

ÚROVEŇ POZNATKOV PRVEJ POMOCI BEZ POMÔCOK MEDZI ŠTUDENTMI ZDRAVOTNÍCKYCH A LEKÁRSKYCH ODBOROV V POROVNANÍ SO ZDRAVOTNÍCKYMI PROFESIONÁLMI NA SLOVENSKU

KNOWLEDGE OF BASIC LIFE SUPPORT AMONG MEDICAL UNIVERSITY STUDENTS COMPARED TO LAYPERSONS AND HEALTHCARE PROFESSIONALS IN SLOVAKIA

IŠTOK Marek

Fakulta ošetrovateľstva a zdravotníckych odborných štúdií, Slovenská zdravotnícka Univerzita v Bratislave, Bratislava, Slovenská republika

ABSTRACT

Background: First responders (FRs) are trained volunteers who arrive at the scene of a life-threatening emergency prior to emergency medical services (EMS). In Europe, FRs are typically laypeople, firefighters, or police officers with first aid training. Given limitations in EMS availability, this study aimed to assess whether medical and healthcare students possess sufficient Basic Life Support (BLS) competence to contribute to the FR system.

Methods: A quantitative, descriptive, cross-sectional study was conducted to compare BLS knowledge among professionals, students, and laypersons in Slovakia. Data were collected between March and June 2024 from 353 respondents. Statistical analysis was performed using Microsoft Excel.

Results: The overall mean score for theoretical BLS knowledge across all groups was 85 %. Professionals (n = 147) achieved a mean score of 91.42 %, with most errors related to confusion with Advanced Life Support protocols. Students (n = 73) achieved the highest mean score 95.10%, with errors primarily associated with unconsciousness management, and legal aspects of first aid. Laypersons (n = 133) achieved a mean score of 78.46 %, demonstrating substantial deficits in cardiopulmonary resuscitation (CPR), bleeding control, unconsciousness management, and legal aspects of first aid. Statistical analysis confirmed a significant association between group affiliation and knowledge accuracy ($\chi^2 = 15.03$; $df = 2$; $p < 0.001$), with a moderate effect size (Cramér's $V = 0.21$).

Conclusion: Students demonstrated high levels of BLS knowledge, exceeding those of professionals, suggesting that they may be adequately prepared to serve as FRs. Their broad geographical distribution represents a potentially valuable resource for strengthening pre-hospital care. Structured integration of students into FR systems may contribute to reductions in morbidity and to improved outcomes in emergency situations.

Key words: First Responder. Pre-hospital Care. Medical Students. Basic Life Mortality Reduction.

ABSTRAKT

Východiská a ciele: First responderi (FR) sú vyškolení dobrovoľníci, ktorí dorazia na miesto život ohrozujúcej udalosti skôr než záchranná zdravotná služba (ZZS). V Európe sú FR najčastejšie laici, hasiči alebo policajti s absolvovaným kurzom prvej pomoci. Vzhľadom na obmedzenú dostupnosť ZZS bolo cieľom tejto štúdie zistiť, či študenti medicíny a príbuzných odborov disponujú dostatočnými znalosťami v oblasti Basic Life Support (BLS) na to, aby mohli efektívne pôsobiť v systéme FR.

Metódy: Realizovaná bola kvantitatívna, deskriptívna, prierezová štúdia zameraná na porovnanie znalosti BLS medzi profesionálmi, študentmi a laikmi na Slovensku. Dáta boli zbierané od marca do júna 2024 od 353 respondentov a štatisticky spracované v programe Microsoft Excel.

Výsledky: Priemerná úspešnosť vo vedomostiach BLS naprieč skupinami bola 85 %. Profesionáli (n = 147) dosiahli 91,42 %, pričom najčastejšie pochybenia boli v aplikácii protokolov ALS. Študenti (n = 73) mali najvyššie skóre 95,10 %, s chybami prevažne pri riešení bezvedomia. Laici (n = 133) dosiahli 78,46 %, pričom najväčšie nedostatky mali v KPR, zvládani krvácania, riešení bezvedomia a v právnych aspektoch prvej pomoci. Štatistická analýza potvrdila významný vzťah medzi skupinovú príslušnosťou a úspešnosťou ($\chi^2 = 15.03$; $df = 2$; $p < 0,001$), so stredne silným efektom (Cramér's $V = 0,21$).

