STUDENT SATISFACTION AND SELF REPORT CPR COMPETENCY: HEARTCODE™ BLS COURSES, INSTRUCTOR–LED CPR COURSES, AND MONTHLY VAM PRACTICE FOR CPR SKILL MAINTENANCE

By

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Student Satisfaction and Self Report CPR Competency: HeartCode™ BLS Courses, Instructor–Led CPR Courses, and Monthly VAM Practice for CPR Skill Maintenance

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STUDENT SATISFACTION AND SELF REPORT CPR COMPETENCY

Abstract

Correctly performed cardiopulmonary resuscitation (CPR) can improve survival after sudden cardiac arrest; however, research demonstrates that CPR skills are not retained well.

Objective: This quasi-experimental longitudinal study among 606 nursing students in diploma, associate degree, and baccalaureate nursing programs around the US determined if type of CPR course or monthly practice affects CPR skill retention, confidence, and training satisfaction. Ten nursing programs were randomized to course type, HeartCode™ BLS or an instructor-led (IL) course, and then randomized to practice group, 6 minutes of monthly practice or no further practice.

Method: End of study survey results were compiled and reported as percentages. Short answer data was grouped by category for reporting.

Results: Significantly fewer HeartCode™ BLS students (n=126, 87%) were satisfied with their CPR training compared to 95% (n=183) of IL students. Students who practiced CPR monthly (n=146, 90%) were significantly more confident than students who did no practice (n=136, 78%). Fewer students who practiced monthly thought their initial training was just right (n=101, 61%) than those who did no practice (n=131, 74%).

Conclusions: Monthly practice improved CPR confidence, but course type did not. However, the CPR skills of students who took HeartCode™ BLS were better. Students were most satisfied when they participated in the IL course and frequent practice. According to students, future CPR practice should include: more practice and immediate feedback, more instructor involvement, and more realistic scenarios.
Key words: cardiopulmonary resuscitation practice, confidence, satisfaction, nursing students, HeartCode™ BLS, traditional BLS
Student Satisfaction and Self Report CPR Competency: HeartCode™ BLS Courses, Instructor–Led CPR Courses, and Monthly VAM Practice for CPR Skill Maintenance

When performed correctly, cardiopulmonary resuscitation (CPR) can improve survival after sudden cardiac arrest; but survival is dependent on “the education and training of the rescuers” (Hazinsky et al, 2010). Nurses are frequently the first responders to in-patient respiratory or cardiac arrests (Gombotz, Weh, Mitterndorfer, & Rehak, 2006). Yet, the quality of CPR provided by nurses and physicians is often poor, even when they have been trained in CPR (Abeila, Alvaredo, Myklebust et al, 2005; Abella, Sandvo, Vassilatos et al, 2005). Nursing students are also regularly in clinical situations and, as a result, are required to have completed a CPR course before beginning their clinical experiences. Unfortunately, research consistently demonstrates that nursing students cannot perform CPR to standards within a few weeks of course completion (Ackermann, 2009; Hamilton, 2005; Kardong-Edgren & Adamson, 2009; Leighton & Scholl, 2009; Madden, 2006; Paul, 2010).

Kardong-Edgren et al. (2010) demonstrated significantly better CPR skills performance when nursing students trained with HeartCode™ BLS compared to a traditional instructor-led (IL) course. The researchers then further compared an experimental group of students who practiced CPR skills for 6 minutes a month with a voice activated manikin (VAM) for up to a year with students who did no further practice (Oermann, Kardong-Edgren, and Odom-Maryon, 2011). Monthly practice with VAMs improved retention of nursing students’ CPR skills. This article reports the end-of-study student satisfaction and confidence survey comparison data (1) by initial CPR course type and (2) by monthly practice group versus the no practice group for students who participated in the Oermann et al. (2010) study.
Theoretical Framework

Bandura's (1989) social cognitive theory provided the framework for this study. “Competent functioning requires both skill and self-beliefs of efficacy to use them effectively” (p. 391). Monthly practice should enhance skill mastery and self-perceptions. The objective feedback provided by the CPR manikin software should motivate students to monitor their actions and continue returning for monthly practice. As student skill in CPR improves, the manikin feedback improves, indicating improved skill and skill mastery, practice becomes a self-reinforcing mechanism. Students will “know they know” how to correctly perform CPR and want to maintain skill mastery.

