REVISTA DE ENFERMAGEM REFERÊNCIA
homepage: https://rr.esenfc.pt/rr/
ISSNe: 2182.2883

RESEARCH ARTICLE (ORIGINAL)

Knowledge about basic life support in higher education health students

Conhecimento sobre suporte básico de vida em estudantes do ensino superior de ciências da saúde

Conocimientos sobre el soporte vital básico en los estudiantes de ciencias de la salud de la enseñanza superior

Pedro Miguel Barreira Preto [1]
https://orcid.org/0000-0002-6488-4533

Carlos Pires Magalhães [2,3]
https://orcid.org/0000-0003-0170-8062

Adília Maria Pires da Silva Fernandes [2,3]
https://orcid.org/0000-0003-1658-4509

[1] EPE Northeast Local Health Unit, Bragança Hospital Unit, Bragança, Portugal

[2] Polytechnic Institute of Bragança, Bragança, Portugal

[3] Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra, Coimbra, Portugal

Corresponding author
Carlos Pires Magalhães
E-mail: cmagalhaes@ipb.pt

Received: 12.12.20
Accepted: 20.09.21

Abstract

Background: Cardiac arrest (CA) is a serious problem that requires the immediate intervention of third parties using basic life support (BLS).
Objectives: To assess higher education health students' knowledge about BLS and analyze the associations between level of knowledge and sociodemographic, academic, and socio-educational variables.
Methodology: Quantitative correlational cross-sectional study in a sample of higher education students.
Results: The sample consisted of 683 students, with a mean age of 21 years, mostly women. The mean knowledge score was 11.79 points, on a scale of 0 to 20. There was a statistically significant association between the level of knowledge and the program, the year of study, having attended a BLS course/training, and having attended course units with BLS content.
Conclusion: The mean scores reflect a sufficient level of knowledge, with the following groups obtaining higher scores: 4th-year students, nursing program, and previous BLS training.

Keywords: health students; first aid; cardiopulmonary resuscitation; knowledge

Resumo

Enquadramento: A paragem cardiorrespiratória constitui um grave problema que prossupõe uma atuação imediata de terceiros, devendo-se para tal recorrer ao suporte básico de vida (SBV).
Objetivo: Avaliar os conhecimentos em SBV, em estudantes do ensino superior da área da saúde, e analisar as associações entre o nível de conhecimento e variáveis sociodemográficas, académicas e de contexto socioeducativo.
Metodologia: Estudo correlacional, transversal, quantitativo, efetuado numa amostra de estudantes do ensino superior.
Resultados: Obteve-se uma amostra de 683 estudantes, em média com 21 anos de idade e maioritariamente do sexo feminino. A pontuação média dos conhecimentos foi de 11,79 pontos, numa escala de 0 a 20. O nível de conhecimentos está relacionado de forma estatisticamente significativa, com a licenciatura e o ano de curso frequentado, com o terem frequentado um curso/formação em SBV, com a frequência de unidades curriculares onde se abordaram conteúdos de SBV.
Conclusão: As pontuações médias obtidas enquadram-se num nível suficiente, destacando-se com pontuações mais elevadas os seguintes grupos: estudantes de 4º ano; curso de enfermagem; formação prévia em SBV.

Palavras-chave: estudantes de ciências da saúde; primeiros socorros; reanimação cardiopulmonar; conhecimento

Resumen

Marco contextual: La parada cardiorrespiratoria es un problema grave que requiere la intervención inmediata de terceros, para lo cual debemos recurrir al soporte vital básico (SBV).
Objetivo: Evaluar los conocimientos sobre el SVB en los estudiantes del área de la salud de la enseñanza superior y analizar las asociaciones entre el nivel de conocimiento y las variables sociodemográficas, académicas y del contexto socioeducativo.
Metodología: Estudio correlacional, transversal y cuantitativo, realizado sobre una muestra de estudiantes de enseñanza superior.
Resultados: Se obtuvo una muestra de 683 estudiantes, con una edad media de 21 años y mayoritariamente del sexo femenino. La puntuación media de los conocimientos fue de 11,79 puntos en una escala de 0 a 20. El nivel de conocimiento está relacionado de forma estadísticamente significativa con la titulación de grado y el año del curso realizado, con haber asistido a un curso/formación en SVB y con la frecuencia de las unidades curriculares en las que se abordaron contenidos de SVB.
Conclusión: Las puntuaciones medias obtenidas están dentro de un nivel suficiente, y destacan con puntuaciones más altas los siguientes grupos: estudiantes de 4.º curso; grado de enfermería; formación previa en SBV.

