



## Technological strategies associated with training in Basic Life Support

*Estratégias tecnológicas de ensino associadas ao treinamento em Suporte Básico de Vida*

*Estratégias tecnológicas de enseñanza asociadas al entrenamiento en Soporte Básico de Vida*

Satomi Mori<sup>1</sup>, Iveth Yamaguchi Whitaker<sup>2</sup>, Heimar de Fátima Marin<sup>3</sup>

### ABSTRACT

This study aimed to analyze the effectiveness and advantages of the use of technological resources for teaching Basic Life Support (SBV) through a narrative review. We analyzed 29 articles published and indexed in these sources: Medline, PubMed and LILACS that used video, CD-ROM, DVD, websites and computer programs for teaching SBV. It was observed that the use of these resources may favor the acquisition of knowledge at levels similar or superior to methods of traditional teaching. Among the observed advantages cited were the reduction in training costs, ease of access and standardization of information.

**Keywords:** Advanced Cardiac Life Support; Computer-assisted instructions/methods; Cardiopulmonary resuscitation/education; Education, nursing, continuing/organization & administration; Internet/organization & administration; Health services needs and demand

### RESUMO

Neste estudo objetivou-se analisar a eficácia e as vantagens do uso dos recursos tecnológicos para o ensino em Suporte Básico de Vida (SBV) por meio de revisão narrativa. Foram analisados 29 artigos publicados e indexados nas bases de dados MedLine, PubMed e LILACS que utilizaram vídeo, CD-ROM, DVD, *websites* e programas computacionais para o ensino em SBV. Observou-se que a utilização desses recursos pode favorecer a aquisição de conhecimento em níveis similares ou superiores aos métodos tradicionais de ensino. Dentre as vantagens observadas citam-se a redução dos custos de treinamento, a facilidade de acesso e padronização das informações.

**Descritores:** Suporte vital Cardíaco Avançado; Instrução assistida por computador/métodos; Ressuscitação cardiopulmonar/educação; Educação continuada em Enfermagem/organização & administração; Internet/ organização & administração; Necessidades e demandas de serviços de saúde

### RESUMEN

En este estudio se tuvo como objetivo analizar la eficacia y las ventajas del uso de los recursos tecnológicos para la enseñanza del Soporte Básico de Vida (SBV) por medio de revisión narrativa. Se analizaron 29 artículos publicados e indexados en las bases de datos MedLine, PubMed y LILACS que utilizaron video, CD-ROM, DVD, *websites* y programas de informática para la enseñanza en SBV. Se observó que la utilización de esos recursos puede favorecer en la adquisición de conocimientos en niveles similares o superiores a los métodos tradicionales de enseñanza. Entre las ventajas observadas se citan la reducción de los costos de entrenamiento, la facilidad de acceso y patronización de las informaciones.

**Descriptores:** Apoyo Vital Cardíaco Avanzado; Instrucción por computador/métodos; Resucitación cardiopulmonar/educación; Educación continua en Enfermería/organización & administración; Internet/ organización & administración; Necesidades y demandas de servicios de salud

<sup>1</sup> Master. Nurse of the Nursing College - Universidade Federal de São Paulo – UNIFESP - São Paulo (SP), Brazil.

<sup>2</sup> PhD. Assistant Professor of the Nursing College - Universidade Federal de São Paulo – UNIFESP - São Paulo (SP), Brazil.

<sup>3</sup> Professor of the Nursing College - Universidade Federal de São Paulo – UNIFESP – São Paulo (SP) Brazil.

## INTRODUCTION

The development of knowledge in cardiopulmonary resuscitation (CPR) has involved the scientific work of many researches from the eighteenth century to the present days. The framework for the implementation of modern techniques in CPR occurred in 1950, when the procedure was divided in steps A, B and C, and in 1960 when Kouwenhoven published an article stating that anyone, anywhere, could perform CPR. In 1961, motivated by the possibility of reversing a cardiac arrest, the American Heart Association established a committee to promote cardiopulmonary resuscitation research, standardization of information and Basic Life Support (BLS) training<sup>(1-3)</sup>.

