

RESEARCH ARTICLE (ORIGINAL) 

# Nurses' theoretical knowledge of advanced life support in the care of critically ill people

*Conhecimentos teóricos dos enfermeiros sobre suporte avançado de vida nos cuidados à pessoa em situação crítica*

*Conocimientos teóricos de los enfermeros sobre soporte vital avanzado en el cuidado de personas en situación crítica*

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## Abstract

**Background:** Nurses need not only practical knowledge to apply Advanced Life Support (ALS) but also theoretical knowledge.

**Objectives:** To assess nurses' theoretical knowledge of ALS in the care of critically ill people and to examine the relationship between nurses' theoretical knowledge of ALS in the care of critically ill people and their sociodemographic, academic, and professional variables.

**Methodology:** A quantitative and descriptive-correlational study was conducted on 36 nurses selected through non-probabilistic convenience sampling.

**Results:** In the applied questionnaire, the nurses achieved a correct answer rate of 73.53%. Statistically significant differences were found between specialist nurses and their knowledge of emergency drug administration [amiodarone ( $t = 4.292$ ;  $p = 0.038$ ); and atropine ( $t = 4.912$ ;  $p = 0.027$ )] and capnography monitoring ( $t = 4.788$ ;  $p = 0.029$ ).

**Conclusion:** Nurses showed good levels of theoretical knowledge of ALS, and practical refresher training every 3 months is recommended.

**Keywords:** knowledge; critical care; emergencies; nurses; advanced cardiac life support

## Resumo

**Enquadramento:** Os conhecimentos dos enfermeiros sobre suporte avançado de vida (SAV) implicam não só a aplicação de conhecimentos práticos, mas igualmente a mobilização dos conhecimentos teóricos.

**Objetivos:** Avaliar o nível dos conhecimentos teóricos dos enfermeiros sobre SAV na prática de cuidados à pessoa em situação crítica (PSC) e relacionar o nível dos conhecimentos teóricos dos enfermeiros sobre SAV na prática de cuidados à PSC e as variáveis sociodemográficas, académicas e profissionais dos enfermeiros.

**Metodologia:** Estudo quantitativo, descritivo-correlacional, onde participaram 36 enfermeiros selecionados através de uma técnica de amostragem não probabilística por conveniência.

**Resultados:** Os enfermeiros apresentaram uma percentagem de respostas corretas de 73,53% no questionário aplicado. Evidenciaram-se diferenças estatisticamente significativas entre ser enfermeiro especialista e o conhecimento sobre a administração de fármacos de emergência [amiodarona ( $t = 4,292$ ;  $p = 0,038$ ); e atropina ( $t = 4,912$ ;  $p = 0,027$ )] e a monitorização com capnografia ( $t = 4,788$ ;  $p = 0,029$ ).

**Conclusão:** Os enfermeiros revelaram bons níveis de conhecimentos teóricos sobre SAV, sugerindo-se uma atualização da formação prática a cada 3 meses.

**Palavras-chave:** conhecimento; cuidados críticos; emergência; enfermeiras e enfermeiros; suporte vital cardíaco avançado

## Resumen

**Marco contextual:** El conocimiento de los enfermeros sobre el soporte vital avanzado (SVA) implica no sólo la aplicación de conocimientos prácticos, sino también la movilización de conocimientos teóricos.

**Objetivos:** Evaluar el nivel de conocimiento teórico de los enfermeros sobre los SVA en la práctica de la atención a personas en situación crítica (PSC) y relacionar el nivel de conocimiento teórico de los enfermeros sobre los SVA en la práctica de la atención a PSC con las variables sociodemográficas, académicas y profesionales de los enfermeros.

**Metodología:** Estudio cuantitativo, descriptivo-correlacional, en el que participaron 36 enfermeros seleccionados mediante una técnica no probabilística de muestreo por conveniencia.

**Resultados:** Los enfermeros presentaron un 73,53% de respuestas correctas al cuestionario. Hubo diferencias estadísticamente significativas entre ser enfermero especialista y el conocimiento de la administración de fármacos de urgencia [amiodarona ( $t = 4,292$ ;  $p = 0,038$ ); y atropina ( $t = 4,912$ ;  $p = 0,027$ )] y la monitorización capnográfica ( $t = 4,788$ ;  $p = 0,029$ ).

**Conclusión:** Los enfermeros mostraron buenos niveles de conocimientos teóricos sobre el SVA y se sugiere que la formación práctica se actualice cada 3 meses.

