

## Short Paper

# A Comparison Study: Frequency and Duration of Two BLS Courses to Determine CPR Skill Retention and Competence

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## Significance of Problem

Cardiac arrests present a significant global health problem and are the leading cause of death annually [1]. Healthcare workers as well as laypersons must be trained effectively in cardiopulmonary resuscitation (CPR) to learn and retain skills over time. CPR skill retention is vitally important on successful resuscitation outcomes. CPR skill retention has been shown to significantly decline over time. Overall, the quality of CPR skills including accuracy of compression rate and depth, correct hand placement, and ventilation quality declines rapidly when skills are not regularly practiced and refreshed [2-6]. In one study, adults who participated in various forms of initial CPR certification classes experienced a significant performance decline in CPR skills in as little as two months following initial CPR instruction [7]. Another study found that CPR skills can begin to decline in as little as two weeks following CPR training [4]. Thus, retention of CPR skills after initial CPR training is a key determinant to the maintenance of CPR competency.

## Background

Research on CPR skill retention following CPR training programs has consistently identified a relatively low retention rate. CPR certifications from both the American Heart Association (AHA) and American Red Cross are 2-year certifications, leading to concerns that many students demonstrate significantly low skill retention rates by the time their certification expires. Most research examines either the lay public or college students enrolled in a Nursing program. To improve skill retention rates, studies support the use of CPR distributed practice or refresher training to improve retention of CPR skills [5]. Distributed practice or refresher training can include: (1) short periods of monthly or quarterly practice; or (2) slightly longer refresher training every six months. To date, no studies have compared CPR skill retention in college students from two different academic programs of study who were taught using two different program formats. In addition, the type of CPR training can also impact the retention of CPR skills. The 2 main types of CPR training are initial and renewal CPR training. Normally, CPR instruction courses are often very short in duration with rushed practice time by the learners, possibly-limiting the retention of knowledge and skills. Frequent,

short-duration, distributed CPR training with real-time feedback has been shown to be effective in improving CPR performance [3]. The National Nursing Staff Development Organization (1989) found that CPR instruction in short, frequent exposures can help to reinforce knowledge and maintain psychomotor skills [8]. Brief but frequent practice of CPR skills on an automated feedback manikin appears to be an effective strategy in retaining high quality CPR skills and knowledge [1]. Distributed CPR practice that provides refresher training in short but frequent time segments helps to improve knowledge and CPR skill retention. The focus of this pilot study was to identify if participation in a CPR instruction course presented over a period of several weeks with repeated engagement with skill performance would demonstrate retention improvement of Adult CPR knowledge and skills in college students six months following course completion.

## Methods

Students were selected from an undergraduate Nursing (NURS) and Exercise Physiology (EXPH) program at a small, private Midwestern university. This study was approved by the University's institutional review board. Both groups initially completed course and skill work in American Heart Association (AHA) Adult Basic Life Support (BLS) CPR with an AHA-certified instructor as part of their required academic curriculum. Student groups completed Adult BLS CPR training in one of two formats. NURS students completed an in-person cognitive program of approximately 2 hours in length, followed by a 2-hour skill review and hands-on skill assessment with an AHA certified instructor. In the NURS group, the entire course and subsequent Adult BLS certification was completed in approximately 4 hours. EXPH students completed a 15-wk semester course entitled "Medical Emergency Management", incorporating an AHA certified instructor-led BLS portion of the course. EXPH students completed their in-person cognitive portion of the course, repeated skill review and feedback, and skill assessment in three, 50-minute class sessions per week over a 3-week period. Therefore, the in-person cognitive portion encompassed approximately 7 total hours during their BLS CPR certification. Additionally, EXPH students were assessed on CPR (and related skills) in a written format on multiple other occasions during in-class examinations throughout the 15-week semester. Overall, EXPH students were engaged in BLS

