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Remember fast, act skillfully

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Summary

Remember fast, act skillfully. Training methods for Basic Life Support; analysis from an educational perspective

This thesis contains five studies on education in BLS and AED skills.

Chapter 1 is an introduction to the theme of education in BLS and AED skills.

Chapter 2 describes the basic educational assumptions for this thesis. Three important topics are discussed:

1. Adult education

Most learners of CPR and AED use are adults. In adult education learners are responsible for their own learning process. They can construct new knowledge based on this experience (scaffolding), and most training is directly focused on acquisition in daily life.

2. Educational evolution

Three models in the evolutionary process are described. The process starts with the transfer model (with education in classroom and learners as passive absorbers of knowledge), progresses to the independent learning model (with education in groups and the teacher as a guide), and ends with the interactive learning model (where learners construct their own knowledge in “communities of learners”, with help of other learners or experts in informal and formal networks such as Facebook and MySpace, and formal, closed communities).

3. Retention and retrieval of learning results

Optimal retention is important for the use of CPR and AED skills since these skills may have to be applied unexpectedly and immediately, and skill retrieval has to be instantaneous, even in unfamiliar and stressful situations.

In studies about retention, the retrieved information is seen as an indicator of the retained information.

Based on educational research it is considered that adults are responsible for their own learning, and that the training should be applicable to their daily life. The task of the instructor is evolving from knowledge provider to facilitator. Training should focus on optimal retention and fast retrieval.

Chapter 3 presents an investigation of self-directed AED training, on the basis that self-directed BLS-training, using a personal training manikin with video, had already been shown to be as effective as instructor-led training. We used a non-inferiority design, comparing the traditional / standard 90 minute instructor-led AED training programme of the European Resuscitation Council with three DVD-based AED training methods:

- A 2.5 minutes DVD demonstration of the use of an AED, in a single uninterrupted session, without hands-on practice.
- A 4.5-min training DVD while using a personalised manikin and 'mouse pad' AED in a single uninterrupted session.
- A 9-min training DVD while using a personalised manikin and 'mouse pad' AED in a single uninterrupted session with the addition of working through two scenarios on the DVD during which students had to practise the AED skills.

Three hundred ninety-six participants were assigned to one of the four AED training methods by randomization stratified for age (younger than 21 years, between 21 and 50 years, and older than 50 years).

Participants were tested immediately after the training (post-test) and two months later (retention-test) using modified Cardiff criteria. (Appendix 2) The primary endpoint was the percentage of providers scoring 70% or higher. The secondary endpoints were the mean scores and differences per item per age group.

In both the post-test and retention-test comparison non-inferiority could not be accepted. The skill level of participants in all DVD-based training groups was significantly higher on the retention-test than on the post-test. Those receiving scenario training scored higher on the post-test ($p < 0.001$). All three time-intervals measured were significantly and clinically relevantly longer for participants older than 50 year ($p < 0.03$).

The DVD-based AED training without scenario is not recommended.

Scenario training is a useful addition, but instructor-facilitated training involving feedback and interpersonal educational skills remains the best method.

Chapter 4 describes a prospective study designed to evaluate performance of police officers in a real resuscitation attempt, in comparison with their assessment at the end of their ERC AED training course.

During a period of 11 months we evaluated 67 resuscitation attempts in Amsterdam and surroundings, where police officers used an AED, using the transcripts in conjunction with the information from the ECG tracing, the event recording of the AED and the interview at the scene.

Sixty-seven police-teams were analysed. These teams included 127 police

officers (mean age of 35 years; range 23–54 years). The interval between AED training and the first resuscitation attempt was a median of 4 months (range 1–13). Eighty seven percent of the teams (58/67), who used the AED in real resuscitation attempts, consisted of two police officers who both were qualified as “competent” after the initial training. In 79% (46/58) of the teams, successful completion of the course was associated with good performance during a resuscitation attempt ($p = 0.009$). In turn, of the nine “incompetent” teams in training, three performed competently during the resuscitation attempt.

We concluded that successful training correlates well with successful performance in the field.

In Chapter 5 we compared the educational benefits and cost-effectiveness of initial AED training for nurses, already trained in basic life support, by a 3-h instructor-based course, with self-training by means of an instructional poster, a resuscitation manikin, and a training AED. The study was performed in a hospital that was due soon to be equipped with AEDs. Thirty general ward nurses were randomly allocated to one of two groups for training in the use of an AED. Fifteen nurses were trained by a certified instructor, in a ratio of four to six nurses to one certified instructor, during a AED course that followed the guidelines and organizational standards of the European Resuscitation Council. The other group of 15 nurses was invited to take part in individual self-training. Three training rooms in the hospital were available 24/7 and equipped with an AED training device, a manikin, and a wall poster.