**Palabras clave:** conocimientos; cuidados críticos; urgencias; enfermeros; soporte vital cardiaco avanzado



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## Introduction

Cardiac arrest (CA) still has a high mortality and morbidity rate worldwide, although advanced life support (ALS) guidelines have been published (Merchant et al., 2020). Therefore, it is necessary to conduct further studies to comply with the new guidelines. The question remains: what is nurses' theoretical knowledge of ALS in the care of critically ill patients? To answer this research question, we defined the following objectives: to assess nurses' theoretical knowledge of ALS in the care of critically ill patients and examine the relationship between nurses' theoretical knowledge of ALS and their sociodemographic, academic, and professional variables.

## Background

The American Heart Association (AHA) defines CA as a sudden cessation of cardiac activity, with no normal breathing and signs of circulation. Without timely intervention, such as cardiopulmonary resuscitation (CPR) and early defibrillation, CA can be fatal (Mitropoulou & Fitzsimmons, 2022). The incidence of CA in out-of-hospital settings is approximately 55 per 100,000 inhabitants, and in-hospital it is 1 to 1.5 per 1,000 hospital admissions. CA has a higher mortality rate when it occurs in the out-of-hospital setting, with a figure of 91%, compared to the in-hospital setting with a percentage of 76.4% (Mitropoulou & Fitzsimmons, 2022). The nursing team must be able to recognize when a victim is in CA. CPR maneuvers must be initiated immediately upon detection. Basic life support (BLS) is used, characterized by compressions and ventilations to the critically ill person in CA, with the primary objective of artificially restoring circulation and blood oxygenation (Duarte & Dixe, 2021). Lima et al. (2020) state that CA is an emergency situation that requires the intervention of a properly trained team. The probability of survival for a patient after CA without the intervention of BLS maneuvers in

the first 6 minutes, and without a heartbeat, is only 11% (Duarte & Dixe, 2021). ALS is a complement to BLS, which involves administering emergency drugs, advanced airway access and permeabilization interventions, along with high-quality chest compressions and ventilations. If defibrillable rhythms are present, defibrillation must be applied (Berg et al., 2020). Since 2010, the guidelines have been reviewed every five years to account for the gradual deterioration of knowledge over time. This reinforces the need for continuous training in this context (Merchant et al., 2020). Moura et al. (2019) suggest that constant review and updating of knowledge on ALS and CA is necessary to improve nursing care for critically ill patients.

## Research question

What is nurses' theoretical knowledge of ALS in the care of critically ill patients?

## Methodology

A descriptive-correlational study was conducted with critical care nurses in the medical-surgical emergency service (MSES) of a hospital in central Portugal. Participants were selected using a non-probabilistic convenience sampling technique. Prior to participation, authorization was requested, and participants completed a free and informed consent form, followed by the questionnaire. To be included in this study, participants must have experienced at least one ALS situation during their professional activity in the MSES. A data collection instrument was created to conduct this research. The first section collected data on the socio-demographic, academic, and professional variables of the nurses, such as age, gender, academic qualifications, years of nursing education, nursing specialty, years of experience in the current service, type of working hours, certified ALS training, and perceived knowledge of ALS. The second section comprised closed-ended multiple-choice questions aimed at evaluating the nurses' ALS knowledge (Table 1).

**Table 1***Answers to questions about knowledge of advanced life support*

Questions	Correct answers
1. What are the . . . rhythms?	p-VT and Ventricular Fibrillation
2. What is the most . . . asystole?	Start high-quality CPR maneuvers and administer a 1-milligram bolus of adrenaline intravenously
3. Which of these is not . . . mechanism?	Bradycardia
4. When monitoring . . . do you recommend?	Electrically stimulate with a transcutaneous pacemaker
5. What safety . . . defibrillator pads?	Contact, Oxygen, Nitrates, Water, Hair, Piercing and Pacemaker
6. After monitoring . . . carried out?	Perform synchronized cardioversion
7. Which of these groups . . . cause?	Hypoglycemia, hypoxia, pneumothorax, and cardiac thromboembolism
8. An adult patient . . . performed?	Administer a 1-milligram bolus of adrenaline intravenously
9. You need to . . . choose?	Peripheral or intraosseous venous access
10. After administering . . . performed?	Immediately restart chest compressions
11. For an adult patient . . . circulation?	Greater than 10 millimeters of mercury (mmHg)
12. Three shocks have . . . next?	Administer a bolus of 300 milligrams of amiodarone intravenously
13. What should be . . . airway in place?	10 breaths per minute with uninterrupted chest compressions
14. An adult patient . . . administer?	Bolus of 0.5 milligrams of atropine, intravenously
15. What will enable . . . capnograph?	Prevent selective localization of the endotracheal tube