Palabras clave: estudiantes del área de la salud; primeros auxilios; reanimación cardiopulmonar; conocimiento

How to cite this article: Magalhães, C. P., Fernandes, A. M., & Preto, P. M. (2021). Knowledge about basic life support in students of higher education in health sciences. *Revista de Enfermagem Referência*, *5*(8), e20182. https://doi.org/10.12707/RV20182

Introduction

Cardiac arrest (CA) is a major public health issue due to its high incidence and mortality rates. As a sudden event, CA is one of the leading causes of death, and it is estimated to affect 55-113 people per 100,000 inhabitants in Europe (Perkins et al., 2015).
In the community, patients in CA depend on the behavior of others, who must assess the situation, call the emergency services, and initiate resuscitation maneuvers as quickly as possible. As most of these situations occur in out-of-hospital settings, every citizen should be qualified to provide help based on the best international evidence and recommendations. basic life support (BLS) consists of a set of standardized attitudes and procedures aimed to buy time by maintaining circulation and ventilation until the arrival of differentiated help and, consequently, increasing the chances of survival (Nolan et al., 2010; Perkins et al., 2015).
Students' knowledge about resuscitation is crucial to increasing the chances of survival in a situation of CA, both in the community and in healthcare institutions. Given that healthcare professionals are the first witnesses to in-hospital CA, their education and training as students have an impact on the efficiency and outcomes of cardiopulmonary resuscitation (CPR), so assessing their knowledge is very important to improve training programs (Vural et al., 2017).
BLS training is not yet consistently integrated into the curricula of higher education health programs (Awadalla et al., 2020), with studies showing a great heterogeneity in teaching and evaluation methods (García-Suárez et al., 2019).
In view of the above, this study aimed to identify undergraduate health students' knowledge about BLS and analyze the association between level of knowledge and sociodemographic, academic, and socio-educational variables.

Background

In August 1988, a group of European physicians - resuscitation enthusiasts - created the European Resuscitation Council (ERC). This council aimed to save human lives in Europe by producing guidelines and recommendations, designing and implementing teaching programs, monitoring and auditing cardiopulmonary resuscitation (CPR) practices, and promoting and organizing scientific meetings on resuscitation (Bossaert & Chamberlain, 2013).
In its first international congress, the ERC established a partnership with the American Heart Association. Since then, the ERC has presented guidelines on numerous subjects such as basic and advanced life support, the basic and advanced airway management, and management of peri-arrest arrhythmias (Bossaert & Chamberlain, 2013).
Guidelines are produced and updated every five years based on the available scientific evidence. The partnership with the American Heart Association allows consensus and a uniform practice, although with some adaptations to regional realities (Bossaert & Chamberlain, 2013).
In light of the best scientific evidence, some factors can influence rescue outcomes (Nolan et al., 2010; Perkins et al., 2015). The concept of the chain of survival refers to a set of interconnected steps (links in a sequence of attitudes) that, when respected, maximize the likelihood of a successful CPR. According to Perkins et al. (2015), these steps are as follows: (i) early recognition and call for help; (ii) early CPR; (iii) early defibrillation; and (iv) early Advanced Life Support (ALS) and standardized post-resuscitation care.
Studies in the Portuguese population have shown a low level of qualification to perform BLS (Dixe & Gomes, 2015; Sá-Couto & Nicolau, 2019) but a high level of willingness to undergo training (Dixe & Gomes, 2015). Knowledge about BLS has been associated with taking previous courses/training in the area (Dixe & Gomes, 2015) and the time elapsed since that training (Sá-Couto & Nicolau, 2019). Within the large segment of the general public, there is consensus on the need for BLS training in school settings, including teachers and students (López et al., 2018).
The final report of the Working Group on the Requalification of the National Automated External Defibrillation Program (*Grupo de Trabalho para a Requalificação do Programa Nacional de Desfibrilhação Automática Externa*, GT-RDAE) states that higher education students in the health sciences and sports are priority population groups for resuscitation training (Grupo de Trabalho, 2018). According to Saquib et al. (2019), health students should have an adequate level of knowledge about BLS and CPR, so procedures on these contents should be included in the curricula.
Studies on health students' knowledge about BLS have reported a high percentage of inadequate knowledge in this population (Alanazi et al., 2014; Al-Mohaissen, 2017; Mejia et al., 2016). In general, students who received BLS training as part of their curricula have higher levels of knowledge (Al-Mohaissen, 2017; Mejia et al., 2016).
In a systematic review of 11 studies on the pedagogical methodologies used in BLS in health schools, García-Suárez et al. (2019) found great heterogeneity in teaching methods and feedback devices used in practical evaluations and the measurement of the quality of CPR. On the other hand, learning using high-fidelity clinical simulation with real-time feedback proved to be more effective than the other resources analyzed (García-Suárez et al., 2019).

