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On the future of Basic Life Support training

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ABSTRACT

Most but not all of the steps of cardiopulmonary resuscitation (CPR) were known by 1900. They were however not implemented because established opinion leaders feared change at that time; researchers in laboratories, clinicians, and rescuers did not communicate their findings resulting in no one putting together effective steps for a lifesaving approach to the sudden cardiac arrest [1]. By discussing the training strategies and contents, the present opinion paper aims to highlight the parallels with basic life support (BLS) training and future potentials for the 21st century.

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The title of this article is adapted from a presentation entitled “on the future of reanimatology” given at the 1999 Society for Academic Emergency Medicine annual meeting by Dr. Peter Safar [2]. He presented a brief history of past accomplishments, recent findings, and future potentials for resuscitation research. Dr. Safar recalled that by 1900, most but not all of the steps of cardiopulmonary resuscitation (CPR) were known. They were however not implemented because, in his words “dictatorial professors” feared change; researchers in laboratories, clinicians, and rescuers did not communicate their experiences with the result that no one was able to put together an effective system of lifesaving steps [1].

In this present opinion paper we aim to discuss parallels with CPR training and future potentials for the 21st century. Nearly 55 years have passed since cardiologist Leonard Scherlis started the American Heart Association's CPR Committee in 1963, and in the same year, the American Heart Association (AHA) formally endorsed CPR. Since then not only the AHA but also other international and national organizations have set up educational systems to teach lifesaving techniques effectively. However, over many decades the survival of patients after cardiac arrest did not change that much despite the introduction of new drugs, resuscitation techniques, and better organized rescue systems.

On the other hand we observed that over more than 20 years several alternatives to instructor-led Basic Life Support (BLS) training, such as self-instruction using videos or digital versatile discs (DVDs) with or without a manikin [3,4], the use of automated voice feedback [5,6], computers [7], electronic flashcards [8], peer learning with apps [9], micro-simulation [10], micro-trainings [11], repetitive automated testing [12] were investigated in an attempt to improve CPR quality. Several of these educational interventions are superior or equal to traditional BLS courses which in general last a couple of hours (including didactic lectures and some hands-on training). Despite those diverse training alternatives, BSL skills are still poorly acquired and retention deteriorates in as little as three to 6 months [13].

Perhaps the answer to better skill acquisition and retention lies in the training strategy rather than the training method. Already in 2010, the Consensus of Science and Treatment Recommendation Statement (CoSTR) of the International Liaison Committee on Resuscitation which inspired the publication of the European Resuscitation Council's (ERC) guidelines, mentioned that training should be tailored to the needs of different types of learners and learning styles to ensure acquisition and retention of skills [14,15]. Despite this knowledge, initial BLS training continues to be a “once and done or single learning” strategy, often without measurable educational objectives to attain beyond the level 1 in the Kirkpatrick Model (Fig. 1).

Some students learn very fast and need only a bit of guidance, while others learn slowly and need hard work, regular attention

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Fig. 1. Kirkpatrick Model.
(<http://www.kirkpatrickpartners.com/Our-Philosophy/The-New-World-Kirkpatrick-Model>).

and lot of supervision and input from a dedicated teacher. Different students have different learning attitudes and learning habits, but it's obvious that a "one size fits all" strategy or a "once and done single learning" strategy will only suit the fast and maybe only the bright learners. However, if international CPR organizations really want to increase survival, educational strategies need to address all citizens including a large group of "slower" learners. If their learning needs are not addressed properly, all the efforts will result in poor skill acquisition and in term even less retention.

By adopting 21st century educational strategies with straight forward learning and evaluation objectives, strategies such as self-instruction allowing multiple training opportunities, organising shorter but more frequent BLS training refreshers aiming at the mastery of BLS skills, the quality of resuscitation performance in real life could be increased. It has been shown that low level short BLS training sessions for a very broad population was likely to improve the BLS performance and resulting in better survival rates [16–18].

In addition to the training strategy and despite the international recommendations to retrain BLS skills at least once a year, retraining intervals are often much longer [19]. In fact many official instances, such as accreditation organisms or training organizations, are satisfied with 2 year or even longer retraining intervals. Most of the time logistic impairments, the large amount of personnel to train in BLS, finding time in a busy work schedule or financial matters are the barriers to prevent more frequent training. The use of more frequent (automated) assessments could identify those individuals who require refresher training to help maintain their knowledge and skills [5,11,12,20–22].

