Adequate training in cardiopulmonary resuscitation (CPR) and use of an automated external defibrillator (AED) is an important component of a workplace safety training program. Barriers to traditional in-classroom CPR-AED training programs include time away from work to complete training, logistics, learner discomfort over being in a classroom setting, and instructors who include information irrelevant to CPR. This study evaluated differences in CPR skills performance between employees who learned CPR using a self-directed learning (SDL) kit and employees who attended a traditional instructor-led course. The results suggest that the SDL kit yields learning outcomes comparable to those obtained with traditional instructor-led courses and is a more time-efficient tool for CPR-AED training. Furthermore, the SDL kit overcomes many of the barriers that keep individuals from learning CPR and appears to contribute to bystanders’ confidently attempting resuscitation.

Improving Workplace Safety Training Using a Self-Directed CPR-AED Learning Program

by Mary E. Mancini, RN, PhD, NE-BC, Mary Cazzell, RN, BSN, Suzan Kardong-Edgren, RN, PhD, and Carolyn L. Cason, RN, PhD

Research Abstract

Adequate training in cardiopulmonary resuscitation (CPR) and use of an automated external defibrillator (AED) is an important component of a workplace safety training program. Barriers to traditional in-classroom CPR-AED training programs include time away from work to complete training, logistics, learner discomfort over being in a classroom setting, and instructors who include information irrelevant to CPR. This study evaluated differences in CPR skills performance between employees who learned CPR using a self-directed learning (SDL) kit and employees who attended a traditional instructor-led course. The results suggest that the SDL kit yields learning outcomes comparable to those obtained with traditional instructor-led courses and is a more time-efficient tool for CPR-AED training. Furthermore, the SDL kit overcomes many of the barriers that keep individuals from learning CPR and appears to contribute to bystanders’ confidently attempting resuscitation.

Sudden cardiac arrest (SCA), abrupt cessation of heart function without warning, is a leading cause of death in the United States. Each year approximately 310,000 Americans die of coronary heart disease outside the hospital or in the emergency department, and more than 166,000 of these deaths (54%) are due to SCA (American Heart Association [AHA], 2008a, 2008b). However, SCA is reversible if treated with prompt cardiopulmonary resuscitation (CPR) and defibrillation (AHA, 2005; Cummins, Ornato, Thies, & Pepe, 1991). Although the actual number of SCAs that occur in the workplace is unknown (Occupational Safety and Health Administration [OSHA], 2006), 13% of workplace fatalities reported in 1999 and 2000 to OSHA were due to SCA (OSHA, 2001). For this reason, and because of the known improvement in survival when victims of SCA receive rapid CPR and defibrillation with an automated external defibrillator (AED), OSHA recommends that access to prompt CPR and an AED be incorporated into workplace first aid programs (OSHA, 2006). Furthermore, federal, state, and local regulations require certain industries to include CPR and AED use in their emergency preparedness programs (OSHA, 1994a, 1994b).

Crucial to the success of a workplace CPR-AED program is adequate training of employees to respond to a SCA. Organizations such as the AHA and the American Red Cross offer training classes in these life-saving techniques. Attending these courses requires employees to take time away from work to go to a central location to complete training, which typically takes 4 or more hours. Other impediments associated with traditional CPR courses include logistics (Wik, Myklebust, Auestad, & Steen, 2002), discomfort over being in a classroom setting (Flint et al., 1993), and instructors who include information irrelevant to CPR (Kaye & Mancini, 1998).
CPR Anytime, a video-based, self-instructional training program developed by the AHA and Laerdal Medical (Stavanger, Norway), overcomes the most commonly cited reasons for not seeking CPR training. CPR Anytime is easy to use, provides significant hands-on practice, requires significantly less time than a traditional instructor-led course, and can be completed when convenient to the learner. To learn CPR, the participant needs only the personal learning kit and a DVD player. The CPR Anytime personal learning kit contains an inflatable manikin (Mini Anne®) and a practice-while-watching training video (Potts & Lynch, 2006). Laypersons learning CPR using CPR Anytime perform and retain the knowledge and skills learned as well as, and in some cases better than, those attending traditional instructor-led courses (Einspruch, Lynch, Aufderheide, Nichol, & Becker, 2007; Isbye, Rasmussen, Lippert, Rudolph, & Ringsted, 2006; Lynch et al., 2005).