Research questions/Hypotheses

What is the level of knowledge about BLS among higher education health students?; What is the association between the level of knowledge about BLS in higher education health students and some sociodemographic, academic, and socio-educational variables?
(i) There are statistically significant differences between students' knowledge about BLS and their gender; (ii) There are statistically significant differences between students' knowledge about BLS and the program they

attend; (iii) There are statistically significant differences between students' knowledge about BLS and their year of study? (iv) There are statistically significant differences between students' knowledge about BLS and having attended BLS training or having rescued someone; (v) There are statistically significant differences between students' knowledge about BLS and having attended course units where BLS contents were taught.

Methodology

Based on the study objectives, a quantitative, correlational, cross-sectional study was conducted. The target population consisted of the students attending first-cycle (undergraduate) programs at a health school in the northern region of Portugal (N = 937). The sample was obtained by applying the following inclusion criterion: students attending course units in a school setting or students who, while undergoing their clinical training or internships, would come to school at a scheduled time to present their assignments. The following exclusion criterion was also applied: non-Portuguese-speaking foreign students undergoing mobility programs due to the difficulty in understanding and interpreting the questionnaire used for data collection.

This questionnaire was divided into several sections: sociodemographic and academic aspects, training and experience in BLS, confidence to provide BLS, and knowledge about BLS.

The dependent variable, *knowledge about BLS*, refers to students' theoretical and practical knowledge of the 2010 ERC guidelines, as updated by the 2015 guidelines (Nolan et al., 2010; Perkins et al., 2015). The level of knowledge was assessed through 20 multiple-choice questions with four response options that were structured according to the literature and followed a methodology similar to that used in previous studies (Al-Mohaissen, 2017; Alotaibi et al., 2016; Dixe & Gomes, 2015). Correct answers scored 1 point and wrong answers 0 points, with the final score ranging from 0 to 20. Higher scores corresponded to a higher level of knowledge. The questionnaire assessed the following BLS topics: Concept of chain of survival; Knowledge of the emergency medical number; Checking the safety conditions; Assessment of the state of consciousness; State of consciousness and absence of breathing as signs of CA; Airway permeability; Respiratory assessment; Maximum duration of respiratory assessment; Rate of chest compressions and breaths with one rescuer; Rate of chest compressions and breaths with multiple rescuers; Under what circumstances should circulation be assessed; Time of request for differentiated help; Start of CPR maneuvers with chest compressions or breaths; Knowledge of the pocket mask and its use; Under what circumstances should BLS maneuvers be stopped; Correct location for chest compressions; Depth (in cm) of chest compressions; Rate of chest compressions per minute; When to place a victim into the recovery position; Knowledge of the AED (Automated External Defibrillator) for defibrillation.

The questionnaire was designed based on the vast literature available, the ERC guidelines, and studies on undergraduate students' knowledge about BLS. Two experts in the area were consulted, and the questionnaire was pretested in 30 undergraduate health students to assess their level of understanding of the questions and the time needed to answer them. The questionnaire was applied in the 2017/2018 academic year, using the initial 30 minutes of classes. The researcher was present to explain the purpose and objectives of the study. All ethical principles were respected, and participants signed an informed consent form. A favorable opinion on the study was obtained from an Ethics Committee (RI001-2020/02486). Data were processed using IBM SPSS statistics, version 23.0, and analyzed using descriptive and inferential statistical techniques. Absolute and relative frequencies, measures of central tendency (mean, mode, and median), and measures of dispersion (standard deviation) were calculated. In the study of the research hypotheses, the means obtained in the knowledge questionnaire by the categories of the independent variables were compared using the t-test for two independent samples and the ANOVA test for more than two samples, with a significance level of $p < 0.05$.

