

Original Article

Effectiveness of Advanced Pediatric Life Support Training in Enhancing Knowledge among Fifth-Year Medical Students -Faculty of Medicine -University of Tripoli

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Background: Advanced Pediatric Life Support (APLS) training is essential for preparing medical students to manage pediatric emergencies effectively. **Aim:** This study aimed to assess the effectiveness of APLS training in enhancing the knowledge of fifth-year medical students at the Faculty of Medicine, University of Tripoli. **Methods:** Quasi-experimental using a pre-post-intervention was conducted from 10th December 2023 to 8th February 2024, at the pediatric skill lab, faculty of medicine University of Tripoli. Pre-and post-training assessments were conducted to evaluate students' knowledge of pediatric emergency management. SPSS 27 package program was used for statistical analysis. **Results:** A total of 186 medical students rolled in the study, 76% were females, and 24% were male, the overall pretraining knowledge scale of the students ranged from 51% to 70%, with a mean of 2.7 ± 0.6 and the overall post-training knowledge scale improved from 71% to 85%, with a mean 4 ± 0.8 . p-value $< .001$. Significant improvements were observed across various domains, including airway management, medication administration, and post-resuscitation considerations (p-value < 0.05). **Conclusion:** APLS training significantly enhances the short-term knowledge of fifth-year medical students in managing pediatric emergencies. We recommend Continuous evaluation of APLS training, comparative studies on teaching modalities, and research into long-term knowledge retention to enhance pediatric emergency care education.

Keywords: effectiveness, advanced Pediatric Life Support, knowledge, fifth-year medical student, Faculty of Medicine.

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INTRODUCTION:

Cardiac arrest in children has a high mortality rate, proper cardiopulmonary resuscitation (CPR) started within the first few minutes after the arrest is crucial for reducing morbidity and mortality (1,2). More than 20,000 infants and children have a cardiac arrest per year in the United States (3-6). In 2015, emergency medical service–documented out-of-hospital cardiac arrest (OHCA) occurred in more than 7000 infants and children (6).

The International Liaison Committee on Resuscitation (ILCOR) Formula for Survival highlights three critical elements for achieving successful resuscitation outcomes: the establishment of guidelines rooted in robust resuscitation science, the effective training of both the public and resuscitation professionals and the execution of a well-coordinated Chain of Survival. (7) The "chain of survival" in BLS and APLS protocols includes early event recognition, emergency response system activation, CPR initiation, defibrillation, and subsequent advanced medical interventions (7-9). APLS training is comprehensive, covering a wide range of competencies from airway management to pharmacology, and emphasizes the importance of leadership during emergency scenarios. The assessment and intervention sequence for critically ill or injured children adheres to the ABCDE principles: A for airway, including cervical spine stabilization for injured children, B for breathing, C for circulation, emphasizing hemorrhage control for injured children, D for disability, involving an evaluation of consciousness and neurological status, and E for exposure, ensuring a thorough examination while preserving dignity and conserving body temperature (9,10).

Medical education, particularly during the fifth year, is a critical phase where students transition from theoretical learning to practical, clinical skills. Proficiency in pediatric emergency management is a vital component of this training. Integrating Advanced Pediatric Life Support (APLS) training into the curriculum at this stage can significantly enhance the readiness and competence of future physicians (11). During this period, medical students must develop clinical skills and decision-making proficiency, including

managing pediatric emergencies. Incorporating APLS training into the pediatric skills lab curriculum at this juncture can uniquely benefit Although many studies have reported the results of basic and advanced CPR training for medical students (12-14), there are no studies that analyze the effectiveness of advanced pediatric life support training to enhancing medical students' knowledge and competence in pediatric emergency care.

The Faculty of Medicine at the University of Tripoli serves as a cornerstone of medical education in the country. With a commitment to excellence in healthcare delivery, the Faculty of Medicine recognizes the critical importance of providing comprehensive training in pediatric emergency management to its students, to provide high-quality medical education, the faculty has implemented BLS in the preclinical stage, and APLS training in a clinical stage as an integral component of the undergraduate medical curriculum. However, the effectiveness of APLS training in enhancing knowledge among fifth-year medical students at the University of Tripoli has not been systematically evaluated.

