years, a total of 170 infant specialist and non-infant specialist, who were all employed in hospitals with an infant care department, attended their regularly scheduled recertification program at their respective training centers. Infant specialists take recertification courses (BLS, PALS and/or a Neonate course). Non-infant specialists take a BLS course that includes pediatric resuscitation. No participants had previous exposure to the SmartMan Infant® high fidelity feedback simulator. It was used as the measurement device and it was used for the intervention. During the pre-test, instructors worked one-on-one with participants, They reviewed the AHA course outline for CPR and rescue breathing. Each person then performed on the infant simulator without access to feedback. After the pre-test, participants were shown their performance and given details on the parameters for compressions and ventilations. If needed they were shown how to improve. Participants went through the course and then performed again on the simulator. During the post-test, they had access to visual feedback and were given a target threshold of 70% chest compressions and 60% ventilations to achieve in order to pass the course. If the target could not be achieved, the instructor would review the skills performance and the participant was given more attempts until the target was reached. Best scores were analyzed and were statistically compared using two tailed t-test.

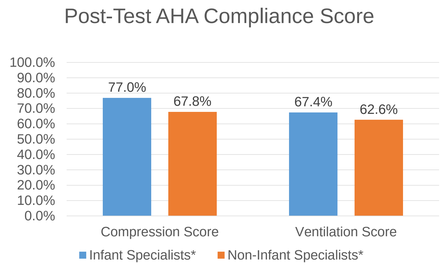
Results



Graph 1: Pre- and Post- Test scores of infant specialists and non-infant specialists.



Graph 2: Pre-Test scores of infant specialist and non-infant specialist. *No significant difference between the two groups



Graph 3: Post-Test scores of infant specialist and non-infant specialist.*Significant difference between the two groups in compression (t=4.6293, p<0.0001) and ventilation (t=2.6793, p<0.01) performance.

		Compliant Compression Score	Compliant Ventilation Score
Infant Specialists	**Pre**-Test	12.65%	3.05%
	Post-Test	76.97%	67.43%
Non-Infant Specialists	**Pre**-Test	14.37%	1.83%
	Post-Test	67.78%	62.60%

Table 1: Pre and Post test scores of infant specialist and non specialist.

	Two Tailed T Test Values of Infant Specialist vs Non-Infant Specialist	
n = 170	Compression	Ventilation
Pre-Test	t = 0.5766, p > 0.5	t = 0.8869, p > 0.35
Post-Test	t = 4.6293, p < 0.0001	t = 2.6793, p < 0.01

Table 2: Result of two tailed t test for Pre- and Post- Test scores between infant specialist and non-infant specialist.

Discussion

The post-test revealed a significant improvement in scores by both groups. Infant specialists went from 12.6% to 77% on compressions and 3.0 to 67.4% on ventilations. Non-infant specialists went from 14.4% to 67.8% on compressions and 1.8% to 62.6% for ventilations. Ventilations had lower scores for both groups but large gains were shown in the post-test as well. 3.0% to 67.4% for specialists and 1.8% to 62.6% for non specialists. See details in **Graph 1**.

Specialist benefitted more from the intervention that non specialists. A two tailed t-test for pre-test baseline in **Graph 2** and **Table 2** showed no significant difference between the two groups' compliant compression ($t=0.5766$, $p>0.5$) and ventilation ($t=0.8869$, $p>0.35$) score. Results shown in **Graph 3** for post-test scores, show a significant different between the two groups. A two tailed t-test demonstrated that specialists improved significantly more both on chest compression ($t=4.6293$, $p<0.0001$) and ventilation ($t=2.6793$, $p<0.01$) That is, those who had a specialist designation focusing on infants improved significantly more than non specialists when given access to the better equipment with real time feedback.

Conclusion

This study shows that without an emphasis on the Quality of infant CPR, and without investment in higher fidelity training equipment with accurate feedback, ability has remained poor. This finding is consistent with the many studies on performance of adult CPR.

In this case, better equipment with feedback produced people with a higher ability to perform the skills required. This study raises the issue of whether it is better to invest more in specialists versus non specialists for emergency response, but further study is required to help tease out the interaction of influences. One of the limitations of this study is the influence of the intervention and the influence of setting a target achievement score cannot be dissected.

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