Results

The sample consisted of 683 students, mostly women (82.6%), aged 17 to 40 years. The mean age was 21.01 years (SD = 2.65), for a sample variance of 7 years, and the mode was 20 years, with 140 students of that age.

The analysis of the answers to the questionnaire (Table 1) showed that most students (93.4%) knew the European emergency medical number and the concept of chain of survival (84.2%). More than half of the sample answered correctly to most of the questions, except for some indicators such as the head tilt-chin lift airway permeability technique (38.9%), the assessment of circulation if the rescuer is an experienced healthcare professional (24.2%), the time in the BLS algorithm to ask for differentiated help (45.7%), the rate of 100-120 chest compressions per minute (30.6%), and the knowledge of the AED for defibrillation (40.6%).

Table 1

Correct answers in the Basic Life Support questionnaire

Items	*n* (%)
Concept of chain of survival	575 (84.2)
Knowledge of the emergency medical number	638 (93.4)
Checking safety conditions	465 (68.1)
Assessment of the state of consciousness	518 (75.8)
Signs of cardiac arrest	424 (62.1)
Airway permeability	266 (38.9)
Respiratory assessment	446 (65.3)
Maximum duration of respiratory assessment	459 (67.2)
Rate of compressions/breaths with one rescuer	462 (67.6)
Rate of compressions/breaths with multiple rescuers	409 (59.9)
Under what circumstances should circulation be assessed	165 (24.2)
Time to ask for differentiated help	312 (45.7)
Start of CPR maneuvers with compressions or breaths	402 (58.9)
Knowledge of the pocket mask and its use	410 (60.0)
Under what circumstances should BLS maneuvers be stopped	429 (62.8)
Correct location for chest compressions	408 (59.7)
Depth (in cm) of chest compressions	399 (58.4)
Rate of chest compressions per minute	209 (30.6)
When to place a victim into the recovery position	383 (56.1)
Knowledge of the AED for defibrillation	277 (40.6)

Note. BLS = Basic life support; CPR = Cardiopulmonary resuscitation; AED = Automated external defibrillation.

On a scale of 0 to 20, the arithmetic mean of the sample in the BLS questionnaire was 11.79 points (*SD* = 3.84). The mean scores obtained in the BLS knowledge test are slightly higher in men, but these differences are not statistically significant (Table 2). The sample is mostly composed of students from the undergraduate Nursing program (55.8%), followed by students from the undergraduate programs in Biomedical Laboratory Sciences (21.2%), Pharmacy (11.0%), Dietetics and Nutrition (8.5%), and Gerontology (3.5%). Students from the undergraduate programs in Nursing (*M* = 13.33; *SD* = 3.75) and Gerontology (11.92; 2.15) had the highest mean scores on the BLS knowledge test. Statistically significant differences ($p < 0.05$) were found in the mean number of correct answers depending on the undergraduate program (Table 2).

A statistically significant association was found between students' knowledge about BLS and the year of study ($p < 0.05$), showing that the higher the year of study, the higher the mean number of correct answers (Table 2).

Table 2

Students' knowledge about BLS based on sociodemographic and academic variables

	n (%)	*M* (*SD*)	Test value	*p*-value
Gender				
Female	564 (82.6)	11.76 (3.82)	*t* = -0.406	0.685
Male	119 (17.4)	11.92 (3.93)		
Program				
Nursing	381 (55.8)	13.33 (3.75)		
Pharmacy	75 (11.0)	9.16 (3.00)		
Dietetics and Nutrition	58 (8.5)	10.62 (3.15)	*F* = 48.737	< 0.05
Laboratory Biomedical Sciences	145 (21.2)	9.53 (2.80)		
Gerontology	24 (3.5)	11.92 (2.15)		
Year of study				
1st year	209 (30.6)	9.88 (2.83)		
2nd year	219 (32.1)	11.04 (3.69)	*F* = 79.22	< 0.05
3rd year	184 (26.9)	13.14 (3.75)		
4th year	71 (10.4)	16.20 (1.83)		

Note. *M* = Mean; *SD* = Standard deviation; *t* = *t*-test for independent samples; *F* = ANOVA test; *p* = Statistical significance

Students who reported having attended a BLS course/training at some point in their lives (57%) had higher scores in the knowledge test (*M* = 14.29; *SD* = 2.80) than those who had never attended any training (Table 3), showing a statistically significant difference ($p < 0.05$). Having ever assisted someone in a life-threatening situation (14.8% of the students) had no statistically significant association with the scores obtained in the knowledge test ($p = 0.094$).