Study Description

The aim of this quasi-experimental longitudinal study was to determine 1) if type of CPR training affects CPR skill retention, confidence, and training satisfaction; 2) if monthly practice affects CPR skill retention, confidence, and training satisfaction; and 3) if retaking CPR training can recover loss of CPR knowledge and skill retention over time among nursing students. Six-hundred six nursing students from 10 geographically dispersed nursing programs around the US participated in a two part year-long study. Schools were randomized to course type to minimize confusion (see Oermann et al. (2010) and Kardong et al. (2010) for a full explanation of the study design and outcomes). In part one, CPR psychomotor skills were compared between students trained with one of two course types. One group used a computer-based American Heart Association approved course, HeartCode BLS with VAM (Laerdal Medical, Stavanger, Norway). VAMs provide voice modulated, movement by movement coaching cues, as one practices CPR on the manikin. Cues include such information as “compress faster, check
hand placement, ventilate more slowly." A second group of students trained in a traditional face to face course that was instructor-led (IL). All students completed their initial courses successfully and received a CPR card.

Students from both types of courses were then randomized into an experimental group which practiced with VAM technology for six-minutes a month for up to one year or the control group who did no further practice until the CPR posttest. When students exited the study at 3, 6, 9, or 12 months, they completed the CPR posttest and exit survey. One-fifth of the students in the experimental and control groups retook the CPR course 12 months after their initial training (12R). This paper reports students’ self-reported confidence and satisfaction with their CPR training method and subsequent monthly practice sessions. The study was approved by each institution’s Review Board and each student provided written consent to participate. See Figure 1 for a diagram of the study design.

**Data Analysis**

Data are summarized as frequencies and percentages. To examine the association between 1) students’ self-reported confidence in his/her ability to perform CPR and satisfaction with their course type (HeartCode BLS or IL) and 2) by monthly practice groups versus no practice for students, the Likelihood Ratio Chi-square Test and Fisher’s Exact Test were used. All significance testing was done at the 0.05 level (two-sided) using the SAS software (Cary, NC, version 9.1, FREQ procedure). For the qualitative-like data, short answers were transcribed, counted, compiled into categories, and percentages calculated.
Results

Students completed demographic questionnaires as they began the study. Three-hundred fifty-seven exit surveys were completed at the end of the study for a 59% response rate. Sixteen surveys had illegitimate or missing identification numbers and so they were not included in the data analysis. The experimental group, those who practiced monthly answered seven end of study questions, five of which were identical to the control group survey and two of which were about subsequent practice length and frequency. Students in the control group, those who did no further CPR practice after their initial course completion answered five questions relating to CPR confidence, initial course length and satisfaction. The last question on both surveys was: "How could the training you received be improved?"

Demographics

Study participants were beginning nursing students enrolled in diploma (13%), associate degree (44%), and baccalaureate (43%) nursing programs. Most students were female, with 44 (15.8%) male students in the experimental group and 41 (15.4%) in the control group. The average student age in the schools using HeartCode BLS with VAM was 30.4; the average age of students in the IL CPR schools was 26.1.

Results

Table 1 presents study findings about confidence and satisfaction by course type. There was no significant difference in student confidence to perform CPR by teaching method (p=0.35). Student who practiced CPR skills monthly were more confident in their ability to perform CPR than those who did not practice (p=0.003). Twenty-two percent of the no practice group reported being not confident or somewhat confident in their CPR ability compared to
only 10% reporting this in the monthly practice group. Regardless of course type or practice group, students overwhelmingly reported they were confident enough to initiate CPR if they were the first to discover an unresponsive adult. There was no significant difference in student perception of initial teaching method (p=0.24). However, there was greater variation in student perception about length of initial course, based on whether they practiced monthly or not (p=0.009). The majority of HeartCode™ BLS (61%) and IL participants (74%) reported that their initial course length was just right. However, 29% of the monthly practice group felt their initial course type was too long compared to 15% of the no practice group. There were differences in satisfaction based on course type (p=0.01). Dissatisfaction was greater in the Heartcode™ BLS group (13%) than in the IL course (6%). Ninety-five percent of students in the IL group were satisfied or very satisfied in their initial course type compared to 87% in the Heartcode™ BLS group. There were no significant differences between the practice groups and their satisfaction with their CPR training.

Table 2 reports student satisfaction with monthly CPR practice by posttest month. Eighty-seven percent of students responded that the length of the practice session (6 minutes) was just right. However, among students who exited at 3 months, nearly 30% (n=4) felt the practice sessions were too short. The majority of students who practiced for 6 minutes a month across all but the first 3 months reported that the length of the monthly practice sessions were just right. As for practice frequency, 63% of students reported that it was just right; 33% felt sessions were more often than they liked.