The study ensured that participants were fully informed of all formal and ethical procedures through the informed consent form. Participants were able to withdraw from the study at any time without risk or discomfort. Anonymity and confidentiality were maintained throughout the research. The media used during the study were destroyed at the end of the research. The data were analyzed using the IBM SPSS Statistics program, version 28.0, with both descriptive and inferential statistical analyses. A statistically significant result is assumed when the *p*-value is equal to or less than .05 (Pestana & Gageiro, 2014). The study was approved by the Ethics Committee of the hospital where it took place (Ref. 19/2023).

## Results

The research tool facilitated the collection of 40 responses from nurses of the MSES at the hospital under study. However, four of these responses were from nurses who had never administered ALS to a CA patient. The study aimed to analyze nurses' knowledge of ALS in CA patients. The sample consisted of 36 nurses (100%) with a mean age of 35 years ( $35.22 \pm 6.10$ ), ranging from 24 to 53 years. Most of the sample were women (72.2%;  $n = 26$ ). The study found that 25% ( $n = 9$ ) of the nurses held both a bachelor's and a master's degree. The obtained sample shows that, on average, the nurses graduated from nursing 12 years ago ( $11.92 \pm 5.62$ ). Additionally, 19.4% ( $n = 7$ ) of the nurses hold the title of specialist nurse, with specialties including medical-surgical nursing (11.1%;  $n = 4$ ), mental health and psychiatric nursing

(2.8%,  $n = 1$ ), community health nursing (2.8%;  $n = 1$ ), and rehabilitation nursing (2.8%,  $n = 1$ ). The nurses have been working for this service for an average of 8 years ( $8.17 \pm 6.27$ ). Some nurses have been with the service for 30 years. The majority of the nurses (91.7%; 33) work shift hours. All of the nurses in the sample had received certified training in ALS, on average, three years ago ( $3.25 \pm 2.70$ ). None of the nurses had been trained for more than 10 years. Despite their ALS training, 16.7% ( $n = 6$ ) of the nurses considered their knowledge inadequate, and 66.7% ( $n = 24$ ) experienced difficulties implementing ALS practices during their most recent care for CA patients. The questionnaire on nurses' theoretical knowledge of ALS (Table 2) consisted of 15 questions with scores ranging from 0 to 15 points. The mean score was 11 points ( $11.03 \pm 1.56$ ), indicating a 73.53% correct answer rate. Overall, the sample demonstrated a good level of theoretical knowledge of ALS, with only three questions showing a higher percentage of incorrect answers than correct ones. Question 3, 'Which of these is not a physiological compensation mechanism?' was answered correctly by only 16.7% ( $n = 6$ ) of the nurses. Question 11, 'For an adult patient undergoing CPR with an advanced airway and capnography, what are the standard PetCO<sub>2</sub> values to improve the chance of returning to spontaneous circulation?' was answered correctly by only 22% ( $n = 8$ ) of the nurses. Question 15, 'What will enable the implementation of CPR maneuvers based on the ALS algorithm using a capnograph?', was answered correctly by only 25% ( $n = 9$ ) of the nurses. We found high scores in questions 1 through 4, ranging from 91.7% to 94.4%. These questions assessed knowledge of

defibrillable rhythms and emergency drugs to administer in the event of bradycardia. The nurses demonstrated a high level of excellence in their theoretical knowledge of ALS, as evidenced by their 100% correct answers in

questions 2, 9, and 10. They accurately identified the appropriate interventions for asystole and pulseless ventricular tachycardia (p-VT), as well as the correct routes of administration for emergency drugs in CA situations.