Moreover, approximately 67% (*n* = 459) of students reported that the curricula of their undergraduate program included BLS training, and 229 students reported having already attended these course units. A statistically significant association was found between the level of knowledge about BLS and these variables ($p < 0.05$), which confirmed the fifth hypothesis.

Table 3

Students' knowledge about BLS based on socio-educational variables

	n (%)	M (*SD*)	Test value	*p*-value
Have you ever had BLS training?				
Yes	389 (57.0)	14.29 (2.80)	*t* = 29.63	< 0.05
No	294 (43.0)	8.48 (2.15)		
Have you ever had to assist someone in a life-threatening situation?				
Yes	101 (14.8)	12.38 (4.18)	*t* = 1.68	0.094
No	582 (85.2)	11.68 (3.77)		
Does your undergraduate program include BLS training?				
Yes	459 (67.2)	12.98 (3.71)	*t* = 12.97	< 0.05
No	224 (32.8)	9.34 (2.80)		
If yes, have you ever attended that Course Unit? [(a)]				
Yes	229 (49.9)	15.80 (1.89)	*t* = 24.95	< 0.05
No	230 (50.1)	10.17 (2.85)		

Note. (a) = Percentage calculated based on the number of students who answered the question (*n* = 459); BLS = Basic life support; *M* = Mean; *SD* = Standard deviation; *t* = *t*-test for independent samples; *F* = ANOVA test; *p* = Statistical significance.

Discussion

The sociodemographic results of this study show a mostly female population. The female student population is predominant in higher education, particularly in health programs. A poor level of knowledge about BLS in higher education health students has been reported in several countries (Al-Mohaissen, 2017; Alanazi et al., 2014; Mejia et al., 2016), and this topic is still underexplored in Portugal. On a scale of 0 to 20, a mean score of 11.79 points was obtained for knowledge about BLS (*SD* = 3.84), or 58.95 points on a scale of 0 to 100.

Based on the association between level of knowledge and gender, the results obtained are in line with several studies conducted in health science students (Khader et al., 2016; Mejia et al., 2016), and no statistically significant differences were found.

The results of this study point to significant differences in students' knowledge across the programs. Another study also found a higher level of knowledge in nursing students, followed by students from Laboratory Sciences, Physiotherapy, and Radiology programs (Khader et al., 2016). A study conducted in Saudi Arabia (Al-Mohaissen, 2017) also found a higher level of knowledge in Nursing students than in students attending Pharmacy, Medicine, Dentistry, or Health and Rehabilitation Sciences programs.

Higher years of study also corresponded to a higher level of knowledge, which may be explained by the attendance of training courses or course units or students' learning experiences in their clinical training or internships, which is in line with the results found by Kadler et al. (2016). In this study, the majority of students (57%) reported having had BLS training at some point in their lives, mainly at the higher education institution they attended. This percentage is higher than that found by Dixe and Gomes (2015), in which, in a sample of 1,700 Portuguese respondents, 17.8% reported having BLS training and experience. In a sample of medical students, Mejia et al. (2016) found a training rate of 42.9%. Respondents who had received BLS training had, on average, a higher level of knowledge, unlike those who reported having already rescued someone. Other studies have corroborated the idea of training as an influencer of theoretical knowledge and practical skills (Al-Mohaissen, 2017; Kose et al., 2020). In this study, the mean scores obtained in the knowledge test are higher in students who attended course units where BLS content was taught. In this regard, Durak et al. (2006) have long advocated that BLS training should be provided early in medical programs. Adequate knowledge is critical to ensure appropriate rescue measures in a situation of CA, and healthcare professionals should be competent and confident to resuscitate from the beginning of their courses (Saquib et al., 2019).

This study highlights that the students who attended BLS training, either through curricular or extracurricular training, obtained higher mean scores in the BLS knowledge test., which confirms the importance of previous training in this area, either to intervene in community settings or health care institutions. Undergraduate health programs have a strong component of internship in health services where, due to the patients' greater vulnerability, these students are more likely to encounter situations of CA. When it occurs in health institutions, students should know the basic resuscitation protocols, namely how to recognize the situation, activate the internal emergency system, and provide first aid, mobilizing the knowledge acquired.

