CPR Compression and Ventilation Skills: Can Nurses Achieve 2010 AHA Guidelines?

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Purpose

To examine the quality of compressions and ventilations in relation to the 2010 AHA Guidelines for CPR among nursing students who were trained and certified in BLS and practiced their skills monthly over a 1-year period.

Background

Skills need to be used or practiced to maintain competency. Yet, nurses in many clinical settings rarely use their CPR skills and may only practice CPR at time of course completion, typically every 1 or 2 years. Studies have documented that CPR skills deteriorate rapidly, as early as 2 months after training. Completing a biennial BLS course is not sufficient to maintain competence in CPR. Nurses, physicians, and other health providers need frequent assessment of their CPR skills and practice to maintain competence.

Method

This randomized trial was conducted over one year to examine the effects of brief practice of CPR skills on performance.

Phase 1: 606 students in 10 nursing programs in the US completed either the (1) AHA HeartCode™ BLS course (self-directed and computer-based) with voice advisory manikin (VAM) feedback or (2) standard instructor-led training with traditional manikins. When students passed their BLS course, their compression and ventilation skills were assessed on a Resusci Anne SkillReporter™ manikin.

Phase 2: Students were then randomly assigned to an experimental or control group. The experimental group practiced their CPR psychomotor skills on a VAM for 6 mins per month for 1 year. The control group did not practice following their initial training. Every 3 months, a subset of students was randomly selected from both groups for reassessment of their CPR skills.

CPR psychomotor skills were assessed using Laerdal Resusci Anne SkillReporter manikin. Outcome measures were compression depth (≥51 mm) and ventilation volume (500-600 ml) based on the 2010 AHA Guidelines.

Results

### Phase 1: Differences in Outcomes of HeartCode and Instructor-led Training

Students who trained with HeartCode BLS and practiced on VAMs had more compressions with adequate depth and more ventilations with adequate volume than students in instructor-led groups but...

Compression Depths Were Low and Ventilation Volumes Were Low

	HeartCode BLS with VAM group	Instructor-led with practice on Resusci Anne manikins (without VAM software)	Instructor-led with practice on hard molded manikins
Mean compression depth	37.7 mm (SD=6.7)	37.4 mm (SD=9.3)	31.8 mm (SD=10.9)
Mean ventilation volume	552.3 ml (SD=178.1)	477.0 ml (SD=273.0 ml)	302.1 ml (SD=242.8 ml)

### Phase 2: Effects of Practice on Maintaining Competence

Brief and self-directed practice enabled students to maintain their competence in compression and ventilation over 1 year, and most of their CPR skills improved significantly. However, mean compression depths even with practice were low.

Figure 1. Mean Compression Depth (in mm) by Group and Test Out Month
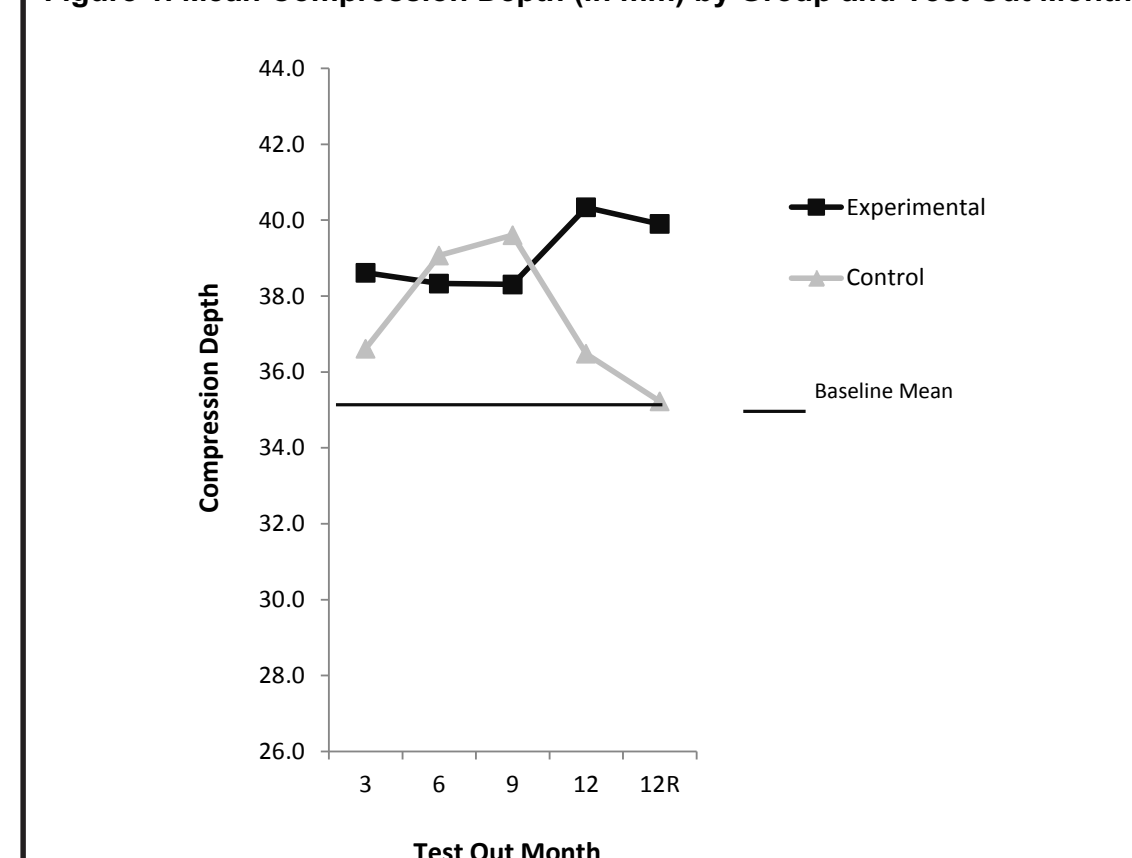
Mean compression depth (in mm) for experimental (6 min monthly practice) and control (no practice) groups at each reassessment time. 12R: Students repeated their BLS course. Baseline mean is average compression depth for both groups combined immediately after CPR training.