In 2006, the AHA began marketing the Heartsaver AED: CPR Anytime course. It has as its core a self-learning kit that includes a 45-minute self-directed AED tutorial and a 28-minute practice-while-watching CPR DVD. As designed, the Heartsaver AED: CPR Anytime course overcomes both the personal and the employer-relevant barriers to employee training in CPR and AED use; however, its effectiveness in preparing employees in CPR and AED use has not been evaluated.

PURPOSE OF THE STUDY

Because of limited evidence that the Heartsaver AED: CPR Anytime course yields outcomes at least as good as those gained from traditional instructor-led courses (Einspruch et al., 2007; Lynch et al., 2005; Potts & Lynch, 2005), this study evaluated differences in CPR skill performance between workplace employees who were randomly assigned to learn CPR using the kit (Heartsaver AED: CPR Anytime course) and those attending a traditional instructor-directed AHA Heartsaver AED course. The primary focus of the evaluation was meeting learning outcomes immediately after completion of the course.

METHODOLOGY

The CPR-AED self-directed learning (SDL) program, like the traditional Heartsaver AED classroom course, consisted of acquisition and assessment of both cognitive knowledge and skills (Table 1). The SDL kit, which retail for $69.95, contained a CD-ROM with software for a 45-minute web-based, interactive tutorial on AED use, a 28-minute CPR skills practice DVD, a student workbook, an inflatable practice manikin with a built-in feedback device (Mini Anne, Laerdal), and a pocket mask. Disinfecting wipes, cleaning instructions, and an extra inflatable lung insert were included. The skills practice DVD was a version of a CPR self-instruction video previously evaluated by Lynch et al. (2005).

Participants

University faculty and staff, their spouses, and students were recruited through flyers posted throughout the campus and notices published in the campus newspaper. To be eligible for the study, learners had to speak English, be at least 18 years old, be in good health and not currently receiving treatment for asthma (self-report), and be able to assume and maintain a kneeling or crouching position for up to 3 minutes. Anyone who had received CPR training within the previous 5 years or who was currently certified in basic life support was excluded from the study.

Nine experienced, AHA-certified CPR instructors (School of Nursing faculty and students) served as instructors and evaluators. Each had completed training on the most recent AHA guidelines on CPR and emergency cardiovascular care (AHA, 2005). The instructors taught the traditional in-classroom course and evaluated the CPR and AED skills performance of all learners according to AHA guidelines. Instructors who evaluated performance skills were blinded to the type of course the learners had completed. No secondary review of the instructors’ evaluation of performance was performed.

Learning Approaches

Learners were randomly assigned to one of two learning approaches for CPR-AED: a prototype SDL product or traditional in-classroom instruction (TRAD) using the Heartsaver AED course. Both approaches consisted of components for acquisition and assessment of cognitive knowledge and psychomotor skills, and the content presented was the same. Table 1 details the components of each instructional approach.

SDL Approach. Learners in the SDL group independently completed the tutorial on CPR and AED use in the university computer laboratory. The tutorial includes an explanation of the Chain of Survival, a point-and-click scenario to teach the sequencing of CPR and AED use, and interactive practice scenarios on CPR, use of an AED, and first aid for choking. In practice scenarios, a voice says “well done” if choices are correct. Immediate and complete feedback is provided, including what was done correctly and why it was correct. When an incorrect choice is made, explanation of why the choice is incorrect is provided. Learners can repeat scenarios until they are comfortable with their performance. Passing a scenario
After passing the interactive scenario assessments, learners completed the skills acquisition part of the SDL course. Each learner received an SDL kit containing the skills practice DVD, gloves, a pocket mask, and an inflatable manikin. Learners watched the DVD and completed the practice-while-watching exercises in individual rooms. On average, learners took 75 minutes to complete the SDL course.

**TRAD Approach.** In the TRAD approach, groups of six learners received instruction from an AHA-certified CPR instructor. The instructor was directed to present the course according to AHA guidelines. The traditional course includes information about adult and infant CPR, AED use, and first aid for choking. Learners practiced the skills presented by the instructor on a Little Anne® manikin (Laerdal). There was one manikin for every three learners. When the instructor had delivered all instruction and was satisfied that all learners had had adequate practice opportunities, the instructor administered a written test. Passing the test required that the learner achieve a minimum score of 84%. For learners failing to achieve this score, the instructor provided remediation and retesting. The typical TRAD course took between 4 and 5 hours.