Table 3 provides a summary of short answers with percentages comparing students' responses between the monthly practice and no practice groups about how training could be
improved. Thirty percent of the no practice group and 36% of students in the monthly practice group made no comment. In the monthly practice group, 21% of students wrote comments about keeping monthly practice as it is. Students wrote that the training was "excellent," "sufficient," "organized and timely," and "great hands-on learning." However, 15% of students wanted more time to practice, both in longer and more frequent training sessions. One student said, "I wish the training program would tell you specifically how to do certain task (ie. using the ambu bag properly) instead of just telling you what is wrong (ie. too forceful)." Some of these students felt the training would be more beneficial with a variety of scenarios and manikin sizes.

Twenty-six percent of the no practice group reported they would like more CPR practice and feedback. Comments highlighted not getting enough practice time with a manikin (presumably during their initial CPR training) to ensure memorization and muscle memory. Twenty-two percent of the no practice students surveyed responded that their training was adequate. Many used the short answer question as an opportunity to impart what they liked most about the training; for example the training was "clearly communicated" and "easy to learn & memorize." Some students reported not knowing whether they were actually practicing CPR correctly because of a lack of feedback during their initial CPR training. Perceiving the connection between repetition and correct performance, one student wrote that she would like to have, "more regular practice sessions because it all has to do with feel and then we would improve our performance just like with sports." Another student wrote: "I would have liked to have received information on how well (sic) my performance was so that I could learn to improve my CPR skills."
Discussion

Some very valuable information was gained from this study. Monthly practice positively influenced CPR confidence, but course type did not. Verplancke (2008) reported that self confidence in one's ability to perform CPR and recent practice was predictive of good ventilation and compression ability. Some students in the study asked if they could continue practicing their CPR skills monthly, even after they tested out, to maintain their skills. They explained that they enjoyed "beating the machine," clearly demonstrating self-confidence and reinforcing the theoretical framework for this study that confidence would reinforce and build the desire to practice skills. Students in both courses reported they were confident enough in their ability to perform CPR that they would start CPR when appropriate. However, in actuality, HeartCode™ BLS training led to superior CPR psychomotor skills (Oermann, Kardong-Edgren, Odom-Maryon, Ha, 2010).

Next we examined students' training satisfaction. According to student satisfaction, HeartCode™ BLS and IL courses are of appropriate length. While most of the monthly practice group was also satisfied, some thought their initial course was too long. Since they received six minutes of CPR practice monthly for up to a year after the initial course, they may have felt some of the initial course was unnecessary. However, more IL students and students who practiced monthly were satisfied with their overall training, compared to HeartCode™ BLS and those who did no practice, respectively. They may have experienced some sense of 'getting their money's worth' or of being optimally prepared to perform CPR when called upon. It seems students were most satisfied when they participated in the initial face-to-face course and then practiced monthly with the VAM. Students were also satisfied with six minutes of CPR
practice every month. Regardless of study exit month, most students reported their training length and frequency were just right.

CPR practice for six minutes per month positively affected skill performance (Oermann, Kardong-Edgren, Odom-Maryon, Ha, 2010). However, the six minutes practice time was selected arbitrarily; changing the practice length (i.e. 10 minutes) or frequency (i.e. every other month, every quarter) could result in improved satisfaction and/or CPR skills. More research is needed to determine the ideal practice type for CPR competence and confidence.

According to students, future CPR practice should include: more opportunities for practice and immediate feedback, more instructor involvement and explanation, and more realistic scenarios. Students in our study suggested that monthly practice for more than six minutes and additional instructors to provide individual support and feedback would be ideal. It is of interest to note that 26% of students who did no practice wanted more practice, compared to only 15% of students in the monthly practice group. Perhaps they recognized that in order to perform CPR confidently, more practice is needed. Those who practiced monthly might have been more aware of their need for more instruction because 8% felt they needed more instructor involvement and explanation, compared to 6% of those who did no practice. Students identified that their practice was not like performing CPR in real life; they would have appreciated more realistic scenarios. As simulation is being incorporated into nursing programs, including CPR scenarios would be an appropriate and important endeavor.