**Table 2**

*Nurses' theoretical knowledge of advanced life support*

Questions	Correct answers		Incorrect answers	
	<i>n</i>	%	<i>n</i>	%
1. "What are the shockable rhythms?"	33	91.7	3	8.3
2. "What is the most appropriate intervention for a patient with asystole?"	36	100	---	---
3. "Which of these is not a physiological compensation mechanism?"	6	16.7	30	83.3
4. "When monitoring an adult patient, sinus bradycardia of 36 beats per minute is noted. After receiving a bolus of 3 milligrams of atropine, the patient experienced syncope. What intervention do you recommend?"	34	94.4	2	5.6
5. "What safety precautions should be taken before placing defibrillator pads?"	31	86.1	5	13.9
6. "After monitoring an adult patient who reported palpitations, it was found that they had an ECG trace with narrow and regular QRS complexes, a heart rate of 187 beats per minute, chest pain, and hemodynamic instability. What intervention should be carried out?"	27	75	9	25
7. "Which of these groups identifies a potentially non-reversible cause?"	25	69.4	11	30.6
8. "An adult patient was found in CA and has undergone CPR maneuvers. During the initial rhythm assessment, it was observed that the patient had an organized rhythm but no palpable pulse. Which interventions should be performed?"	32	88.9	4	11.1
9. "You need to choose a route to administer medication to a patient in CA. Which do you choose?"	36	100	---	---
10. "After administering the second shock to an adult patient with p-VT, what intervention should be performed?"	36	100	---	---
11. "For an adult patient undergoing CPR with an advanced airway and capnography, what are the standard PetCO <sub>2</sub> values to improve the chance of returning to spontaneous circulation?"	8	22.2	28	77.8
12. "Three shocks have already been administered to an adult patient with VF. They were also administered 1 milligram of adrenaline intravenously. What medication should I administer next?"	30	83.3	6	16.7
13. "What should be the ventilation pattern for a critically ill patient in CA with an advanced airway in place?"	31	86.1	5	13.9
14. "An adult patient is symptomatic with sinus bradycardia of 43 beats per minute after monitoring. What is the initial dose of atropine that you will administer?"	23	63.9	13	36.1
15. "What will enable the implementation of CPR maneuvers based on the ALS algorithm using a capnograph?"	9	25	27	75
<b>TOTAL</b>		<b>Mean</b>		<b>Standard Deviation</b>
<b>Score (0 – 15 points)</b>		11.03		1.56

Note. *n* = Number of cases; % = Percentage of cases.

The study analyzed the sociodemographic, academic, and professional variables of the nurses, as well as their knowledge and insecurity in ALS practices. The Mann-Whitney *U*-test was used to analyze these variables since the sample did not have a normal distribution (Shapiro-Wilk test).

Statistically significant differences were found between the nurses' knowledge of ALS and their score on the questionnaire ( $U = 31; p = .010$ ). This suggests that nurses with a better understanding of ALS tend to have a higher overall score on the questionnaire (Table 3).

**Table 3**

Results of the Mann-Whitney U-test between nurses' sociodemographic, academic, and professional variables, knowledge, insecurity, and the score obtained in the questionnaire

Variable	Questionnaire score		U	p
	n	MR		
Gender	Male	10	126.500	0.897 <sup>ns</sup>
		MR 18.85		
	Female	26		
		MR 18.37		
Academic Qualifications	Bachelor's degree	27	113.000	0.746 <sup>ns</sup>
		MR 18.19		
	Master's degree	9		
		MR 19.44		
Nursing Specialty	Yes	7	82.500	0.429 <sup>ns</sup>
		MR 21.21		
	No	29		
		MR 17.84		
Working Hours	Shift	33	40.000	0.571 <sup>ns</sup>
		MR 18.21		
	Fixed	3		
		MR 21.67		
Knowledge of ALS	Adequate	30	31.500	0.010 <sup>*</sup>
		MR 20.45		
	Inadequate	6		
		MR 8.75		
Confidence in ALS practices	Practice with confidence	12	96.000	0.093 <sup>ns</sup>
		MR 22.50		
	Practice without confidence	24		
		MR 16.50		

Note. n = Sample; MR = Middle Rank; ALS = Advanced Life Support; U = Mann-Whitney test; p = Significance; ns = Not significant; \* = Statistically significant difference.

Table 4 shows that there were no statistically significant correlations found between the sociodemographic and professional variables and the score obtained in the questionnaire.

**Table 4**

Results of Spearman's Correlation Coefficient between sociodemographic and professional variables and the score obtained in the questionnaire

Variable	Questionnaire score	
	Spearman's Correlation Coefficient	p
Age	0.116	0.250 <sup>ns</sup>
Years as a nurse	0.155	0.183 <sup>ns</sup>
Years in the current service	- 0.021	0.452 <sup>ns</sup>
Years of ALS training	- 0.039	0.411 <sup>ns</sup>

Note. ALS = Advanced Life Support; p = Significance; ns = Not significant.