This study aimed to evaluate the baseline knowledge of fifth-year medical students regarding pediatric emergency management before undergoing APLS training, to measure post-training Knowledge Enhancement, and to identify specific areas of pediatric emergency management where fifth-year medical students may exhibit deficiencies or gaps in knowledge, both pre-and post-APLS training.

MATERIAL AND METHODS:

Quasi-experimental using a pre-post-intervention was conducted at the pediatric skill lab, faculty of medicine University of Tripoli. The study spanned from 10th December 2023 to 8th February 2024, all students of the fall/2023 semester enrolled in the APLS training program who gave verbal consent and completed both pre-and post-training assessments were included in the study. Ethical approval was sought and obtained from the institutional ethical committee. The intervention involved structured APLS training, pediatric assessment triangle, basic life support, recognition and management of respiratory emergencies, shock

management, cardiovascular emergencies, and post-resuscitation care, conducted over one day, as part of the fifth-year medical curriculum. The training program included didactic lectures covering core principles of pediatric emergency care, and case-based discussions to facilitate the application of theoretical knowledge to clinical scenarios, the structural training program was delivered by faculty staff members working at the pediatric skill lab. The participants underwent a pre-test assessment to evaluate their baseline knowledge of pediatric emergency management. The pre-test assessment consisted of thirteen multiple-choice questions, covering key concepts and principles relevant to pediatric emergencies, one point was allocated for each correct response and zero was allocated to a wrong response. The maximum achievable score was 13 marks, and the total score for each respondent was expressed as a percentage of the maximum score. Respondents were categorized into those with A knowledge score of > 85%excellent, 71-85% very good, 51-70% good, 31-50% average, and 0-30% poor.

After completing the APLS training intervention, participants underwent a post-test assessment to measure the immediate impact of the training on their knowledge. The post-test assessment utilized the same standardized questionnaire administered during the pre-test assessment. Collected data was coded, and IBM SPSS Statistics software version 27 was used to analyze mean, frequency, percentage, Wilcoxon, and McNemar test was used to find the significance of the differences between categorical variables. A p-value of less than 0.05 is considered significant.

RESULTS:

A total of 186 students were enrolled in the study, 76% were females, and 24% were male, the overall pre-training knowledge scale of the students ranged from 51% to 70%, with a mean of 2.7 ± 0.6 and the overall post-training knowledge scale improved from 71% to 85%, a mean of 4 ± 0.8 . p-value <.001(table1).

Table (1): Overall knowledge scale before and after the training

	0 – 30%	31- 50%	51-70%	71 – 85%	>85%	Z	P value
Before attending the course	1.1%	34.2%	58.8%	5.9%	0	-10.9	<0.001
After attending the course	0	1.6%	23.5%	43.9%	31%		

The percentage of correct answers varied across different questions, with a range of 14.4% to 95.2%. Noticeable improvements were observed across various areas, including understanding the role of basic life support (BLS) in Advanced Pediatric Life Support (APLS), initial airway maneuvers, advanced airway management, medication administration, and post-resuscitation considerations.

Specific questions, such as those related to the first step in securing pediatric patients,

the role of ECG monitoring, and the management of reversible causes of cardiac arrest, showed notable increases in correct answers. McNemar a statistically significant improvement in several key areas of pediatric emergency management post-APLS training, a relatively low percentage of correct answers regarding the role of DC shock in the management of asystole highlights a potential gap in knowledge among fifth-year medical students (table 2).