Záver: Študenti preukázali nadpriemerné znalosti BLS, dokonca vyššie než profesionáli, čo naznačuje ich vhodnosť pre úlohu FR. Vďaka ich geografickému rozmiestneniu môžu predstavovať významný prínos pre prednemocničnú starostlivosť. Koordinované zapojenie študentov do systému FR môže priamo znížiť mortalitu a morbiditu a podporiť rýchlejšie zotavenie pacientov.

Kľúčové slová: First Responder. Prednemocničná starostlivosť. Študenti medicíny. Basic Life Support. Zníženie mortality.

INTRODUCTION

First responders (FRs) represent a critical component of contemporary emergency medicine, playing a key role in reducing morbidity and mortality when dispatched efficiently to acute medical incidents [1]. Their effectiveness depends on rapid mobilization, standardized training, and consistent access to essential equipment [2]. Although FR programs exist globally, their structure, logistics, and scope of practice vary significantly between countries, often shaped by the design of emergency care systems. FRs are typically firefighters, police officers, military personnel, civil protection agents, and off-duty professionals such as physicians or nurses [3]. In many countries, trained civilian volunteers or laypeople who have completed certified FR courses

are also included in this group. Regardless of professional background, the core expectation of an FR is the ability to assess critical situations quickly, provide basic life support (BLS), and initiate further emergency responses [4]. In Slovakia, FR duties are primarily carried out by members of the fire and rescue services, police forces, volunteer fire brigades, and off-duty professionals. In cases when EMS dispatch centre wants to use volunteer firefighters as FRs, the EMS dispatch centre may contact them directly and inform them of the nearest automatic external defibrillator (AED) location, and the scene of the incident. FRs are permitted to use an AED and perform basic bandaging techniques [5-6]. The early minutes of a medical emergency are often decisive for the patient's outcome, which underscores the importance of rapid FR intervention [7]. Yet limited staffing in emergency medical services (EMS) and the FR system presents a challenge, especially in rural areas with lower population density and limited infrastructure, due to increased response times which negatively affects patient outcomes [8].

This study investigates whether medical and healthcare students in Slovakia have adequate theoretical knowledge of BLS to serve as competent FRs. By assessing their performance and comparing it with that of professionals and laypersons, we are intended to determine, if students could help mitigate staffing shortages in the Slovak FR system. If confirmed, student FRs may enhance coverage, particularly in underserved regions, thereby improving a patient outcome through earlier intervention [9].

OBJECTIVE

The primary objective of this study is to evaluate and compare the theoretical knowledge of BLS among professionals, students in the 4th and 5th of medical programmes and 2nd and 3rd year of EMS studies, and laypersons, with the goal of optimizing the personnel resources of the FR system.

Hypothesis

We hypothesize that students enrolled in medical and healthcare programs demonstrate theoretical BLS knowledge at a level comparable to professionals, and significantly higher than that of laypersons. This would support the potential integration of students into the Slovak FR system to improve response capacity and a patient outcome.

METHODS

This cross-sectional study was conducted in 2024 in Bratislava, primarily at the Slovak Medical University, with additional participation from Comenius University in Bratislava and members of the public. With ethical approval granted by the Institutional Ethics Committee of Slovak Medical University and its specialists we developed a structured questionnaire. The questionnaire consisted of 20 questions divided into three sections. The first section gathered demographic and group characteristics. A total of 353 respondents were included: 147 professionals, 73 students of healthcare-related programs, and 133 laypersons. The remaining sections of the questionnaire assessed knowledge of basic BLS and intermediate BLS. Participation was anonymous and voluntary with informed consent. To compare success rates among the three participant groups, a chi-square test of independence was used, to assess the strength between groups and its accuracy Cramér's V was calculated. Data was performed using in Microsoft Excel 365 and R 4.4. The level of statistical significance was set at $p < 0.05$.

RESULTS

The aim was to focus exclusively on interventions within the scope of BLS providers, assessing knowledge across fundamental and advanced theoretical domains of BLS. The overall mean success rate for all participants in the theoretical assessment was 85 %. When stratified by group affiliation, healthcare students achieved the highest average score of 95.10%, professionals scored an average of 91.42 %, and laypersons including certified FRs attained 78.46 %. A chi-square test of independence was performed to compare the distribution of responses among the groups. The results and success rates are presented in Table 1.