The findings of this study have to be interpreted in light of some limitations. The results cannot be extrapolated due to the nonprobability sampling technique. Another limitation is that the level of knowledge was only assessed through a questionnaire that mainly assesses theoretical and cognitive knowledge rather than the practical performance and the psychomotor skills.

Conclusion

As citizens and future professionals, health students are on the frontline, so it is relevant to assess their level of knowledge about BLS. This study aimed to assess the knowledge about BLS among undergraduate health science students and explore associations between the level of knowledge and other context variables. The mean score of undergraduate health science students' knowledge about BLS was 11.79 points (on a scale of 0 to 20).

This study concluded that knowledge is independent of gender and varies depending on the program and year of study. Students who had attended BLS courses or training and those who had already attended course units where BLS content was taught had a higher level of knowledge. In view of the above, the authors of this study believe that all curricula should address these contents before students start their clinical training/internships. Extracurricular training results from the temporal validation of these BLS courses provided by institutions accredited by the National Institute of Medical Emergency, which is currently five years in Portugal.

This topic should be further explored in other studies conducted in secondary or higher education schools, namely longitudinal studies with knowledge assessment before training, immediately after training, and in a follow-up evaluation to assess the effectiveness of these training programs and knowledge retention.

At the educational level, CPR training should become a mandatory subject in all undergraduate programs in health sciences. It should be noted that resuscitation training is also a domain of individual responsibility, so students should undertake extracurricular training in this field to certify their skills regularly.

Author contributions

Concetualization: Preto, P. M., Magalhães, C. P., Fernandes, A. M.

Data curation: Preto, P. M., Magalhães, C. P., Fernandes, A. M.

Formal analysis: Preto, P. M., Magalhães, C. P.

Writing – original draft: Magalhães, C. P.

Writing – review & editing: Fernandes, A. M.

References

Al-Mohaissen, M. A. (2017). Knowledge and attitudes towards basic life support among health students at a Saudi women's university. *Sultan Qaboos University Medical Journal*, *17*(1), e59–e65. https://doi.org/10.18295/squmj.2016.17.01.011

Alanazi, A., Alsalmeh, M., Alsomali, O., Almurshdi, A., Alabdali, A., Al-Sulami, M., Al-Nemer, A., Al-Qusairy, A., Aloraibi, S., & Iqbal, Z. (2014). Poor Basic Life Support awareness among medical and college of applied medical sciences students necessitates the need for improvement in standards of BLS training and assessment for future health care providers. *Middle-East Journal of Scientific Research, 21*(5), 848–854. https://doi.org/10.5829/idosi.mejsr.2014.21.05.82335

Alotaibi, O., Alamri, F., Almufleh, L., & Alsougi, W. (2016). Basic Life Support: Knowledge and attitude among dental students and staff in the College of Dentistry, King Saud University. *Saudi Journal for Dental Research*, *7*(1), 51–56. https://doi.org/10.1016/j.sjdr.2015.06.001

Awadalla, N. J., Al Humayed, R. S., & Mahfouz, A. A. (2020). Experience of Basic Life Support among King Khalid University health profession students, southwestern Saudi Arabia. *International Journal of Environmental Research and Public Health*, *17*(13), 1–7. https://doi.org/10.3390/ijerph17134822

Bossaert, L., & Chamberlain, D. (2013). The European Resuscitation Council: Its history and development. *Resuscitation*, *84(*10), 1291–1294. https://doi.org/10.1016/j.resuscitation.2013.07.025

Dixe, M. A., & Gomes, J. C. (2015). Knowledge of the Portuguese population on Basic Life Support and availability to attend training. *Revista da Escola de Enfermagem da USP*, *49*(4), 636–644. https://doi.org/10.1590/S0080-623420150000400015

Durak, H., Çertug, A., Çalişkan, A., & Dalen, J. (2006). Basic life support skills training in a first year medical curriculum: Six years' experience with two cognitive–constructivist designs. *Medical Teacher*, *28*(2), e49–e58. https://doi.org/10.1080/01421590600617657

García-Suárez, M., Méndez-Martínez, C., Martínez-Isasi, S., Gómez--Salgado, J., & Fernández-García, D. (2019). Basic Life Support training methods for health science students: A systematic review. *International Journal of Environmental Research and Public Health*, *16*(5), 768. https://doi.org/10.3390/ijerph16050768