Table (2):- APLS knowledge assessment pre- and post-training

Question	% Correct answer before training	% Correct answer after training	P value
1 -Do the steps of the BLS approach play any role in APLS? (1) Yes. (2) No.	95.2%	96.3%	0.8
2- What is the first step for securing the sick person? (1) Airway. (2) Breathing. (3) Circulation. (4) Safety.	50.8%	83.4%	<0.001
3- Maneuvers to achieve a patent airway initially: (1) Head tilt & chin lift. (2) Jaw thrust. (3) Both 1 & 2. (4) Laryngeal mask.	78.1%	89.8%	0.005
4- If a patent airway is not achieved one of the following should be considered: (1) Intubation. (2) Laryngeal mask. (3) Cricothyroidotomy. (4) All the above.	31%	63.1%	<0.001
5- During supporting breathing in an intubated patient >12 years, the inflation rate should be With cautious compressions. (1)10-20/min. (2)20-30/min. (3)30-40/min. (4)40-50/min.	35.8%	61%	<0.001
6- How many attempts are allowed to secure peripheral IV access? (1)1 to 2 attempts <30 seconds. (2)3 attempts <40 seconds. (3)4 attempts <60 seconds. (4)As long as required to secure an IV access.	47.6%	81.8%	<0.001
7- Does ECG monitoring of heart rate and rhythm play any role in APLS? (1) Yes. (2) No.	87.7%	95.2%	0.01
8- Does DC shock play any role in the management of Asystole? (1) Yes. (2) No.	14.4%	56.1%	<0.001
9-In the management of pulseless ventricular tachycardia, when to consider giving Amiodarone IV? (1) After the first shock. (2) After the second shock. (3)After the third shock.(4)Not considered.	18.7%	83.4%	<0.001
10- During the APLS Adrenaline can be administrated through which of the following? (1) IV access. (2)Interosseous access. (3) Intramuscular injection. (4) Both 1 & 2.	38.5%	78.6%	<0.001
11-When managing pulseless electrical activity, what is the best action? (1) Perform CPR and give adrenaline. (2) Perform CPR only. (3) Give adrenaline and DC shock. (4) Give amiodarone and DC shock.	41.7%	73.3%	<0.001
12-Which of the following reversible causes could improve the APLS outcome? (1) Hypothermia. (2) Pneumothorax. (3)Electrolyte abnormalities.(4)Hypoxia. (5) All the above.	70.6%	90.9%	<0.001
13- Things to consider post-resuscitation: (1) Vital signs. (2) Input/output chart. (3) Arterial blood gases. (4)Thermal regulation. (5) All the above.	88.8%	94.7%	0.06

DISCUSSION:

The findings of this study underscore the significant impact of Advanced Pediatric Life Support (APLS) training on the knowledge and understanding of fifth-year medical students in managing pediatric emergencies. The overall post-training knowledge scale improved to 85%, a mean of 4 ± 0.8 , p -value $< .001$, which may prove useful for making quick and accurate therapeutic decisions. This result was similar to the Yasmine et al. study, which Assessed the Knowledge and Practices of University Students of Pediatrics Basic Life Support, the main outcome of the study was that the overall knowledge score increased significantly after the workshop 6.07 ± 1.7 comparing with before the workshop 4.67 ± 1.6 ($P < 0.001$) and the overall practice score increased significantly after the workshop 5.65 ± 1.7 comparing with before the workshop 3.97 ± 1.5 , proving that the web-based learning and video-based self-learning are successful in improving the knowledge and practice of the trainee(15)

Notable improvements were observed across various domains, including airway management, medication administration, and post-resuscitation considerations. Specifically, the percentage of correct answers increased significantly post-training, indicating enhanced proficiency in pediatric emergency management among the participants. Comparing these results with Rafał et al. study, which assesses the knowledge level of basic and advanced resuscitation procedures in children among students of medicine, which shows the level of knowledge of basic resuscitation procedures in children as average (49%) and of advanced procedures as low (38%). Students received an average overall score of 9.7 ± 2.9 points, the level of knowledge on basic and advanced resuscitation procedures in children among students of medicine is insufficient, and it is recommended to increase the number of both practical and theoretical classes on resuscitation

procedures in children for medical students (16), that explain the critical roles of teaching BLS. APLS to undergraduate medical school, while the Archa et al. study on the effectiveness of pediatric advanced life support training program in terms of knowledge and knowledge retention among nursing students at selected colleges of nursing, showed that APLS training program was effective in enhancing the knowledge, the mean of the post-test knowledge score (28.47) was higher by pre-test knowledge score which was (11.13). But there is a subsequent decrease in knowledge on the 28th day (19.67), so regular reinforcement sessions should be given to the students (17), and differ in our result, we did not assess retention knowledge.