A smaller number of students who practiced monthly suggested that avoiding technical issues with equipment and software, decreasing practice frequency, increasing ease of practice scheduling and shortening practice sessions would improve training. As one student
commented, the software does not explain how skills should be performed; it only tells the user what is being done incorrectly. For beginners, the training program should include review of skills. Program manufacturers may want to consider adding short reminders for how to do CPR skills properly (such as holding ambu bag correctly). Flexible scheduling could be a good solution to promote more consistent practice. This would allow students to choose longer or shorter and less frequent or more frequent practice sessions, according to their preference or assessed need. A manikin could also be available in the lab whenever the school is open so that students could practice at their convenience. This opportunity could also be extended to faculty for CPR practice.

Although students in the no practice group were very satisfied with their training and felt competent in their CPR skills, Oermann et al. reported that their skills were lacking, demonstrating unconscious incompetence (Maslow, 2002). Only four students suggested requiring CPR recertification more frequently than the current standard of every two years. They may have known the skills for the moment but were not necessarily competent (Maslow). One student commented on a benefit of practice illustrates building towards conscious competence: “I would need to touch up on CPR training every now & then to retain the correct way to do it.” A method, developed by Paul (2010) could be used in future research. Students evaluated their own videotaped CPR practice alone and with an instructor. Students liked this method because it allowed them to see themselves rather than trying to remember what they did. This technique could meet students’ request for more feedback.
Limitations

This study has limitations which can impact the validity of the results and inform future research. Short answer responses were not separated by initial course type; they were only separated by monthly practice and no practice. As a result, there was no way to know whether student responses were referring to HeartCode™ BLS, IL, monthly practice, or no practice, unless they specified a course in their comments. A further limitation is that the question regarding students’ opinion of their initial course was completed upon leaving the study. For most of the control group that was immediately, but some in the experimental group completed surveys at 3, 6, 9, and up to 12 months after initial training, so their opinion may have been influenced by the time between their initial course and survey completion. Another limitation is that survey responses at 3, 6, 9, 12, and 12 R were unable to be analyzed by initial course type (HeartCode™ BLS or IL) because the posttest counts were too small to ensure valid results. Therefore, it is unclear if initial course influenced student satisfaction with subsequent practice length or frequency. In addition, the questions regarding satisfaction with subsequent CPR practice length and frequency were left blank on approximately 33% of returned surveys, respectively. Given the small numbers being compared between exit month groups (n range= 1 to 37), had more students completed the survey question, the results could be different. Finally, students in the experimental group who received IL training did not have the opportunity to practice on VAMs until the first six-minute practice session. This may have influenced students’ satisfaction with training.
Conclusion

As with any skill, CPR performance improves with practice. This paper reports whether students' CPR confidence and training satisfaction are affected by course type or practice frequency. The overall goal was to improve nursing students' readiness for clinical encounters. Since the length and frequency of monthly practice were set arbitrarily, more research should be done to discover the optimal variables for CPR knowledge and skill retention. Another consideration is that single-rescuer CPR in the hospital setting is uncommon, so future research could focus on two-rescuer CPR. Although students desired changes in the training they experienced, most felt that it was adequate. This response from a student who practiced monthly encapsulates that opinion: "Honestly, I think it's a great system. I think the refresher every 2 years is far too little for a skill that is so important & that lives depend on. I would have been terrified to ever stumble upon an unconscious, apneic, pulseless individual before this training. Now I am more than confident in my abilities that I'd be able to handle the situation."
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Table 1: Confidence and Satisfaction with CPR Course and Practice

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Response</th>
<th>HeartCode™ BLS (N=144)</th>
<th>Instructor Led (N=194)</th>
<th>p-value</th>
<th>Practice Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>How confident are you in your ability to perform CPR?</td>
<td>Confident - very confident</td>
<td>117 (81%)</td>
<td>165 (85%)</td>
<td>0.35</td>
<td>Monthly Practice (N=163)</td>
</tr>
<tr>
<td></td>
<td>Not confident - somewhat confident</td>
<td>27 (19%)</td>
<td>29 (15%)</td>
<td></td>
<td>No Practice (N=194)</td>
</tr>
<tr>
<td>If you were the first to discover an unconscious and unresponsive adult patient, which of the following best describes the actions you would most likely take?</td>
<td>Activate EMS and start CPR</td>
<td>143 (98%)</td>
<td>191 (99%)</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not start CPR</td>
<td>3 (2%)</td>
<td>2 (1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In regard to the length of your initial CPR training, it was:</td>
<td>Too long</td>
<td>29 (20%)</td>
<td>46 (24%)</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Just right</td>
<td>99 (67%)</td>
<td>133 (69%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Too short</td>
<td>19 (13%)</td>
<td>15 (8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicate your level of satisfaction with your CPR training:</td>
<td>Satisfied - very satisfied</td>
<td>126 (87%)</td>
<td>183 (95%)</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not satisfied - somewhat satisfied</td>
<td>19 (13%)</td>
<td>10 (6%)</td>
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</tr>
</tbody>
</table>