**Learning Outcomes**

Each learner performed CPR with an AED while being observed by an AHA-certified CPR instructor blinded to the learning approach. The instructor evaluated CPR performance and use of an AED using an evaluation tool adapted by Lynch et al. (2005) (Table 2). Learners performed CPR on a Resusci® Anne manikin that recorded the rate and depth of compressions, hand position during compressions, and ventilations. A software program designed for this study was used to capture these data from the manikin.

After completing the psychomotor skills assessment, learners completed an attitude survey to discern their receptivity to each learning approach. The survey, the same as that used by Lynch et al. (2005), contained 13 items; responses followed a Likert format and included strongly disagree, disagree, not sure, agree, or strongly agree with assigned values of 1 through 5, respectively.

**Procedure**

The study was approved by the university institutional review board. Potential participants responded to the flyers and newspaper advertisements by telephoning a study team member, who arranged a time for participation for those who met the study criteria. One hundred forty-eight individuals were scheduled to participate in the study. All participants received a reminder postcard or phone call the day before their appointment time. All participants who agreed to participate in the study did so. Upon arrival, participants were directed to a large room in the School of Nursing devoted to the CPR study, where they signed consent forms to participate in the study, provided demographic data, and were assigned to a learning approach. All participants completed their assigned training.

To maintain the AHA-recommended 1:6 instructor to student ratio, if fewer than six study participants were present at the start of a study session, they were assigned to complete the SDL course. If six participants were present at the start of a session, the instructor provided the

<table>
<thead>
<tr>
<th>Program Component</th>
<th>Self-Directed Learning</th>
<th>Traditional In-Classroom Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive knowledge acquisition</td>
<td>Web-based interactive simulations Each learner completes at own pace</td>
<td>Instructor presents American Heart Association protocol 6:1 learner to instructor ratio</td>
</tr>
<tr>
<td>Cognitive knowledge assessment</td>
<td>Online test</td>
<td>Paper and pencil test</td>
</tr>
<tr>
<td>Skills acquisition</td>
<td>Each learner controls pace of watching DVD and practicing demonstrated skills Each learner practices on a personal inflatable manikin Audio feedback (click) from personal manikin with each compression of adequate depth</td>
<td>Instructor uses DVD to demonstrate skills Learners share manikins to practice skills (3 learners per manikin) Instructor feedback on adequacy of depth of compressions</td>
</tr>
<tr>
<td>Skills assessment</td>
<td>Assessed by instructor and sensorized manikin</td>
<td>Assessed by instructor and sensorized manikin</td>
</tr>
<tr>
<td>Average time to complete learning</td>
<td>1 hour, 15 minutes</td>
<td>4 hours, 30 minutes</td>
</tr>
</tbody>
</table>
TRAD course. If more than six participants were present, six were randomly assigned to a TRAD course and the remainder to SDL.

Learners in the SDL group were given a password and directed to the computer laboratory. After completing the online tutorial, SDL learners returned to a study area configured with six cubicles. Each cubicle had a small personal DVD player with headphones and the SDL kit. A facilitator with no knowledge of CPR directed the individual learners to make themselves comfortable and to stop the video at any time if they needed a break. The facilitator answered questions about using the DVD and adjusted the volume on DVD players as needed. Facilitators with no knowledge of CPR were specifically chosen so that they could not help learners with the course content. Learners were videotaped as they completed the skills acquisition part of the course.

TRAD learners were accompanied to a large classroom with adequate floor space for a traditional AHA CPR-AED course. An attendant ran a DVD recording camera during the class, discretely changing discs every hour.

After they finished the skills acquisition part of the course, learners were offered snacks while they waited to complete the psychomotor skills assessment with an instructor. After the assessment, learners completed the attitude survey. As they left the study room, learners were given a $10.00 gift card from a local merchant for their participation.

**Statistical Analyses**

Data were analyzed using SPSS software (SPSS, Inc., Chicago, IL). Counts and frequencies provided summaries of demographic data, instructor-assessed performance, and learners’ receptivity to instructional approach. Differences in instructor-assessed performance associated with learning approach were evaluated using chi-square analyses. Differences in manikin-recorded performance associated with learning approach were evaluated using multivariate analyses of variance followed by univariate analysis of variance. Differences in learner receptivity were evaluated using chi-square analysis. For all statistical tests, *p* < .05 was considered significant.