**Table 1:** Chart 1 Responses for 10 CPR performance identifiers of Nursing and Exercise Physiology students.

Performance Identifier	Yes		No	
	NURS	EXPH	NURS	EXPH
Check the scene	5	7	15	6
Check the victim	13	11	7	2
Check for breathing and pulse	15	3	5	10
Activate EMS and get an AED	18	7	2	6
Place 2 hands on lower half of sternum	18	13	2	0
Compress chest at least 100-120 times per minute	18	12	2	1
Compress chest at least 2" - 2.4" in depth	19	12	1	1
Allow complete chest recoil after each compression	20	13	0	0
Give 2 breaths (1 sec. each), minimizing interruptions	19	5	1	8
Resume CPR compression/breath cycle within 10 seconds of last compression	20	13	0	0
Mean SD	16.5 ± 4.60*	9.6 ± 3.75*	3.5 ± 4.60	3.4 ± 3.75

\*Nursing "yes" responses were significantly higher than Exercise Physiology "yes" responses.

CPR cognitive and psychomotor skill work almost twice as long as NURS students. Approximately 6 months after their BLS certification, eligible students were contacted by one of the investigators and asked to participate in a follow-up study of CPR skill retention. Participants were not academically obligated to participate in the follow-up study. A total of 20 Nursing and 13 EXPH students agreed to participate in the study. Participants were not given advance notice of the study or formal skill practice after initial certification (unless this occurred outside of the university). This ensured that all participants were evaluated under the same conditions and with the same equipment. Participants had the skill of Adult CPR re-evaluated on a Prestan® feedback manikin 6 months after initial BLS certification. The skill did not include the use of an AED. Students were individually evaluated by their original course instructor using a checklist of 10 performance identifiers. Students received no feedback during the skill evaluations, other than what was provided by the manikin itself regarding ventilations (chest rise) and compressions (rate and depth). If the student successfully completed the skill evaluation, a "yes" was recorded. If the student failed to successfully complete the skill evaluation, a "no" was recorded. Successful completion of each performance identifier was determined by the student's original AHA certified course instructor.

### Main Outcome Measurement

Student's successful completion (as determined by the AHA certified course instructor) of each performance identifier were evaluated. The total number of performance identifiers successfully completed ("yes" responses) were compared between Nursing (n=20) and Exercise Physiology (n=13) students.

### Results

Results are expressed as mean ± standard deviation. A two-tailed t-test was used to compare the groups. Significance was set at  $p < 0.05$ . The number of individual "yes" responses for each performance identifier were determined for each group. The average number of "yes" responses for the 10 performance indicators was then compared between the groups (see Chart 1). Average "yes" responses were

significantly higher in the NURS group ( $16.5 \pm 4.60$ ) when compared to the EXPH group ( $9.6 \pm 3.75$ ) (Table 1).

### Discussion

Nursing students displayed a statistically significant higher number of successful performance identifiers than Exercise Physiology students, suggesting that higher frequency training sessions leading up to CPR certification may not be a primary factor to college students' retaining CPR skills. Several limitations were identified during this study. One significant limitation was the variance in clinical experience between the participant groups. Nursing students had several weeks of hands-on clinical experience in the healthcare setting. At the six-month evaluation point, nursing students had been participating in weekly clinical rotations in the hospital setting for approximately two months. This healthcare related exposure may have a positive impact on CPR skill retention. A second limitation is the use of two different evaluators. Although both evaluators used the same tool and performance identifiers, researcher bias inherently occurs when two different evaluators come from different backgrounds and viewpoints. Skill mastery involves some imperfections which might be graded differently between evaluators, especially with the pre-assessment components (e.g. check the scene, check the victim, etc).

### Conclusion

Higher frequency training sessions for CPR certification may not be a primary factor to CPR skill retention over 6 months. Results of this study underscore the significant problem of rapid decline in CPR knowledge and skill retention in all learners. These findings support the incorporation of an effective and interactive initial training along with periodic CPR skill refreshers to reinforce learning and skill competence. Low dose (short duration) yet higher frequency CPR skill refreshers may help to retain critical CPR knowledge and skill retention. Additional studies examining various options of initial CPR certification courses and skill refresher activities are recommended to help identify that "sweet spot" of frequency and duration to support CPR skill competence.

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