Table 1 Distribution of correct and incorrect answers among respondent groups

Parameters	Correct	Incorrect	Total
Laypersons	104	29	133
Healthcare students	69	4	73
Professionals	134	13	147
Summary	307	46	353

Legend: * $\chi^2 = 15.03$, $df = 2$, $p < 0.001$

The students group exhibited the highest accuracy rate, surpassing professionals, which may be explained by recent, structured educational exposure. Laypersons demonstrated the lowest level of

accuracy at a satisfactory level of BLS. The chi-square test revealed a significant difference in performance between groups ($\chi^2 = 15.03$, $df = 2$, $p < 0.001$). The distribution of correct and incorrect responses among the groups is presented in Table 1. To assess the strength of the observed association Cramér's V was calculated. The relevant values were substituted into the formula with results:

$$V = \sqrt{(15.03 / [353 \times (2 - 1)])} = \sqrt{(0.0426)} \approx 0.21$$

Since the p-value is far below the conventional threshold of 0.05, the null hypothesis of independence was rejected, indicating a significant association between group membership and response accuracy. This demonstrates that observed differences in performance are unlikely due to chance and instead reflect a meaningful relationship between expertise level and BLS knowledge. The results provide strong evidence that group membership significantly affects task performance.

In summary, these results provide strong evidence that participants' level of medical education and professional experience significantly influence their theoretical BLS competence. Students and professionals performed notably better than laypersons, likely reflecting their formal training and recent education. Students slightly outperformed professionals, which may be attributable to more current and standardized instruction in BLS protocols. It should be noted, however, that this study did not assess practical skills or real-time performance, which are critical components of effective first aid. Further research is warranted to explore the correlation between theoretical knowledge and practical application in emergency scenarios. The resulting Cramér's $V = 0.21$ indicates a moderate association between group membership and response accuracy in the theoretical BLS assessment. This suggests that a respondent's level of professional or educational exposure to emergency care significantly influences their theoretical understanding of BLS protocols. The data show that students in healthcare-related fields achieved the highest average accuracy (95.10 %), likely reflecting the immediacy and relevance of their ongoing academic training. Professionals, while still performing well, demonstrated a slightly lower accuracy rate (91.42 %), which may reflect a degree of distance from formal theoretical instruction in BLS, especially if their training occurred in the past. In contrast, laypersons achieved

a substantially lower accuracy rate (78.46 %). This group's performance underscores the need for targeted educational interventions, particularly if individuals from this demographic are expected to serve as reliable FRs in pre-hospital settings. The moderate effect size captured by Cramér's V reinforces the notion that while training and education markedly improve BLS knowledge, disparities in theoretical preparedness persist between professional, student, and lay populations. These findings highlight the importance of not only maintaining continuous education among healthcare providers, but also expanding accessible, high-quality training programs for the public, as the quality of bystander BLS significantly influences a patient outcome prior to EMS arrival.[10].

DISCUSSION

The results of this study clearly demonstrate significant differences in the theoretical knowledge of BLS across the examined respondent groups. Medical and healthcare students achieved the highest average accuracy (95.10 %), followed by professionals (91.42 %), while laypersons and certified FRs performed the lowest (78.46 %). These differences were statistically significant ($\chi^2 = 15.03$; $df = 2$; $p < 0.0001$). Furthermore, the calculated Cramér's V ($V \approx 0.21$) indicates a moderately strong association between group affiliation and response accuracy, underscoring the critical role that formal training and professional education play in effective first aid delivery [11]. Based on these findings, healthcare and medical students emerge as promising candidates for inclusion in the FR system. The optimization of this system depends on adequate training and effective deployment of trained individuals. Their involvement not only offers a potential time benefit for patients by shortening the interval before the initiation of lifesaving interventions but also contributes positively to EMS teams by alleviating the burden in the early phase of response [10, 12]. In addition, it provides the student-responders authentic experiential learning, which complements their theoretical education. Prior studies have shown that real-world exposure strengthens practical competencies, including stress management, clinical communication, and rapid patient assessment and triage [13]. This mutually beneficial model enhancing both, a patient outcomes and student training supports the integration of students into structured FR system [14]. However, to ensure

the effectiveness and safety of such integration, several critical conditions must be met:

- Timely arrival at the scene of the incident
- Accurate assessment of the patient's medical condition
- Correct administration of first aid measures
- Proper handover of the patient to emergency services [2, 15].