An equally important shortcoming of most training strategies is the fact that they generally focus on the "visible outcome of learning", knowledge and skills, which is the part being certified and known to others. The "invisible outcomes" like attitude towards helping others, first aid and BLS is rarely approached. Especially when targeting larger populations like school children, first responders, security and rescue personnel, building a strong base for these "invisible" attitudes form the backbone for the effective acquisition of knowledge and skills. Adopting these "positive" attitudes is broader then performing BLS skills alone, but also need to focus on prevention of cardiac arrest, such as healthy life style and early recognition of pre-arrest situations. Ideally this education starts at school and should be perceived as a social responsibility [23]. Breckwoldt and colleagues, reviewing 20 BLS courses in Berlin found that on the one hand teachers did not always comply to the current guidelines and on the other hand that there was insufficient emphasis on reducing fear to act in a real time situation [24]. The open question is how to overcome that?

Several attempts to hold world records in mass BLS training are examples of disseminating knowledge and/or skills on a very large scale. By mediatizing the topic they contribute to facilitate and increase awareness and shape the right attitudes to immediately help persons needing help without prejudice. The Danish experiment of

mass distribution of manikins among schoolchildren is another example of getting beyond "simple" skills training. In this experiment a substantial observed multiplier effect demonstrated the potential of mass education and dissemination of knowledge [25]. Furthermore, a targeted media campaign together with widespread education can significantly increase the willingness to use an AED, and increase the confidence in providing chest compressions and mouth-to-mouth ventilations [26]. In this trial Nielsen and colleagues reported that almost all participants with a BLS course in the past 5 years had a significantly greater willingness to perform BLS including the use of an AED. In a 3-year follow-up period after that intervention, the authors observed a persistent significant increase in the bystander BLS rate, however without significant difference in 30-day survival [27].

After discussing the strategy to teach knowledge and skills and shaping the right attitudes towards CPR, we also need to look into the BLS course content. Despite the recommendation for 30:2 CPR, compression-only CPR has been advocated as a preferable approach for bystanders since the elimination of mouth-to-mouth ventilation addresses some of the barriers to performing CPR [28]. A recent review on chest-compression-only CPR confirms it is faster to initiate CPR and delivers more compressions, however compressions are often shallower due to fatigue and the long term skill retention is unclear [29]. Since the confidence in the equivalence between chest compression-only and standard CPR is not sufficient to change current practice to compression only CPR, the ERC recommend the teaching of 30:2 CPR [13]. Only when a bystander has not been trained in adult CPR, the emergency medical dispatcher should instruct him or her to give chest-compression-only CPR while awaiting the arrival of professional help [30].

Proper compression depth of at least 5 cm is the major determinant of survival after cardiac arrest [31,32]. However, most teaching strategies do not measure the achieved depth in an objective way and more important, no predefined bench of "good quality" is defined (e.g. proportion of compressions with adequate depth or effective compression ratio) [33–36]. Multiple repetitive formative tests were able to train people to a predefined success level and even although there was a small decay in skills after 5 months, compression depth was still adequate in 80% of the participants [12,37]. Other authors also described the efficiency of rapid cycle deliberate practice or training based on mastery learning principles [38,39]. Combining such strategies of multiple short sessions, together with objective measurements and straight forward learning outcomes might ultimately result in better acquisition and retention of BLS skills for every type of learner. Furthermore, by translating the principles of mastery learning into a CPR game with multiple short gaming levels which gradually train people to a good level of CPR quality, new technologies might offer a perspective to overcome the deficits of traditional approaches.

In the 1950's Don Kirkpatrick proposed to rank the result of education in a model which is in the meantime used worldwide as the standard evaluation of training effectiveness. At the lowest level 1 it rates the reaction of participants response to the training. Level 2 "Learning" measures if they actually learned the material. Level 3 "Behaviour" considers if they are using what they learned on the job, and Level 4 "Results" evaluates if the training positively impacted the organization.

The model is applied before, during and after training to both maximize and demonstrate training's value to the organization.

All of our work is based on the sound principles of the updated Kirkpatrick Model – the "New World Kirkpatrick Model" (Fig. 1):

Level 1 or reaction: measures the degree to which participants find the training favourable and relevant for their job. How they

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