Grupo de Trabalho. (2018). *Requalificação do programa nacional de desfibrilhação automática externa (GT – RDAE): Despacho nº 2715/2018*: *Relatório final.* https://www.inem.pt/wp-content/uploads/2018/07/Documento-Final-GT-RDAE-20_7_2018.pdf

Khader, K. A., Al-ghamdi, A. N., Youssef, H. A., Ahmad, A. I., Ayasreh, I. R., Al-mawajdeh, N. A., & Mohammed, A. A. (2016). Awareness and knowledge of health-college students of cardiopulmonary resuscitation at Taif University, Saudi Arabia. *International Journal of Multidisciplinary and Current Research*, *4*, 348–351. http://ijmcr.com/wp-content/uploads/2016/04/Paper25348-351.pdf

Kose, S., Akin, S., Mendi, O., & Goktas, S. (2020). The effectiveness of Basic Life Support training on nursing students' knowledge and basic life support practices: A non-randomized quasi-experimental design. *African Health Sciences*, *20*(2), 966–976. https://doi.org/10.4314/ahs.v20i2.53

López, M. P., Martínez-Isasi, S., Barcala-Furelos, R., Fernández--Méndez, F., Santamariña, D. V, Sánchez-Santos, L., & Rodríguez-Nuñez, A. (2018). Un primer paso en la enseñanza del Soporte Vital Básico en las escuelas: La formación de los profesores. *Anales de pediatría*,*89*(5), 265-271. https://doi.org/10.1016/j.anpedi.2017.11.002

Mejia, C. R., García-Saavedra, M., Benites-Flores, I., Ordinola-Calle, D., Failoc-Rojas, V. E., Valladares-Garrido, D., Talledo-Ulfe, L., Valladares-Garrido, M., Bendezú-Quispe, G., Fasanando-Vela, R., Vásquez-García, G., Chaucayanqui-Gil, D. P., Herrera-Gonzales, D., Paredes-S, L., Arévalo-Oliva, C. E., Bravo-Bravo, A. A., Alvarado-Roque, A., Alvarado-Córdova, R. E., Jiménez-Núñez, D., Escalante-Kanashiro, R., & Mezones-Holguín, E. (2016). Factors associated with knowledge of Basic Life Support in medical students from nine Peruvian universities. *Revista Mexicana de Cardiología*, *27*(2), 87-94. http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0188-21982016000200087&lng=es&tlng=en

Nolan, J. P., Soar, J., Zideman, D. A., Biarent, D., Bossaert, L. L., Deakin, C., Koster, R. W., Wyllie, J., & Böttiger, B. (2010). European Resuscitation Council Guidelines for Resuscitation 2010 section 1: Executive summary. *Resuscitation, 81*(10), 1219–1276. https://doi.org/10.1016/j.resuscitation.2010.08.021

Perkins, G. D., Handley, A. J., Koster, R. W., Castrén, M., Smyth, M. A., Olasveengen, T., Monsieurs, K. G., Raffay, V., Gräsner, J.-T., Wenzel, V., Ristagno, G., & Soar, J. (2015). European Resuscitation Council Guidelines for Resuscitation 2015: Section 2: Adult Basic Life Support and Automated External Defibrillation. *Resuscitation, 95*, 81–99. https://doi.org/10.1016/j.resuscitation.2015.07.015

Sá-Couto, C., & Nicolau, A. (2019). General public's knowledge regarding basic life support: A pilot study with a Portuguese sample. *Acta Médica Portuguesa*, *32*(2), 111–118. https://doi.org/10.20344/amp.10971

Saquib, S. A., Al-Harthi, H. M., Khoshhal, A. A., Shaher, A. A., Al-Shammari, A. B., Khan, A., Al-Qahtani, T. A., & Khalid, I. (2019). Knowledge and attitude about Basic Life Support and emergency medical services amongst healthcare interns in university hospitals: A cross-sectional study. *Emergency Medicine International, 2019*. https://doi.org/10.1155/2019/9342892

Vural, M., Koşar, M. F., Kerimoğlu, O., Kızkapan, F., Kahyaoğlu, S., Tuğrul, S., & İşleyen, H. B. (2017). Cardiopulmonary resuscitation knowledge among nursing students: A questionnaire study. *Anatolian Journal of Cardiology*, *17*(2), 140–145. https://doi.org/10.14744/AnatolJCardiol.2016.7156