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ORIGINAL RESEARCH

Physicians' Knowledge of the Systematic ABCDE Approach in Riyadh, Saudi Arabia

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Purpose: To evaluate physicians' knowledge of the ABCDE (Airway, Breathing, Circulation, Disability, Exposure) approach components.

Methods: A cross-sectional study was conducted in 2023 using an online questionnaire in order to collect data about the knowledge of the ABCDE approach's components among physicians in different specialties in Riyadh, Saudi Arabia.

Results: The number of participants were 165 in total and the median knowledge score for all participants was 15.0, with an associated interquartile range (IQR) of 10.0 to 20.0. Intensive Care Medicine had the highest median knowledge score of 19.0 (IQR: 12.0–21.0), followed by Internal Medicine at 17.0 (IQR: 13.0–20.0). Conversely, Cardiology and Anesthesiology showed lower scores, with medians of 8.0 (IQR: 4.0–10.0) and 7.5 (IQR: 4.0–13.5), respectively (p = 0.011). Senior Registrars demonstrated the highest median knowledge score of 20.0 (IQR: 14.0–22.0), while Fellows had the lowest at 8.5 (IQR: 7.0–13.0) (p < 0.001). Practicing for 10 to 15 years and more than 15 years having medians of 20.0 (IQR: 16.0–23.0) and 19.0 (IQR: 17.0–22.0), respectively. However, participants with less experience, working for less than 5 years, had a median score of 12.0 (IQR: 8.5–16.5) (p < 0.001).

Conclusion: Knowledge scores of physicians representing various medical specialties found diverse levels regarding the ABCDE approach. Knowledge scores were significantly influenced by the primary area of practice, level of experience, and duration worked in the profession, highlighting the need for tailored training and education across different specialties and career stages. On the other hand, future studies should concentrate on finding new factors that influence practice adherence to the ABCDE approach and tying theoretical knowledge to clinical practice.

Keywords: emergency medicine, patient assessment, clinical knowledge, critical care, medical education, healthcare training

Introduction

The ABCDE (Airway, Breathing, Circulation, Disability, Exposure) approach is a systematic method used in emergency medicine to assess and manage critically ill or injured patients.[1] It provides a structured framework for healthcare providers to prioritize and address immediate life-threatening issues in a timely manner.[2]

The approach involves the sequential evaluation of Airway assessment, which is the first step to ensure the patient's airway is open and not compromised. Breathing evaluation, which is the second step to determine whether the patient is able to breathe effectively, which includes checking for signs of respiratory distress. Circulation check or circulation component, assesses a patient's cardiovascular status. The pulse, blood pressure, and overall perfusion should be evaluated. Signs of shock or inadequate blood flow should be addressed immediately. Additionally, disability assessment

is a way of assessing the patient's neurological state. This includes assessing their level of consciousness. As a final step, exposure and environmental control involves exposing the patient to determine if there are any additional injuries or medical conditions. Maintaining the patient's body temperature and providing an appropriate environment are also part of this process.[3]

The importance of the ABCDE approach is to help healthcare providers identify and address life-threatening issues in a systematic manner, improving patient outcomes and reducing mortality rates in emergency situations. It is widely used in emergency departments and critical care settings.

Although ABCDE is widely recommended, the level of proficiency in ABCDE knowledge varies among healthcare workers and adherence in practice appears to be suboptimal. Schoeber et al, conducted a study to assess healthcare professionals' knowledge of the ABCDE systematic approach among participants (nurses, residents and medical specialists) working in the following departments: Anesthesiology, Pediatrics, Emergency Department, Neonatal Intensive Care Unit and Pediatric Intensive Care Unit. According to the study, healthcare workers demonstrated varying levels of proficiency on a validated ABCDE knowledge test.[4] Furthermore, in a previous study by Kliem et al, it was noted that ABCDE approach compliance was not frequent in a simulated status epileptic, but, if followed, it resulted in more frequent airway protection and adherence to treatment steps.[5] Likewise, in previous studies conducted by Mohamed et al, in 2018 concerning the adherence to the ABCDE approach in evaluating critically ill patients, it was found that there was a suboptimal level of adherence to the ABCDE approach.[6] Moreover, as found by Linders et al, in their study, some factors may affect the application of the ABCDE approach as well as impede the reliance of healthcare workers on ABCDE; this include guidelines themselves, professional considerations, patient factors, team factors, incentives and also resources.[1]

Physicians' knowledge of the ABCDE approach's components and training are unknown in Saudi Arabia. As such, the purpose of this study is to assess physicians' knowledge of the ABCDE approach's components across different specialties.