**RESULTS**

**Demographics**

Seventy-six learners were randomized to the SDL group, and 72 were assigned to the TRAD group. Ages ranged from 25 to 65 years. More women than men were in both learning groups, with a slightly higher percentage of women in the SLD group (Table 3). The distributions of ethnicity in the two learning approaches were similar, although there were more Whites in the TRAD group and more Asians in the SDL group (Table 3). The majority of learners had at least a high school education or equivalent. No significant differences in demographics were found between the two instructional approaches.

**Time to Course Completion**

Learners in the SDL cohort, on average, took 35 minutes to complete the online tutorial. Completion times ranged from 15 minutes to almost 2 hours (two older learners who had never used a computer). All but two learners (who were not experienced in using a DVD player) completed the skills acquisition part of the course within 40 minutes. On average, the SDL learners took 1 hour, 15 minutes to complete their entire program. Learners in the TRAD cohort, on average, took 4 hours, 30 minutes to complete their entire program.

<table>
<thead>
<tr>
<th>Checklist Item</th>
<th>Self-Directed Learning (N = 59)</th>
<th>Traditional In-Classroom Instruction (N = 63)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess responsiveness</td>
<td>96</td>
<td>94</td>
</tr>
<tr>
<td>Call 911*</td>
<td>90</td>
<td>99</td>
</tr>
<tr>
<td>Adequate ventilation</td>
<td>86</td>
<td>90</td>
</tr>
<tr>
<td>Proper hand placement</td>
<td>86</td>
<td>93</td>
</tr>
<tr>
<td>Deliver compressions of adequate depth*</td>
<td>80</td>
<td>97</td>
</tr>
<tr>
<td>Performs two cycles of cardiopulmonary resuscitation</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Turns on automated external defibrillator</td>
<td>97</td>
<td>100</td>
</tr>
<tr>
<td>Places pads correctly</td>
<td>93</td>
<td>99</td>
</tr>
<tr>
<td>Clears the victim to analyze*</td>
<td>37</td>
<td>96</td>
</tr>
<tr>
<td>Clears the victim to shock*</td>
<td>72</td>
<td>93</td>
</tr>
<tr>
<td>Resumes after 1 shock</td>
<td>97</td>
<td>96</td>
</tr>
<tr>
<td>Adequate performance overall*</td>
<td>88</td>
<td>100</td>
</tr>
</tbody>
</table>

*Significant difference, *p* < .05.
Skills Performance Outcomes

Instructor Assessments. Table 2 summarizes the skills performance outcomes assessed by instructors using the checklist of Lynch et al. (2005). According to instructor assessments, the percentages of learners in each group were comparable in performance on seven of the 11 checklist items. A larger percentage of learners in the TRAD group performed four of the 11 items significantly more often than did learners in the SDL group (p < .05). These four items were call 911, deliver compressions of adequate depth, clear the victim to analyze, and clear the victim to shock. All learners in the TRAD group were assessed to have adequate overall performance, whereas 88% of those in the SDL group were so assessed by instructors.

Sensorized Manikin Assessments. Table 4 summarizes the results provided by the sensorized manikin. The data presented in Table 4 are based on 59 SDL learners and 63 TRAD learners. Software difficulties precluded collection of data on the other subjects in each of the groups.

The AHA guidelines recommend that for chest compressions to be effective (support return of spontaneous circulation), 90 to 100 compressions should be delivered per minute, the chest should be depressed 1.5 to 2 inches with each compression, and the hands should be placed on the sternum between the nipples.

Although the average rate of compressions was higher for the TRAD group, the performance of both learner groups was within AHA guideline recommendations (Table 4). Overall, 75% of SDL learners achieved satisfactory rates of compressions, as compared with 90% of TRAD learners (p < .05).

The percentages of compressions of adequate depth were comparable for the two groups (Table 4), as were the percentages of compressions delivered using the correct hand position. There were no significant differences associated with learning approach on these two performance measures.

For chest compressions to be most effective, the rescuer’s hands must fully release pressure off the chest. Learners in the SDL group performed significantly better on this measure than did those in the TRAD group.
Despite the relatively high levels of satisfactory performance on individual compression-related skills, only 28% of SDL learners and 34% of TRAD learners (difference not statistically significant) delivered compressions that met all the AHA criteria for effective chest compressions (i.e., only 28% and 34% performed compressions of the correct rate and depth with correct hand position at the same time).