Statistically significant differences were identified between the specialist nurse variable and the answers (correct and incorrect) to questions 12, 14, and 15 using the Chi-square test. Specifically, statistically significant differences were found between being a specialist nurse and knowledge of the need to administer amiodarone in shockable rhythms

( $t = 4.292$ ;  $p = 0.038$ ); between being a specialist nurse and knowledge of the need to administer atropine in bradycardia with signs of shock ( $t = 4.912$ ;  $p = 0.027$ ); and between being a specialist nurse and knowledge of the need to perform capnography monitoring in CPR ( $t = 4.788$ ;  $p = 0.029$ ; Table 5).

**Table 5**

*Results of the chi-square test between the scores for questions 12, 14, and 15 on knowledge of advanced life support and the specialist nurse variable*

Variable	Score per question	
	Chi-square	<i>p</i>
Question 12 – “Administering amiodarone... shockable rhythms”	4.292	0.038*
Question 14 – “Administering atropine in bradycardia”	4.912	0.027*
Question 15 – “Capnography monitoring in CPR . . .”	4.788	0.029*

*Note.* *p* = Significance; \* = Statistically significant difference.

Statistically significant differences were found only in questions 11, 13, and 14 (Table 6) when using the Mann-Whitney *U*-test to compare the variable of years of certified ALS training and the answers to the questionnaire on ALS knowledge. These differences specifically relate to the nurses’ knowledge of validating the standard PetCO<sub>2</sub> values to improve the chance of a CA patient returning to spontaneous circulation ( $U = 59.000$ ;  $p = 0$ ). There are significant correlations between the years of certified ALS training and the definition of ventilation pattern

for a CA patient with an advanced airway ( $U = 18.500$ ;  $p = 0.005$ ), as well as the definition of the initial dose of atropine for a patient with sinus bradycardia in shock ( $U = 49.000$ ;  $p = 0.001$ ). Furthermore, knowledge of ALS, particularly the definition of the initial dose of atropine in a patient with sinus bradycardia in shock, exhibits statistically significant differences when correlated with age ( $U = 82.000$ ;  $p = 0.025$ ) and years of experience in the MSES ( $U = 73.000$ ;  $p = 0.011$ ).

**Table 6**

*Results of the Mann-Whitney U-test between the scores for questions 11, 13, and 14 on knowledge of advanced life support and the variables of age, years in the current service, and years of training in advanced life support*

Variable		Score in Question 11		<i>U</i>	<i>p</i>
<b>Years of ALS training</b>	Correct Answer	<i>n</i>	8	59.000	0.036*
		MR	11.88		
	Incorrect Answer	<i>n</i>	28		
		MR	20.39		
Variable		Score in Question 13		<i>U</i>	<i>p</i>
<b>Years of ALS training</b>	Correct Answer	<i>n</i>	31	18.500	0.005*
		MR	16.60		
	Incorrect Answer	<i>n</i>	5		
		MR	30.30		
Variable		Score in Question 14		<i>U</i>	<i>p</i>
<b>Age</b>	Correct Answer	<i>n</i>	23	82.000	0.025*
		MR	21.43		
	Incorrect Answer	<i>n</i>	13		
		MR	13.31		
<b>Years in the current service</b>	Correct Answer	<i>n</i>	23	73.000	0.011*
		MR	21.83		
	Incorrect Answer	<i>n</i>	13		
		MR	12.62		
<b>Years of ALS training</b>	Correct Answer	<i>n</i>	23	49.000	0.001*
		MR	22.87		
	Incorrect Answer	<i>n</i>	13		
		MR	10.77		

*Note.* *n* = Sample; MR = Middle Rank; ALS = Advanced Life Support; *U* = Mann-Whitney test; *p* = Significance; \* = Statistically significant difference.

## Discussion

A total of 40 MSES nurses participated in this study, with only 4 having no real-life experience in ALS. Pragosa (2019) emphasizes the importance of health professionals keeping pace with the constantly evolving world through continuous training. Based on the results, 83.3% of the sample considered their ALS knowledge adequate, although 66.7% reported feeling unconfident while providing ALS care. According to Smith et al. (2008), nurses possess sufficient theoretical knowledge, but their practical skills tend to decline over time. Therefore, providing continuous training with shorter intervals between sessions is crucial to reducing the perception of insecurity when caring for critically ill patients. According to Oliveira et al. (2018), practical training should be recertified every three months, considering the critical care reality of each institution. The nurses in this study had certified ALS training and demonstrated good knowledge of caring for CA patients, with an average score of 11 out of 15 points. However, there is still room for improvement. An analysis of the questions regarding how to act in