The significant increase in correct answers observed in specific areas, such as understanding the initial airway maneuvers and managing reversible causes of cardiac arrest, reflects the targeted effectiveness of APLS training in addressing key aspects of pediatric emergency care. These findings are consistent with the objectives of APLS training, which aims to equip healthcare providers with the necessary knowledge and skills to assess and manage pediatric patients in emergencies effectively. However, despite the overall improvements observed, certain areas of pediatric emergency management still warrant attention. For instance, the relatively low percentage of correct answers regarding the role of DC shock in the management of asystole highlights a potential gap in knowledge among fifth-year medical students. This underscores the importance of continuous evaluation and refinement of medical education curricula to ensure comprehensive coverage of essential topics in pediatric emergency care, which will enhance patient outcomes and reduce morbidity and mortality associated with pediatric emergencies.

CONCLUSION:

The study concludes that APLS training significantly improves medical students' knowledge in managing pediatric emergencies. By identifying specific areas of improvement and demonstrating statistically significant gains in knowledge post-training, the study highlights the value of incorporating APLS training into medical education curricula.

RECOMMENDATIONS:

- Further research should explore the long-term retention of knowledge and skills acquired through APLS training among medical students.
- Comparative studies can be conducted to evaluate the effectiveness of different teaching modalities and educational interventions in pediatric emergency training.
- Continuous evaluation and refinement of medical education curricula are essential to ensure the ongoing competence of healthcare providers in pediatric emergency care.

LIMITATION:

Although our study is the first study that assesses the effectiveness of advanced pediatric life support training in enhancing knowledge among fifth-year medical students at the faculty of medicine, our study has a few limitations, there is no assessment of long-term knowledge retention, there is no control group in the study, and the study is conducted at a single institution.

REFERENCE:

1. J. López-Herce, J. Del Castillo, M. Matamoros, S. Cañadas, A. Rodriguez-Calvo, C. Cecchetti, et al. Factors associated with mortality in pediatric in-hospital cardiac arrest: a prospective multicenter multinational observational study. *Intensive*

LIST OF ABBREVIATIONS:

- ABG:** Arterial Blood Gas
APLS: Advanced Pediatric Life Support
BLS: Basic Life Support
CPR: Cardiopulmonary Resuscitation
DC: Cardioversion-Defibrillation
ILCOR: International Liaison Committee on Resuscitation
IM: Intramuscular
IO: Interosseous
IV: Intravenous
MCQ: Multiple Choice Questions
VT: Ventricular Tachycardia

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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Care Med, 39 (2013), pp. 309-318
<http://dx.doi.org/10.1007/s00134-012-2709-7> | Medline

2. F.W. Moler, K. Meert, A.E. Donaldson, V. Nadkarni, R.J. Brill, H.J. Dalton, et al. In-

hospital versus out-of-hospital pediatric cardiac arrest: a multicenter cohort study. *Crit Care Med*, 37 (2009), pp. 2259-2267 <http://dx.doi.org/10.1097/CCM.0b013e3181a00a6a> | Medline

3. Holmberg MJ, Ross CE, Fitzmaurice GM, Chan PS, Duval-Arnould J, Grossestreuer AV, Yankama T, Donnino MW, Andersen LW; American Heart Association's Get With The Guidelines-Resuscitation Investigators. Annual Incidence of Adult and Pediatric In-Hospital Cardiac Arrest in the United States. *Circ Cardiovasc Qual Outcomes*. 2019; 12:e005580. [LinkGoogle Scholar](#)