For ventilations, the AHA guidelines recommend that each ventilation be delivered over 1 second with an average minute volume between 5,000 and 6,000 ml. The percentage of ventilations that met AHA guidelines was very low in both groups—8% for SDL and 17% for TRAD ($p < .05$). The average minute volume of ventilations was low and comparable in the two groups; however, 29% of SDL learners delivered ventilations with adequate minute volumes, whereas only 10% of TRAD learners did.

**Attitudes Toward CPR Learning Approaches**

Learners’ receptivity to learning CPR is summarized in Table 5. With the exception of two items (2 and 7), the percentages of learners in each group who responded with agree or strongly agree were comparable. Learners in both groups evaluated themselves as being willing to do CPR (item 4), knowing how to do CPR (item 6), and feeling confident about performing CPR in a real emergency (item 10). Significantly fewer SDL learners than TRAD learners thought that they would do more harm than good by doing CPR (item 2) and that they would be too nervous to do CPR in a real emergency (item 7).

**DISCUSSION**

Using a self-directed approach to learning CPR skills is not new. In a systematic review article on bystander CPR, Vaillancourt, Stiell, and Wells (2008) noted evidence that learners who take well-designed modular or video self-training courses perform as well as those who take traditional CPR classes (Bircher & Safar, 1983; Coleman, Dracup, & Moser, 1991; Jabbour, Osmond, & Klassen, 1996; Monsieurs et al., 2004; Nelson & Brown, 1984). In perhaps the most comprehensive study to compare a self-directed learning approach for CPR training to a traditional classroom approach, Lynch et al. (2005) investigated the effect on 285 adults between the ages of 40 and 70 years who had no CPR training for at least 5 years prior to the study. Each adult was randomly assigned to an untrained control group, a traditional instructor-led course (Heartsaver), or a self-instruction program. Learners in the self-instruction program received a kit that contained a 22-minute video, an inflatable Mini Anne manikin on which to practice CPR skills, and an electronic device that provided feedback about correct rate and depth of compressions as well as correct hand placement for compressions. Lynch et al. concluded that the findings supported the use of video self-instruction because it produced results as good as those produced by the traditional Heartsaver course and did so with far less investment of time on the part of learners.

This study evaluated an SDL approach for CPR-AED training, the level of training frequently required in workplace safety programs. The percentage of learners with overall adequate performance, as judged by AHA-certified instructors blinded to learners’ type of CPR training, was high in both groups (SDL, 88%; TRAD, 100%). In the study conducted by Lynch et al. (2005), where performance was also judged by raters not knowledgeable of learning approach, 60% of SDL learners were judged to have adequate overall performance, whereas only 40% of learners in the more tradi-

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**Table 4**

**Skills Performance as Assessed by the Sensorized Manikin**

<table>
<thead>
<tr>
<th>Skill</th>
<th>Self-Directed Learning $M \pm SEM$</th>
<th>Traditional In-Classroom Instruction $M \pm SEM$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average rate of compressions per minute*</td>
<td>99 ± 3</td>
<td>108 ± 2</td>
</tr>
<tr>
<td>Percentage of compressions of adequate depth</td>
<td>68 ± 6</td>
<td>80 ± 4</td>
</tr>
<tr>
<td>Percentage of incorrect hand position</td>
<td>10 ± 4</td>
<td>10 ± 4</td>
</tr>
<tr>
<td>Percentage of compressions without full chest recoil*</td>
<td>2 ± 0.7</td>
<td>8 ± 2.4</td>
</tr>
<tr>
<td>Percentage of compressions meeting American Heart Association guidelines*</td>
<td>28 ± 5</td>
<td>34 ± 4</td>
</tr>
<tr>
<td>Ventilations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average minute volume of ventilations (ml)</td>
<td>3,631 ± 349</td>
<td>2,824 ± 430</td>
</tr>
<tr>
<td>Percentage of ventilations that were adequate*</td>
<td>8 ± 3</td>
<td>17 ± 3</td>
</tr>
</tbody>
</table>

*Significant difference, $p < .05$. *Compressions meeting American Heart Association guidelines for effectiveness in terms of rate of compressions, depth of compressions, and correct hand placement.
In this study, data from the instructors’ subjective assessment of individual performance identified four steps in which performance by SDL learners was significantly less than that of TRAD learners: calling 911, adequate compression depth, clearing the victim to analyze, and clearing the victim to shock (Table 2). Upon review, it was noted that the prototype DVD did not adequately address three of these steps: calling 911, clearing the victim to analyze, and clearing the victim to shock. On the basis of these findings, coverage of the three elements was enhanced in the next generation of the SDL product. The remaining variance in the instructors’ evaluation of performance was adequacy of chest compressions. Analysis of the objective data from the sensorized manikin on the adequacy of chest compressions did not find a statistical difference between the groups (Table 4).