The proximity of universities to urban centres increases the likelihood of rapid response by students during academic semesters. However, during academic breaks, students often return to areas such as urban peripheries or semi-rural regions, where EMS response times may be considerably longer due to infrastructural limitations or lower population density [16-17]. This geographic dispersion presents a valuable opportunity to utilize students as decentralized responders in areas typically underserved by EMS [18]. The data also suggest that both students and professionals possess adequate theoretical BLS knowledge. In contrast, the lay population exhibits lower performance, highlighting the continued necessity for systematic and recurring BLS training initiatives targeting the public [19]. Given that the first person to respond is often a bystander at the scene, improving general BLS competence could significantly enhance community-level emergency outcomes [20]. For the optimization of the FR system in Slovakia, it is essential to establish effective logistics through a navigation and notification application, accompanied by regular refresh training of FRs every five years and appropriate legislative anchoring, as implemented in the Czech Republic [21]. Current European Resuscitation Council guidelines indicate that the implementation of First Responder (FR) systems provides a direct benefit to patients. If the system also includes the *Community FR* category – which can include healthcare students – they should be actively involved, particularly in cases of out-of-hospital cardiac arrest [22]. Nevertheless, integrating students into high-stress, real-life emergencies also introduces psychological risk [23]. Scientific data has documented elevated rates of mental health concerns including post-traumatic stress and burnout among FRs [24]. These findings indicate that the integration of students into FR must include adequate psychological support, debriefing and resilience training to ensure sustainable engagement and sustainability [25].

Finally, the role of pre-incident training cannot be overstated. In addition to technical drills, training must incorporate psychological readiness, self-care strategies, and emotional regulation [25]. This includes developing coping skills for potential mental aftereffects of emergency involvement. A comprehensive training protocol covering both clinical and psychological domains is essential for sustaining the efficiency, well-being, and long-term engagement of FRs [23].

CONCLUSION

Students demonstrate the highest BLS knowledge, followed by professionals and laypersons. Integrating students into the FR system could enhance early intervention for patients with acute conditions. It can also provide practical training and structured oversight, which is beneficial for students' future development and for patients, as FRs on the scene decrease response times and contribute to reducing mortality [13].

REFERENCES

- [1] GROTHE J., TUCKER S., BLAKE A. et al. Exploring First Responders' Use and Perceptions on Continuous Health and Environmental [1] Monitoring. *International Journal of Environmental Research and Public Health*. 2023; 20 (6): 4787.
- [2] DE GREEF B., GENBRUGGE C., VERMA S. et al. Cost-effectiveness of a community first responder system for out-of-hospital cardiac arrest in Belgium. *Open Heart*. 2025; 12: e003098.
- [3] OVING I., DE GRAAF C., MASTERSON S. et al. European first responder systems and differences in return of spontaneous circulation and survival after out-of-hospital cardiac arrest: A study of registry cohorts. *The Lancet Regional Health – Europe*. 2021; 1: 100004.
- [4] PILBERY R., LETHBRIDGE K. *Ambulance Care Practice*. 2nd edition. London: Association of Ambulance Chief Executives, 2019. 640 p. ISBN 978-1-85959-854-2.
- [5] HAKSZER L. *Register defibrilátorov sa stále rozširuje. Dostupné prístroje zachraňujú desiatky životov mesačne* [online]. Networks Media, 2025 [cit. 25.05.2025]. Available online: <https://zdravotnickydennik.sk/2025/04/register-defibrilatorov-sa-stale-rozsiruje-dostupne-pristroje-zachranuju-desiatky-zivotov-mesacne/>