Each nurse was assessed on 17 aspects of performance between 13 and 16 days after training. (Appendix 1)

The two groups were comparable for gender, seniority, and experience in resuscitation.

No significant differences in performance were found between the groups for 14 of the skills tested. For three skills (creating workspace, checking for signs of a circulation, and the spatial position of the AED in relation to the victim), there were statistical differences, but these were not considered to be of clinical relevance. It was calculated that if poster self-training were to be used instead of instructor-based courses, there would be a saving in costs of up to € 47 for each nurse trained. The results about cost effective may occur for other training groups as well.

Whereas the study in Chapter 5 focuses on using a poster for initial AED training, the study in Chapter 6 looks at using a poster for refresher training. This latter study compared two refresher training methods for CPR and use

of an AED after standard initial CPR and AED training. This study involved 139 lifeguards, working on the beaches in the West and South-West of the Netherlands.

Seventy-nine received a one-and-a-half-hour, instructor-led refresher training course with a ratio of 6 students per instructor and 3 students per manikin and AED training device (group A). The other 60 were advised to refresh their own knowledge with a poster, a manikin, and an AED training device (group B). The lifeguards were assessed 3, 6, and 12 months after the initial training. A score sheet with 17 skills on a 7-point VAS scale was used for the assessments. (Appendix 1)

The assessment results showed that 75% of the lifeguards in each group were deemed competent after 3 months. After 6 months, 78% in group A and 75% in group B were considered competent. After 12 months, this was 71% and 76% respectively.

Young and less experienced lifeguards performed better than older and more experienced lifeguards.

We concluded that refresher self-training by the use of a poster was as effective as, and more flexible than, scheduled, instructor-led refresher training. This confirms the findings of the study in Chapter 5.

In Chapter 7 a preliminary report of the effectiveness of a web-based self-training program for CPR and the use of an AED. The program included theory, scenario training, and self-testing, but without practice on a manikin, or any instructor input.

Sixteen volunteers, who completed on-line training in their own time, were assessed, without prior warning, in a scenario setting. A recording manikin, expert assessors and video recording were used with a modified version of the Cardiff Test. (Appendix 2)

All 16 volunteers performed the assessed skills in the use of an AED correctly.

Most of the skills of BLS assessed were performed well, but chest compression depth and rate were performed less well (59% and 67% of participants, respectively, performed correctly). Opening the airway and lung inflation were performed poorly (38% and 13% of participants performed correctly), as was checking for safety (19% participants performed correctly). There was no significant correlation between the time a participant spent on-line and the quality of performance. Only 5 of the volunteers had ever attended a BLS course or used a resuscitation manikin before the assessment; their performance scores were not significantly better than those of the other 11 volunteers.

These results suggest that it may be possible to train people in BLS and

AED skills using a micro-simulation web-based interactive program but without any practice on a manikin. This seems to be particularly the case for the use of an AED, where performance achieved a uniformly high standard.

Chapter 8 is the general discussion. The results of this dissertation show that poster-, video- and web based training are promising alternatives means of improving retention and retrieval of AED and CPR skills, although, as yet not well enough developed to be equal or superior to instructor-based training. The different training methods and results of the studies in this thesis are explained from the viewpoint of adult education, where learners have their own responsibility for learning. We found that testing is a powerful learning tool in adult education.

From the viewpoint of educational evolution most resuscitation training is delivered according to the transfer model: an instructor delivers the training in a classroom using a manual, a presentation or lecture, and a manikin to demonstrate and practice. The alternative training methods correspond with the Model of Independent Learning and Model of Interactive Learning, they can enhance a more uniform training design.

Not all studies had the same level of evidence. Some were in the ‘context of discovery’, comparable with observational research in the medical domain, in which a level below that of randomised controlled trial design can be effective. Others belong to the ‘context of justification’, comparable with interventional research in medicine. For the last, randomised controlled trials might be optimal.

Some topics to considered explaining the results of the alternative and the instruction-led studies are collaborative learning and an aspect of neuroscience: mirror-neurons.

In collaborative learning learners can help each other by asking questions.

A mirror neuron is a neuron which fires when someone acts as well as when someone observes the same action performed by another person. Thus, the neuron “mirrors” the behaviour of another person, as though the observer was acting himself. These neurons may be important for understanding the actions of other people, and for learning new skills by imitation.

It is recommended that teaching BLS and AED skills become a part of normal life, for example by training children at secondary school as part of the school curriculum, at work, or at social events to increase the number of people that can recognize, remember, and provide CPR and AED.