Since then, several studies on training and availability of BLS information have been conducted. The first technological resource created for this purpose and widely used today is the manikin, which provides practical training procedures, such as mouth to mouth ventilation and external chest compression. Further on, other resources for the propagation of information began to be tested and used with the same purpose.

The importance of disseminating knowledge and developing skills in CPR are due to the fact that, when performed early and correctly, it can save lives. Another important aspect is the high incidence of situations that can cause cardiac arrest, such as myocardial infarction and accidents<sup>(4-5)</sup>. Therefore, it is important that people have easy access to information and BLS training. Despite the existence of BLS courses, more investment is needed to spread the knowledge to cover a greater number of CPR-trained bystanders. Considering that, there are many technological resources for communication, such as videos, CD-ROMs, DVDs and websites that can be used for this purpose.

Considering the importance of disclosing information on BLS, the purpose of the present study was to analyse the effectiveness and the advantages of using these resources to acquire knowledge and skills on BLS, both by layperson and healthcare professionals. It is believed that such information can contribute to make a decision on the best resources to be used for this purpose, according to the needs and conditions of its users. Moreover, they could also promote the improvement and development of new strategies for BLS training.

## METHODS

The present study is a narrative review, whose search was conducted in the databases Medline, PubMed and LILACS using the keywords: cardiopulmonary resuscitation and education. The search included articles published up to 2009, and the languages English, Spanish and Portuguese were considered. The inclusion criterion

for the articles was the description of using one or more of the following technology tools: video, CD-ROMs, DVDs, websites and computer programs as the only educational resources for CPR or BLS training. Studies on Advanced Life Support training, issues unrelated to BLS, as well as those that did not use the technological resources above mentioned were excluded.

From the MedLine database, 1,041 articles were obtained, 27 of which were selected. PubMed provided 189 articles, three articles were selected as 20 had already been selected through MedLine. In LILACS, 51 articles were found, however, none were selected because they did not have the inclusion criteria for this study. Therefore, a total of 30 articles was selected.

## RESULTS

Information about the type of study, year of publication, journal and device are showed in Chart 1.

Out of the 30 articles selected, 21 (70%) were related to videos and DVDs, nine (30%) CD-ROM, computer programs and websites. Fifteen articles (50%) were published in the journal *Resuscitation*.

### Videotape and DVD

Among the studies that used video or DVD, 16 were applied to layperson, two to medical students, one to nursing student, and one to health care professionals<sup>(6-26)</sup>.

From the studies performed with layperson, five assessed their skills immediately after training, seven assessed from one week to eight months after the training, and four interviewed the participants<sup>(7-9,11-22,24)</sup>.

Through the data obtained in interviews to lay people, 65 CPR were witnessed. 31 occurred in the group that received videotape training, and 34 in the group that received no training. CPR was initiated by the layperson in 83% and 75% of cases, respectively<sup>(7)</sup>.

The rate of layperson trained using DVDs was verified after a few months, that study observed that 4% of Norway's population had been trained. Another study found that there was no significant increase in the rate of people trained from one year to another, after using such resource. As for the psychosocial aspect, it was possible to observe that video training reduced the initial anxiety when compared to other methods<sup>(10,12,14,22)</sup>.