Figure 2. Mean Ventilation Volume (ml) by Group and Test Out Month
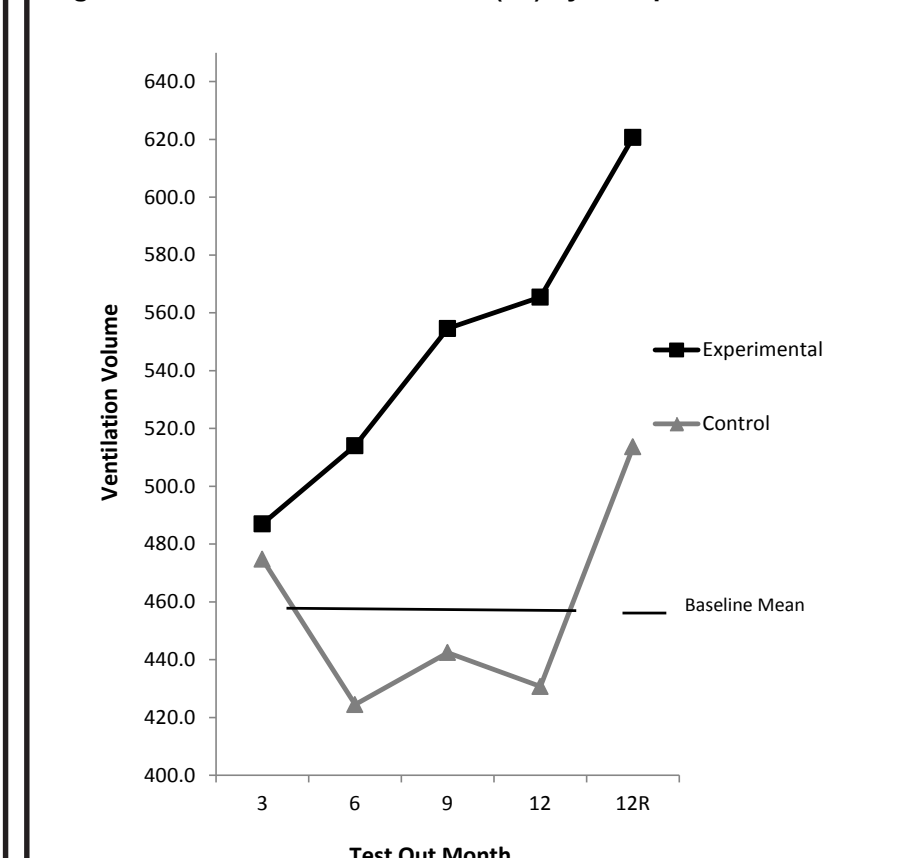
Mean ventilation volume (ml) for experimental (6 min monthly practice) and control (no practice) groups at each reassessment time. 12R: Students repeated their BLS course. Baseline mean is average ventilation volume for both groups combined immediately after CPR training.

Comparison of Outcomes to 2010 AHA Guidelines for CPR

Compression rates were consistent with 2010 Guidelines. Of the 606 participants, most (n=438, 72%) compressed at least 100 times per minute: their mean compression rate was 107.2 (SD=15.8).

Compression depths were far below the recommended depth of at least 51 mm or 2 inches. Their mean compression depth, however, was only 35.3 mm (SD=9.2). Only 24 (4%) students compressed deep enough to meet the guidelines, and their mean depth was 54.1 (SD=3.2) (Table).

Table. Nursing Students' (N=606) Ability to Meet 2010 AHA Guidelines for CPR

	All Students		Participants Meeting Guideline	
CPR Skill	**Mean (SD)**	**2010 Guideline**	**n (%)**	**CPR Outcome Mean (SD)**
Compression Depth (mm)	35.3 (9.2)	>=51 mm[a]	24 (4%)	54.1 (3.2)
		<51 mm	581 (96%)	34.5 (8.8)
Compression Rate (avg/minute)	107.2 (15.8)	>=100/min[a]	438 (72%)	113.5 (12.0)
		<100/min	167 (28%)	90.7 (12.2)
Ventilation Volume (ml)	442.8 (249.6)	500 to 600 ml[a]	112 (18%)	549.0 (29.3)
		<500 ml	347 (58%)	283.4 (187.2)
		>600 ml	144 (24%)	744.5 (121.6)
Ventilation Rate (avg/minute)	9.6 (7.4)	8 to 10/min[a]	124 (24%)	9.1 (0.8)
		<8/min	226 (37%)	2.7 (2.9)
		>10/min	253 (42%)	16.2 (6.2)

Using data collected immediately following successful completion of CPR course [a]2010 Guideline

Conclusions

The findings suggest that students and nurses who use their CPR skills infrequently may have difficulty compressing with an adequate depth even when prompted to compress deeper.

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