Resident CPR Improvement Using A Biofeedback Device

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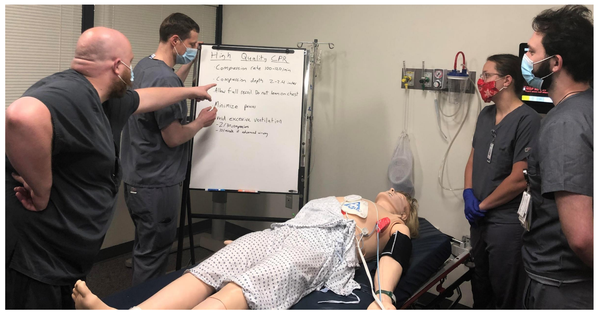
ABSTRACT

This study seeks to determine if a brief educational session on the use of a biofeedback device improves delivery of high-quality CPR by Emergency Medicine residents. Residents received brief education to interpret and adjust their technique based on the real time biofeedback data to achieve high-quality CPR. There was a statistically significant difference in high quality CPR provided by residents after a brief educational session (21.7% vs 71.7%, p=0.0006, 95% CI 33.43-66.57).

INTRODUCTION

- Emergency Medicine physicians are trained to be experts at cardiopulmonary resuscitation.
- High quality CPR is a surrogate marker of improved survival.[1]
- American Heart Association parameters for high quality CPR are:
  - Compression depth of 2–2.4 inches
  - Compression rate of 100–120 per minute
  - Release speed greater than 400 mm per second.
- One study found that only 29% of resident physicians could compress a mannequin properly.[2]
- Short interval practice of CPR using a visual feedback device and verbal coaching improves the proportion of learners able to perform high quality CPR.[3]



MATERIALS & METHODS

During educational conferences on two dates, Emergency Medicine resident physicians were split into three groups and ran a simulated resuscitation of a patient in cardiac arrest. The total residents numbered 24 in March and 18 in September. Residents were unaware their performance would be recorded. The residents performed CPR on a mannequin equipped with the biofeedback device and monitor. The monitor displayed and recorded compression depth, rate, and release speed for each group's simulation. The percent of time each parameter met American Heart Association recommendations was recorded. Residents then received brief education to interpret and adjust their technique based on the real time biofeedback data. The simulation was then repeated. Data was extracted from each group's monitor and analyzed. Averages for compression depth, compression rate, and release speed with standard deviations (SD) were calculated. CPR was considered high quality when all AHA recommended parameters were met, and the percent of time high quality CPR was delivered was reported as a composite outcome (HQ). Using an unpaired t-test, the pre-education mean HQ was compared between dates, as was post-education mean HQ. Using a paired t-test, the overall post-education mean HQ from both dates was compared to the overall pre-education mean HQ from both dates.

RESULTS

Averages	Compression depth (inches)	Compression rate (/minute)	Release speed (mm/second)
Pre-education	2.217 SD=0.366	119.7 SD=7.47	387 SD=57.47
Post-education	2.167 SD=0.121	112 SD=2.97	361.83 SD=21.255

Percent High Quality CPR	March	September	All Groups
Pre-education	16.33	27	21.7
Post-education	73.3	70	71.7

There was no statistical difference in HQ between the March and September groups pre-education (16.33% vs 27%, p=0.2039) or post-education (73.3% vs 70%, p=0.7049). There was a statistically significant difference in HQ of all pre-education compared to all post-education resident groups (21.7% vs 71.7%, p=0.0006, 95% CI 33.43-66.57).

DISCUSSION

The groups of both dates had the same pre-education and post-education performance, therefore analysis of combined data from both dates on the effect of an educational intervention is valid. After a brief educational session on the usage of a biofeedback device, Emergency Medicine resident physicians rapidly and substantially improved the percent of time they delivered high quality CPR. Our findings may be influenced by a Hawthorne effect, but the substantial improvement in CPR quality we observed highlights our method as a promising strategy for training resident physicians. Because high quality CPR is a known surrogate of survival in cardiac arrest, consideration should be given to standardizing the use of biofeedback devices for resident CPR education.

REFERENCES

[1] Tolikowska et al. Resuscitation 2015
[2] Scoggin et al. Lancet 1981
[3] Anderson et al. Resuscitation 2019
https://www.zoll.com/medical-products/defibrillator-electrodes/cpr-d-padz-aed
https://www.zoll.com/medical-technology/cpr/cpr-dashboard

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