Reports of variations between subjective instructor assessment of CPR performance and objective assessment using sensorized manikins are not new. Lynch, Einspruch, Nichol, and Aufderheide (2008) reported that when objective CPR performance assessments were compared to CPR instructor ratings, the instructors gave false-positive ratings to 55% of the learners who performed compression depths less than 1.5 inches. Birnbaum et al. (2005) discovered that CPR instructors excused sequencing errors and heavily weighted ventilations. Several investigators have suggested that instructors may be asked to assess skills beyond their perceptual or cognitive capacity and that perhaps the best use of an instructor’s judgment is for skills not measured by a manikin (Brennan, Braslow, Batcheller, & Kaye, 1996; Kaye et al., 1991; Lynch et al.).

The objective data provided by the sensorized manikin in this study suggest that SDL learners performed as well as TRAD learners on the percentage of compressions that met the AHA guideline recommendations (rate, depth, and hand position). SDL learners delivered significantly more compressions in which the chest was allowed to recoil fully than did TRAD learners.

Both groups of learners in this study had larger mean percentages of compressions with adequate depth (68% for SDL, 80% for TRAD) than those reported by Lynch et al. in 2005 (47% for SDL, 45% for TRAD). Proper hand placement among learners in this study was comparable (90%) for the two groups and better than that reported by Lynch et al. in 2005 (83% for SDL, 71% for TRAD).

In both groups, learners’ performance of ventilations frequently failed to meet AHA guidelines. This finding is consistent with what has been reported from other studies that assessed ventilation performance (Assar et al., 2000; Heidenreich, Higdon, et al., 2004; Heidenreich, Sanders, et al., 2004). TRAD learners delivered a higher percentage of adequate ventilations (17%) than did SDL learners (8%); however, SDL learners tended to deliver ventilations with larger minute volumes (approximately equal to 3,600 ml) than did TRAD learners (approximately equal to 2,800 ml).

In absolute terms, although comparable results were

<table>
<thead>
<tr>
<th>Item</th>
<th>Self-Directed Learning</th>
<th>Traditional In-Classroom Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cardiopulmonary resuscitation (CPR) should be taught by someone who has proper certification.</td>
<td>81</td>
<td>84</td>
</tr>
<tr>
<td>2. I would probably do more harm than good.*</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>3. It is a good idea for people to teach others to do CPR.</td>
<td>87</td>
<td>78</td>
</tr>
<tr>
<td>4. I would be willing to perform CPR.</td>
<td>100</td>
<td>95</td>
</tr>
<tr>
<td>5. I have knowledge to teach CPR.</td>
<td>75</td>
<td>83</td>
</tr>
<tr>
<td>6. I know how to do CPR.</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>7. In a real emergency, I would be too nervous to do CPR.*</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>8. I am willing to teach what I know to my family or friends.</td>
<td>87</td>
<td>95</td>
</tr>
<tr>
<td>9. I have to remember many things to do CPR.</td>
<td>68</td>
<td>65</td>
</tr>
<tr>
<td>10. I feel confident that I could do CPR in a real emergency.</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>11. CPR is difficult to learn.</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>12. I would perform CPR on a stranger in a real emergency.</td>
<td>90</td>
<td>83</td>
</tr>
<tr>
<td>13. I feel confident that I can perform the skills of CPR on a manikin.</td>
<td>97</td>
<td>95</td>
</tr>
</tbody>
</table>

*Significant difference, p < .05.
obtained, neither training method achieved optimal performance outcomes as defined by AHA guidelines. For most of the compressions, the majority of learners used proper hand position. The rate at which learners delivered compressions appears to be less of a problem than delivering compressions of adequate depth. Lynch et al. (2005) reported similarly that none of the learners in the SDL or TRAD group performed compressions of depths adequate to meet AHA guidelines. How to teach learners to deliver compressions of adequate depth is an area requiring further study.