Among medical students, a superior performance was verified in the group whose skills had been acquired through video training, in comparison to the control group. About 43% of those who received traditional training and 19% of video trained individuals were classified as incompetent in CPR. Among nursing students, it was observed that there were no significant differences between the intervention and control groups, however, the group that used video training demonstrated to have best performance after primary assessment. It was also found that 49.2% of them reported that the

**Chart 1** – Studies that used technological resources for Basic Life Support training.

Journal and references	Amount	Year	Kind of study	Technological resources
<i>Annals of Emergency Medicine</i> (6,8,10,25)	4	1995	Prospective	Video
		1998	Prospective	Video
		1998	Prospective	Video
		1999	Prospective	Video
<i>Circulation</i> (19)	1	2007	Prospective	DVD
<i>Critical Care Medicine</i> (13)	1	2000	Prospective	Video
<i>Official Journal of the American Association of Occupational Health Nurses</i> (2,4)	1	2009	Prospective	Video
<i>European Journal of Anaesthesiology</i> (28)	1	2006	Prospective	Website
<i>Family medicine</i> (9)	1	1998	Prospective	Video
<i>Heart Lung</i> (11)	1	1999	Prospective	Video
<i>Human Factors</i> (20)	1	2008	Prospective	Video
<i>International Journal of Nursing Practice</i> (34)	1	2008	Prospective	Website
<i>Resuscitation</i> (7,12,14-18,21-23,26-27,29-31)	15	1997	Prospective	Video
		2000	Prospective	Video
		2000	Prospective	Video
		2004	Prospective	CD-ROM
		2005	Prospective	Video
		2006	Prospective	DVD
		2006	Prospective	Computer program
		2006	Prospective	Website
		2007	Prospective	Video
		2007	Prospective	DVD
		2007	Prospective	DVD
		2007	Prospective	DVD
		2008	Prospective	Computer program
2009	Prospective	Video		
2009	Prospective	DVD		
<i>Studies in Health Technology and Informatics</i> (32-33,35)	3	2007	Prospective	Computer program
		2008	Prospective	Website
		2009	Prospective	Website

limiting factor to participate in CPR training was its cost<sup>(26)</sup>.

Other studies verified that the practical evaluation results, immediately after the CPR training, demonstrated adequate skill acquisition among 60% and 80% of video trained individuals and among 6.1% and 45.1% of individuals in the control group. Other studies showed different results: 79% of those who participated in a training course with instructor and videos had a good performance. 72.5% of those receiving guidance by instructors, and 65% of those who only used videos also had a good performance<sup>(8-9,13,15)</sup>.

When evaluating external chest compressions (ECC), it was found that the average ECC achieved before and after training was  $100.5 \pm 62.5$  to  $161 \pm 32.8$  in the intervention group, and  $74.4 \pm 55.5$  to  $159 \pm 31.8$  in the control group. No significant differences between groups were found. Another study analysed trainings that used videos, and it also demonstrated that the ECC average increased from 60 to 119. The use of video has also been effective in achieving satisfactory performance in the use of automated external defibrillator<sup>(21,23-24)</sup>.

Studies evaluating knowledge and skills retention over time showed that after two months of training, 40% of the group that used videos and 16% of the individuals

in the control group were competent in performing the procedures. Still considering the same period, another study observed the decline in performance from 60% to 44% in the intervention group and 42% to 30% in the control group. Studies that assessed the participants after three and six months, demonstrated that adults had better performance than children. The other study showed that there was no significant difference between the intervention and control groups, concluding that video training was as effective as the traditional method<sup>(10-11,16-20)</sup>.

#### CD-ROM, Computer Programs and websites

The use of CD-ROM, computer programs and Internet was assessed through medical, nursing and high school students, as well as nurses, mental health professionals, and professionals of a company<sup>(27-35)</sup>.

In three studies about the use of the Internet by high school students, one verified that the average score on the BLS theoretical test was 7.5 in the intervention group and 6.0 in the control group. Another study found no significant differences between groups<sup>(31)</sup>. When comparing the acquisition of knowledge after two days of training in four distinct groups, the theoretical evaluation scores were 87% for the group that used

both computers and practical training, 82% for those who used only the computer, 77% for the group that associated video and practical demonstrations, and 54% for the group without training. When assessing the sequences of CPR, maneuvers scores varied between 26% and 100% in the intervention group and 12% and 56% in the control group<sup>(30)</sup>.