- [6] OPERAČNÉ STREDISKO ZÁCHRANNEJ ZDRAVOTNEJ SLUŽBY SLOVENSKEJ REPUBLIKY. *Výročná správa 2022* [online]. Operačné stredisko záchranej zdravotnej služby Slovenskej republiky, 2023. Available online: https://155.sk/subory/dokumenty/vyrocna_spravy/Vyrocna_sprava_OSZZSSR_2022.pdf
- [7] DEEB A., GUYETTE F., DALEY B. et al. Time to early resuscitative intervention association with mortality in trauma patients at risk for hemorrhage. *The Journal of Trauma and Acute Care Surgery*. 2023; 94 (4): 504-512.
- [8] LUIIJF E., KLAVER M. Insufficient Situational Awareness about Critical Infrastructures by Emergency Management [online]. ResearchGate, 2011 [Accessed 25 May 2025]. Available at: https://www.researchgate.net/publication/229047138_Insufficient_Situational_Awareness_about_Critical_Infrastructures_by_Emergency_Management.
- [9] BAETZNER A., WESPI R., HILL J. et al. Preparing medical first responders for crises: a systematic literature review of disaster training programs and their effectiveness. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*. 2022; 30 (1): 76.
- [10] YGIYEVA D., PIVINA L., MESSOVA A. et al. Evaluating the Effectiveness of a First Aid Training Programme for Individuals Without a Background in Medical Education. *Advances in Medical Education and Practice*. 2024; 15: 773-782.
- [11] MINNA S., HILTUNEN L., KÄRKKÄINEN T. How to evaluate first aid skills after training: a systematic review. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*. 2022; 30: 56.
- [12] METELMANN C., BARRY T., GREIF R. Editorial – Impact of first responders in resuscitation. *Resuscitation Plus*. 2022; 12: 100303.
- [13] ORSI A., WATSON A., WIJEGOONEWARDENE N. et al. Perceptions and experiences of medical student first responders: a mixed methods study. *BMC Medical Education*. 2022; 22 (1): 721.
- [14] SCHNETZLER N., TARAMACAZ V., HERREN T. et al. Recruiting Medical, Dental, and Biomedical Students as First Responders in the Immediate Aftermath of the COVID-19 Pandemic: Prospective Follow-Up Study. *JMIR Medical Education*. 2025; 11: e63018.
- [15] MÜLLER M., METELMANN C., THIES K. et al. Reporting standard for describing first responder systems, smartphone alerting systems, and AED networks. *Resuscitation*. 2024; 195: 110087.
- [16] MOSCOVITZ H., SABZALIEVA A. Conceptualising the new geopolitics of higher education. *Globalisation, Societies and Education*. 2023; 21 (2): 149-165.
- [17] HSIAO-HSUAN L., CHEN A., DAI CH. et al. Physical Infrastructure Assessment for Emergency Medical Response [online]. ResearchGate, 2014 [Accessed 20 May 2025]. ISSN 1943-5487.
- [18] ORKIN A., VENUGOPAL J., CURRAN J. et al. Emergency care with lay responders in underserved populations: a systematic review. *Bulletin of the World Health Organization*. 2021; 99 (7): 514-528.
- [19] IRFAN B., ZAHID I., KHAN M. et al. Current state of knowledge of basic life support in health professionals of the largest city in Pakistan: a cross-sectional study. *BMC Health Services Research*. 2019; 19 (1): 865.
- [20] IDLAND S., JOHANSEN J., HAKON K. et al. Assessing bystander first aid: development and validation of a First Aid Quality Assessment (FAQA) tool. *BMC Emergency Medicine*. 2023; 23 (1): 39.
- [21] MINISTERSTVO ZDRAVOTNICTVÍ ČESKÉ REPUBLIKY. *Metodický pokyn pro systematické využívání poskytovatelů první pomoci na vyžádání (first responderů)* [online]. 2021 [cit. 31.10.2025]. Available at: <https://mzd.gov.cz/metodicky-pokyn-pro-systematicke-vyuzivani-poskytovatelu-prvni-pomoci-na-vyzadani-first-responderu/>
- [22] SEMERARO F., SCHNAUBELT S., OLASVEENGEN T. et al. European Resuscitation Council Guidelines 2025 System Saving Lives. *Resuscitation*. Elsevier, 2025, ISSN 0300-9572, 1873-1570. DOI: 10.1016/j.resuscitation.2025.110821
- [23] PAPAZOGLU K. Stress, Prevention, and Resilience among First Responders. *International Journal of Environmental Research and Public Health*. 2023; 20 (24): 7174.

- [24] JONES R., JACKSON D., USHER K. First responder mental health, traumatic events and rural and remote experience. *Journal of Advanced Nursing*. 2024; 80 (2): 835-837.
- [25] LOWERY A., CASSIDY T. Health and well-being of first responders: The role of psychological capital, self-compassion, social support, relationship satisfaction, and physical activity. *Journal of Workplace Behavioral Health*. 2022; 37 (2): 87-105.