In 11 of the 13 ways provided, learners’ receptivity to learning CPR and using an AED was comparable by the SDL approach or the TRAD approach (Table 5). Both groups of learners reported knowing how to perform CPR and willingness to do so if called on. The two areas in which the learners differed significantly may be of importance relative to their likelihood to perform CPR in an actual emergency. SDL learners were significantly less likely to agree or strongly agree with two statements: “I would probably do more harm than good” (0% for SDL, 17% for TRAD; p ≤ .05) and “In a real emergency I would be too nervous to do CPR” (3% for SDL, 13% for TRAD; p ≤ .05). These two attributes—fear of doing harm and panic—have been reported as primary reasons that trained and untrained individuals fail to perform CPR when needed in real life (Swor et al., 2006).

As the SOS-KANTO Study Group (2007) has shown, any resuscitation attempt after SCA significantly improves outcomes (5% vs. 2.2%, p < .0001). One strategy to increase the number of victims on whom resuscitation is attempted is to increase the number of individuals who are trained in CPR; however, as Swor et al. (2006) found, having had training in CPR does not always mean that the individual will attempt resuscitation. Swor et al. interviewed 868 individuals who called 911 at the time they witnessed a cardiac arrest. Of these, only 21% of the individuals initiated CPR (19% had been trained to perform CPR and 2% had not been trained but attempted it). Among the 79% who did not initiate CPR, 35% had been trained. If SDL decreases the restraining force associated with fear of causing harm and panic, it is possible that an increase in bystander CPR will result.

**IMPLICATIONS FOR PRACTICE**

The key to improving the current 6.4% survival rate from SCA (AHA, 2005; Nichol et al., 1999) is to have individuals trained in both CPR and the use of an AED and confident that they can help victims. As shown in Seattle–King County, Washington, early recognition and activation of the emergency response system, early application of CPR, early defibrillation, and early advanced life support can improve survival rates to more than 30% (Cummins et al., 1991; Eisenberg, Horwood, Cummins, Reynolds-Haertle, & Hearme, 1990). Extrapolating from the Seattle experience, Communique (1996) estimated that if similar levels of bystander CPR and public access defibrillation could be achieved nationally, more than 250 lives a day—or 100,000 lives annually—could be saved.

The results of this study and those reported by Lynch et al. (2005) suggest that the SDL program yields learning outcomes comparable to those obtained with traditional instructor-led courses. It overcomes many of the barriers individuals encounter to learning CPR and appears to make bystanders confident and willing to attempt resuscitation.

Although this study did not examine learners’ retention of CPR knowledge or skills, others have found significant declines in skills performance for both SDL and TRAD learners within as little as 2 months (Einspruch et al., 2007). The results reported by Einspruch et al. point to the need for further study on what is truly learned and not learned during initial training.

Beyond the efficiencies associated with initial training, a CPR-AED SDL kit belongs to the learner and can be used at any time for practice. Research on the impact of these kits for personal refresher training is warranted. Furthermore, a CPR-AED SDL kit can be shared with family and friends so that others can learn how to help in emergencies. In studies using a personal learning kit for mass CPR training in schools, an additional 1.5 individuals on average were trained when the kits were taken home (Isbye, Rasmussen, Ringsted, & Lippert, 2007).

In the work setting, time is money. Although CPR-AED training is required for certain employees, time spent in training is traditionally considered nonproductive. For this reason, course length is an important element to consider in determining an overall value equation for a training program. The SDL approach has a distinct time advantage over CPR-AED training. In this study, the average time to complete SDL training was 1 hour, 15 minutes, compared with 4 hours, 30 minutes for TRAD training (Table 1). This difference impacts employee productivity as well as the productivity of those responsible for the instruction. Training materials that are both effective and efficient in terms of learner outcomes and total time away from work (lost productivity) provide value to both the employer and the employee.

**CONCLUSION**

In 2004, recognizing the importance of occupational health initiatives in improving the health and wellness of workers, AHA and OSHA formed an alliance to reduce the cost of death and disability due to cardiovascular disease. A specific target of the alliance is CPR instruction and AED programs (Grunig, 2004). Although the average age of a SCA victim is approximately 65 years, many are in their 30s and 40s and active in the work environment (Eisenberg et al., 1990). Because occupational health nurses provide health promotion and risk reduction programs for the working population, they have the opportunity to affect the outcome of SCA, regardless of whether the victim is an employee in the work environment, a family member, or a friend of the employee in the community setting.