4. Atkins DL, Everson-Stewart S, Sears GK, Daya M, Osmond MH, Warden CR, Berg RA; Resuscitation Outcomes Consortium Investigators. Epidemiology and outcomes from out-of-hospital cardiac arrest in children: the Resuscitation Outcomes Consortium Epistry-Cardiac Arrest. *Circulation*. 2009; 119:1484-1491. doi: 10.1161/CIRCULATIONAHA.108.802678 [LinkGoogle Scholar](#)

5. Knudson JD, Neish SR, Cabrera AG, Lowry AW, Shamszad P, Morales DL, Graves DE, Williams EA, Rossano JW. Prevalence and outcomes of pediatric in-hospital cardiopulmonary resuscitation in the United States: an analysis of the Kids' Inpatient Database*. *Crit Care Med*. 2012; 40:2940-2944. doi: 10.1097/CCM.0b013e31825feb3f [CrossrefMedlineGoogle Scholar](#)

6. Virani SS, Alonso A, Benjamin EJ, Bittencourt MS, Callaway CW, Carson AP, Chamberlain AM, Chang AR, Cheng S, Delling FN, et al; on behalf of the American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics—2020 update: a report from the American Heart Association. *Circulation*. 2020; 141:e139-

e596. doi: 10.1161/CIR.0000000000000757 [LinkGoogle Scholar](#)

7. Søreide E, Morrison L, Hillman K, Monsieurs K, Sunde K, Zideman D, Eisenberg M, Sterz F, Nadkarni VM, Soar J, Nolan JP; Utstein Formula for Survival Collaborators. The formula for survival in resuscitation. *Resuscitation*. 2013; 84:1487-1493. doi: 10.1016/j.resuscitation.2013.07.020 [CrossrefMedlineGoogle Scholar](#)

8. Lin Y, et al. The role of simulation in teaching pediatric resuscitation: current perspectives. *Adv. Med Educ. Pract.* 2015;6:239 - 248.

9. A report on early defibrillation and its uses in Sudden Cardiac Arrest: <http://www.resuscitationcentral.com/defibrillation/early-defibrillation-sca-chain-of-survival/>

10. Berg RA, Hemphill R, Abella BS, et al. Part 5: adult basic life support: 2010 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation*. 2010;122(18 Suppl 3):S685-705.

11. Phillips PS, Nolan JP. Training in basic and advanced life support in UK medical schools: questionnaire survey. *BMJ*. 2001;323(7303): 22-3 6. Roshana S, Batajoo KH, Piryani RM, Sharma MW. Basic life support: knowledge and attitude of medical/paramedical professionals. *World J Emerg Med*. 2012;3(2):141-5. 7. Saquib SA, Al-Harhi HM, Khosh

12. Liberman M, Golberg N, Mulder D, et al. Teaching cardiopulmonary resuscitation to CEGEP students in Quebec-project. *Resuscitation* 2000; 47: 249-257.

13. Starc B, Pecan M. Training of medical students in resuscitation at the University of

Ljubljana. Resuscitation 1996; 32: 19-22.

14. Clark LJ, Watson J, Cobbe SM, et al. CPR'98: a practice multimedia computer-based

guide to cardiopulmonary resuscitation for medical students. Resuscitation 2000;44: 109-117.

15. Hesham F. El-Sayed, Ahmed M. Abd El Halim, Yasmine G. Mohamed: Assessment of Knowledge and Practices of University Students of Pediatrics Basic LifeSupport; The Egyptian Journal of Hospital Medicine (October 2023) Vol. 93, Page 7679-7684

16. Agnieszka Gałka¹, Rafał Czyż: Assessment of the knowledge level on basic and advanced resuscitation procedures in children among students of medicine; Journal of Education Health and sport⁸(March 2028):490-502

17. Archa Biju: The effectiveness of pediatric advanced life support (pals) training program in terms of knowledge and knowledge retention among nursing students at selected college of nursing; International Journal of Advance Research in Nursing Volume 7; Issue 1; Jan-Jun 2024; Page No. 42-45