### Table 2: Satisfaction with Subsequent CPR Practice

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Response</th>
<th>3 Months (N=14)</th>
<th>6 Months (N=34)</th>
<th>9 Months (N=26)</th>
<th>12 Months (N=42)</th>
<th>12 R Months (N=27)</th>
<th>All Students (N=143)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In regard to the length of your subsequent CPR training, each session was:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too long</td>
<td>1 (7%)</td>
<td>2 (6%)</td>
<td>3 (12%)</td>
<td>3 (7%)</td>
<td>2 (7%)</td>
<td>11 (8%)</td>
<td></td>
</tr>
<tr>
<td>Just right</td>
<td>9 (64%)</td>
<td>31 (91%)</td>
<td>23 (88%)</td>
<td>37 (88%)</td>
<td>24 (89%)</td>
<td>124 (87%)</td>
<td></td>
</tr>
<tr>
<td>Too short</td>
<td>4 (29%)</td>
<td>1 (3%)</td>
<td>0 (0%)</td>
<td>2 (5%)</td>
<td>1 (4%)</td>
<td>8 (5%)</td>
<td></td>
</tr>
<tr>
<td>No answer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In regard to the frequency of your subsequent CPR training, the sessions occured:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More often than liked</td>
<td>5 (36%)</td>
<td>10 (30%)</td>
<td>10 (38%)</td>
<td>14 (33%)</td>
<td>8 (30%)</td>
<td>47 (33%)</td>
<td></td>
</tr>
<tr>
<td>Just right</td>
<td>7 (50%)</td>
<td>22 (67%)</td>
<td>14 (54%)</td>
<td>28 (67%)</td>
<td>18 (67%)</td>
<td>89 (63%)</td>
<td></td>
</tr>
<tr>
<td>Less often than liked</td>
<td>2 (14%)</td>
<td>1 (3%)</td>
<td>2 (8%)</td>
<td>0 (0%)</td>
<td>1 (4%)</td>
<td>6 (4%)</td>
<td></td>
</tr>
<tr>
<td>No answer</td>
<td></td>
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</tbody>
</table>

### Table 3: Student Feedback on CPR Course and Practice

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Monthly Practice (N=169)</th>
<th>No Practice (N=184)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How could the training you received be improved?</td>
<td>Theme n (%)</td>
<td>Theme n (%)</td>
</tr>
<tr>
<td>No comment</td>
<td>61 (36%)</td>
<td>No comment</td>
</tr>
<tr>
<td>Keep it as is</td>
<td>35 (21%)</td>
<td>More practice and feedback</td>
</tr>
<tr>
<td>More practice and feedback</td>
<td>28 (15%)</td>
<td>Keep it as is</td>
</tr>
<tr>
<td>More instructor involvement and explanation</td>
<td>13 (8%)</td>
<td>More instructor involvement and explanation</td>
</tr>
<tr>
<td>More realistic</td>
<td>12 (7%)</td>
<td>Shorter sessions</td>
</tr>
<tr>
<td>Avoid technical issues</td>
<td>7 (4%)</td>
<td>Avoid technical issues</td>
</tr>
<tr>
<td>Decrease frequency</td>
<td>7 (4%)</td>
<td>More realistic</td>
</tr>
<tr>
<td>Address scheduling challenges</td>
<td>4 (2%)</td>
<td>Require BLS certification more frequently</td>
</tr>
<tr>
<td>Shorter sessions</td>
<td>4 (2%)</td>
<td>Smaller group size</td>
</tr>
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<td></td>
<td></td>
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</tbody>
</table>
Figure 1: Study Design

Schools (n=10)

HeartCode™
(4 schools, n=303)

- Monthly Practice (n=152)
  - 3 months
  - 6 months
  - 9 months
  - 12 months

- No Practice (n=151)
  - 12 R

- Posttest Only

Instructor-led
(6 schools, n=303)

- Monthly Practice (n=151)
  - 3 months
  - 6 months
  - 9 months
  - 12 months

- No Practice (n=152)
  - 12 R

- Posttest Only

Abbreviations: 12R, repeat CPR test; n, number.