Whether motivated by regulatory and accreditation requirements or by the desire to improve overall survival from SCA through CPR training for lay providers, workplace safety programs invest significant time, energy, and money in teaching CPR-AED. The results of this study
identify that an SDL approach to CPR-AED training—now available as Heartsaver AED Anytime—is as effective as traditional classroom-based training programs and a more time-efficient tool for training large numbers of individuals. As such, occupational health nurses should consider using an SDL approach to implement or expand existing CPR training programs in the occupational health care setting. Widespread use of self-instructional CPR courses will enhance the incidence and performance quality of bystander CPR, which is especially critical whether SCAs occur at home, in the workplace, or in the community (Abella et al., 2008). These actions should improve survival from SCA.

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REFERENCES


Donovan, D. S., et al. (1991). The problem of poor retention of cardiopulmonary resuscitation skills may lie with the instructor, not the learner or the curriculum. Resuscitation, 21(1), 67-77.


Improving Workplace Safety Training Using a Self-Directed CPR-AED Learning Program

Directions: Circle the letter of the best answer on the answer sheet provided. (Note: You may submit a photocopy for processing.)

1. According to the Occupational Safety and Health Administration, ___% of reported workplace fatalities are due to sudden cardiac arrest.
   A. 7.
   B. 13.
   C. 20.
   D. 27.

2. In this study, the traditional in-classroom instruction (TRAD) approach used a ____ instructor to student ratio.
   B. 1:8.
   C. 1:10.
   D. 1:12.

3. Eligibility criteria for this study included all of the following except:
   A. Be at least 18 years old.
   B. Be in good health.
   C. Can maintain a kneeling position for up to 5 minutes.
   D. No cardiopulmonary resuscitation (CPR) training within the previous 5 years.

4. The assessment of skills performance by instructor revealed that both the self-directed learning (SDL) group and the TRAD group had 100% correct on this checklist item:
   A. Call 911.
   B. Turn on automated external defibrillator (AED).
   C. Resume compressions after one shock.
   D. Perform two cycles of CPR.

5. Skills performance outcomes by instructor assessment showed that ____% of those in the SDL group had adequate overall performance.
   A. 80.
   B. 84.
   C. 88.
   D. 92.

6. When assessed by a sensorized manikin, the percentage of TRAD learners who met American Heart Association guidelines for compressions was:
   A. 28%.
   B. 34%.
   C. 40%.
   D. 47%.

7. Based on instructor assessment, a step in which performance by SDL learners was significantly less than TRAD learners was:
   A. Perform two cycles of CPR.
   B. Adequate compression depth.
   C. Proper hand placement.
   D. Adequate ventilation.

8. In Lynch et al.’s (2005) study, instructors gave false-positive ratings to ____% of the learners who performed compression depths of less than 1.5 inches.
   A. 45.
   B. 50.
   C. 55.
   D. 60.

9. Compared to SDL learners, TRAD learners in this study had what percentage of adequate ventilations?
   A. 8.
   B. 17.
   C. 24.
   D. 29.

10. According to Cummins et al. (1991), early recognition, application of CPR, defibrillation, and advanced life support can improve survival rates to more than ____%.
    A. 8.
    B. 16.
    C. 22.
    D. 30.
Improving Workplace Safety Training Using a Self-Directed CPR-AED Learning Program

April 2009

(Goal: To gain ideas and strategies to enhance personal and professional growth in occupational health nursing.)

Mark one answer only!
(You may submit a photocopy of the answer sheet for processing.)

1. As a result of completing this module, I am able to:
   A. Identify the purpose of this research study.
   B. Compare and contrast the self-directed learning (SDL) and traditional in-classroom instruction (TRAD) approaches.
   C. Discuss the procedure in this research study.
   D. Describe the results comparing SDL and TRAD.
   E. Discuss the study’s implications for occupational health nurse practice.

2. The objectives were relevant to the overall goal of this independent study module.

3. The teaching/learning resources were effective for the content.

4. How much time (in minutes) was required to read this module and take the test?

   4 3 2 1
   60 70 80 90

Please print or type: (this information will be used to prepare your certificate of completion for the module).

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