Cureus

Open Access
Poster

Cureus

Assessing PICU Mattress Compressibility with Standard Backboard and Real-Time Feedback: A Simulation-Based Study

Yiqun Lin [1]

1. KidSIM Simulation Education and Research Program, Alberta Children's Hospital

Corresponding author: Yiqun Lin, yiqlin@ucalgary.ca

Categories: Pediatrics, Medical Simulation
Keywords: cardiopulmonary resuscitation, mattress, quality, chest compression, pediatric intensive care

How to cite this poster
Lin Y (2017) Assessing PICU Mattress Compressibility with Standard Backboard and Real-Time Feedback: A Simulation-Based Study. Cureus 9(6): e.

Abstract

Introduction

The depth of chest compressions (CC) during cardiac arrest is associated with patient survival and neurological outcomes. Previous studies showed that mattress compression can reduce the proportion of CCs given with adequate depth.

Objectives

We aim to (1) quantify and assess the effect of mattress type and use of backboard on mattress compressibility and (2) explore how source of feedback influence effective compression depth.

Methods

Sixteen PICU providers were recruited to perform 1 minute of chest compression (CC) on a manikin in each of the following four conditions: (a) typical PICU mattress; (b) typical PICU mattress with CPR backboard; (c) memory foam PICU mattress; (d) memory foam PICU mattress with a CPR backboard using 2 different sources of feedback: (i) an external device and (ii) an internal device. CPR quality was concurrently measured by the 2 sources: (i) one external accelerometer sensor to measure the total vertical hand movement and (ii) one internal light sensor to measure the absolute sternum-to-spine movement of the manikin. The difference between 2 measures (i.e. mattress compression depth) were compared using mixed effect linear regression. Effective compression depth with different sources of feedback were compared with mixed effect linear regression model.

Results

Open Access
Published 06/01/2017

Data from total of 12101 individual compressions were analyzed. When internal device used as the source of feedback, Participants performed high-quality CPR (effective CC depth: 51 – 54 mm). The mean mattress compression depths (percentage of depletion) were: 47.7mm (47.5%) on PICU mattress only, 34.8mm (40.4%) on PICU mattress with backboard, 34.7mm (39.2%) on memory foam mattress only, and 24.6mm (31.2%) on memory foam mattress with backboard. Both memory foam mattress (Mean difference, MD: 11.7mm, 95%CI: 4.8 – 18.5mm) and use of backboard (MD: 11.6mm, 95%CI: 9.0 – 14.3mm) have main effect on minimizing mattress compressibility. Participants failed to perform guideline compliant effective CPR on mattresses when using external device as source of real-time feedback (effective CC depth 38 – 46 mm). Use of internal device as source of feedback improved effective CC depth by 7 – 14 mm compared to external device. ($p < 0.01$).

Conclusion

Use of a memory foam mattress and CPR backboard minimize mattress compressibility, but depletion of compression depth is still substantial. A feedback device measuring sternum-to-spine displacement can significantly improve effective compression depth on a mattress.

65