In studies involving the use of CD-ROMs by nursing and medical students, the best performances were verified among those who had used them. The average score achieved by nursing students in practical assessments ranged from 5% to 100% in the intervention group and 0% and 100% in the control group, and 50% of the assessed items reached 0% in this group<sup>(27)</sup>. Among medical students, the theoretical evaluation demonstrated a better performance in the intervention group, in comparison to the control group,  $p = 0.0007$ . However, there were no significant differences between the groups in the practical assessment ( $p = 0.4381$ )<sup>(27)</sup>.

The practical assessment of nurses demonstrated an average score of 34 in the group that received conventional training, 28 in the group that was trained via the internet and 26 in the control group<sup>(29)</sup>. The mental health professionals who used the website had a better performance in 21 of the 30 features observed, and among professionals recruited from a company, the information obtained from a website collaborated to 84% and 100% of them to correctly perform BLS steps<sup>(32,35)</sup>.

## DISCUSSION

Among the selected studies that used videos, CD-ROMs, DVDs, computer programs and websites as the only resources for BLS training, it was observed that such resources can be used for knowledge acquisition. They presented similar or superior results in most of the studies analysed, when compared with traditional methods. Regarding the assessment of the practical performance, some studies found that these technological resources may not favour the acquisition of skills, and they recommend that practical training on the procedure also occurs<sup>(23,27,34-35)</sup>.

Despite this observation, the use of such tools is considered essential for the dissemination of knowledge and information about BLS. This is attributed to the possibility of covering a larger number of CPR-trained bystanders, when compared to traditional methods, in which the vacancies for training courses are often limited. Other aspects that make them attractive relate to the possibility of reduced the variability in quality and quantity of information provided. In traditional methods, there may be differences in information given by different instructors, and the use of audio-visual materials decreases or eliminates such risk<sup>(11,13)</sup>.

Other relevant factors to be considered are the costs

of training and the flexibility of the chosen material. Even though the cost for the production of technological tools is high, its value is offset by the high possibility of reproduction and reutilization in different places and by different people. This is a core characteristic, especially due to the fact that the information can be shared among people of different socioeconomic conditions<sup>(8)</sup>.

The possibility of reducing the time spent in the classroom and the fact of students could study according to their needs without the influence of peers, were also a valued aspects. Most of the tools described is easy to use and adapt, and enable to be reviewed. Some even allow users to interact with the system through simulations and quizzes, and make dynamic illustrations possible, through videos and sounds<sup>(8,11,13,25-26,29-34)</sup>.

Such resources were also appreciated, because they are flexible and individuals can review or continue studying, according to their own needs without the influence of others, as well as the fact they are exciting and innovative<sup>(28)</sup>.

The limitations often identified in the studies are related to the fact that data were obtained in small populations, meaning that their results may not be applicable in other contexts. Other less frequently cited factors that may have influenced the results were people with a prior ability in BLS, or people who have received additional information during the study, those who were randomized unequally among groups, and the use of different dummies in the intervention and control groups during the practical assessment, the irregular intervals between guidance and the practical assessment, and the fact that technical failures occurred with the equipment during training<sup>(7-8,11,26-28,30-32)</sup>.

When considering the results obtained and the importance of increasing the chances of more lives being saved by the application of simple procedures by trained and informed individuals, the relevance and need for greater investment in the creation and dissemination of new technologies for BLS training are clear. Among them, the resources of Virtual Reality and Augmented Reality allow the user to interact with a computer interface more easily. Besides, larger political incentives are necessary to everyone access such resources. These initiatives could benefit especially those who have limitations to participate in courses or training due to socioeconomic reasons.

## CONCLUSION

The use of technological tools facilitates the acquisition of knowledge at similar or superior levels to those presented by the traditional methods of BLS training. However, for the adequate development of skills, an association of both practices is recommended. Other important aspects to be considered is the fact that the resources analysed can reduce training costs,

facilitate the population's access to information, suit the learners' personal needs, and influence the standardization

of the available information, reducing time spent in the classroom, among other factors.

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