cases of asystole and p-VT, as well as advanced airway management techniques, revealed a convergence in the results obtained. According to the National Institute of Medical Emergency (Instituto Nacional de Emergência Médica, 2023), the recommended course of action for a patient with asystole is to immediately initiate high-quality, uninterrupted BLS maneuvers. This includes ensuring airway patency and ventilation, as well as administering emergency drugs. According to the nurses in this study, the intravenous route is the most commonly used method of drug administration. However, if this is not feasible, the intraosseous route can be considered. In the case of treating patients with p-VT, it is recommended to perform 2 minutes of BLS after the second shock, as stated by Merchant et al. (2020). This recommendation was unanimously identified by the nurses in the study. Over 94% of the surveyed nurses demonstrated knowledge of how to intervene in the case of a critically ill person with bradycardia. According to AHA guidelines, in an unstable patient with persistent bradycardia, the most appropriate intervention after the administration of 3 milligrams of atropine is the placement of a transcuta-

neous pacemaker (Panchal et al., 2020). Our analysis of the data revealed a need to update nurses' knowledge of physiological compensation mechanisms and the use of capnography. Bradycardia was identified as a response to compensation mechanisms. Silva (2019) identified altered state of consciousness, tachycardia, and tachypnea as compensatory physiological responses, but did not mention bradycardia. The overall knowledge of capnography during ALS was lower than expected. Sandroni et al. (2018) found that  $PetCO_2$  values higher than 10 mmHg improve the chance of returning to spontaneous circulation. Additionally, using a capnograph to implement CPR maneuvers based on the ALS algorithm not only confirms the placement of the endotracheal tube but also monitors the quality of CPR (Serviço Nacional de Saúde, 2021). Farias et al. (2021) found that nurses with higher self-confidence had better knowledge and results. This was confirmed in our study based on the overall score. The same author states that confidence in providing care to critically ill patients influences care outcomes. Therefore, professionals who have provided effective care to critically ill patients will have greater self-confidence in the care they provide. Umuhzoza et al. (2021) concluded that nurses' final performance is not associated with their years as a nurse and professional skills. They stated that years of work only contribute to the professional's self-confidence in performing CPR interventions. We reached the same conclusion as the study regarding the variables of age, years as a nurse, years in the current service, and years of certified ALS training. These variables did not show a statistically significant result when correlated with the overall score of the questionnaire. Soares (2017) states that specialist nurses have more knowledge in their area of expertise, resulting in higher quality care compared to general care nurses. The study results show a statistically significant correlation between being a specialist nurse and the ability to make decisions regarding the administration of emergency drugs in specific situations. Additionally, specialist nurses were found to be more proficient in capnography monitoring during CPR. According to Pragosa (2019) study, nurses' theoretical knowledge of ALS is negatively affected by the time elapsed since their last training. Nurses who received training less than a year ago had more knowledge than those who received training more than a year ago. Statistically significant variations were found in this study between nurses' knowledge of validating  $PETCO_2$  values, defining the ventilation pattern appropriate for a CA patient with an advanced airway, and defining the initial dose of atropine to administer to an adult patient with sinus bradycardia and in shock, based on the time since their last update on ALS knowledge.

One limitation of this study is the low percentage of questionnaire responses from the accessible population, making it difficult to infer the results of nurses' ALS knowledge for the population under study. Another limitation is that the ALS guidelines were recently updated, and most nurses had received certified ALS training before these changes. Due to this limitation, the scientific research was only able to consider studies within a 3-year

timeframe. As a result, the number of available studies based on the most recent guidelines was reduced.

## Conclusion

The study involved nurses from a hospital in central Portugal. It concluded that, despite having certified ALS training, 20% of nurses felt they lacked the knowledge to provide critical care correctly, and 70% experienced difficulties in implementing ALS. The nurses demonstrated good ALS knowledge, as evidenced by their ability to answer three out of four questions correctly. The participants demonstrated weaker knowledge regarding physiological compensation mechanisms and capnography. However, they exhibited a better understanding of defibrillation rhythms, intervention in patients with bradycardia and in shock, intervention in patients with asystole or p-VT, and identification of the routes of administration of emergency drugs.

The study found that having a better understanding of ALS knowledge leads to higher scores on the nurses' knowledge questionnaire. Additionally, being a specialist nurse can improve the provision of critical care by utilizing a solid level of ALS knowledge. Suggestions include implementing quarterly ALS knowledge revalidations to continuously improve CPR care. We suggest studying the theoretical and practical components of nurses' ALS knowledge.

## Author contributions

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