Materials and Methods

This research was a cross-sectional study design. It utilized a questionnaire tested and found valid and reliable by Schoeber et al in the year 2023 to evaluate Physicians' knowledge of the ABCDE approach's components.[4] The Institutional Review Board committee at Imam Mohammad ibn Saud Islamic University, Riyadh, Saudi Arabia has reviewed and approved this research with project number 442/2023, dated 22 February 2023. The questionnaire, comprised of 29 questions based on a prior study. The survey was distributed through Google Forms and the participants who were willing and filled the informed consent featured at the beginning of the questionnaire were allowed to participate in the study. The study focused on Saudi and non-Saudi physicians from diverse specialties and experience levels in both public and private sector hospitals in Riyadh, Saudi Arabia. Exclusion criteria encompassed non-physician healthcare providers and physicians practicing outside Riyadh.

Both descriptive and inferential statistical analysis of the data was carried out. Simple descriptive statistics of the socio-demographic characteristics and other categorical variables in the form of frequencies and percentages were calculated and tabulated. For the 29 questions assessing the knowledge of ABCDE approach, a score of 1 was assigned for each correct response and these were summed up to calculate the total knowledge score of each participant. Thus, the total possible score of a participant ranged from 0 to 29. The scores were compared among participants of different areas of practice and experience. The comparison involved inferential statistical analysis named the Kruskal–Wallis test. Significance was established at a p-value of 0.05 indicating a 95% confidence interval. All statistical calculations were performed using IBM SPSS version 27.0.1.

Results

A total of 165 participants residing in Riyadh, Saudi Arabia, took part in the research. The primary areas of medical practice were diverse, with Family Medicine being the most common (19.4%), followed by Emergency Medicine (15.8%), Pediatrics (12.7%), and Internal Medicine (12.7%). In terms of experience, the participants were distributed across various levels. The largest proportion consisted of residents (33.9%), followed by consultants (24.8%), interns (20.0%), senior registrars (9.1%), registrars (8.5%), and fellows (3.6%). Regarding the duration worked in the medical profession since their initial graduation as doctors, 55.8% of participants had less than 5 years of experience. Additionally, 15.8% had worked for 10 to 15 years, 15.2% for more than 15 years, and 13.3% for 5 to 10 years (Table 1).

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Table 1 Sociodemographic Characteristics and Experience of Participants

		N	%
Residing in Riyadh	Yes	165	100.0%
Primary Area of Practice	Family Medicine	32	19.4%
	Emergency Medicine	26	15.8%
	Pediatrics	21	12.7%
	Internal Medicine	21	12.7%
	Surgery / Trauma	16	9.7%
	Intensive Care Medicine	13	7.9%
	Anesthesiology	12	7.3%
	Obstetrics and Gynecology	9	5.5%
	Cardiology	7	4.2%
	Graduate Medical Student	6	3.6%
	Intensive Care Medicine, Pediatrics	1	0.6%
	Emergency Medicine, Surgery / Trauma	1	0.6%
Level of Experience	Resident	56	33.9%
	Consultant	41	24.8%
	Intern	33	20.0%
	Senior Registrar	15	9.1%
	Registrar	14	8.5%
	Fellow	6	3.6%
Duration Worked in Profession (since first graduating as a doctor)	Less than 5 years	92	55.8%
	10 to 15 years	26	15.8%
	More than 15 years	25	15.2%
	5 to 10 years	22	13.3%

While assessing knowledge of ABCDE approach, a substantial percentage of participants correctly identified that internal bleeding in thoracic, abdominal, pelvic, and upper leg regions can lead to hypovolemic shock (61.2%). In addition, to frequency of breathing, most of the participants 68.5% indicated use of accessory breathing muscles as one of the major aspects that help them with assessing the effort of breathing. Impressively, 80.0% recognized a capillary refill time of 4 seconds on the sternum as abnormal, 61.2% indicated that P in the AVPU-score mean patient responds to pain; 61.2% indicated normal sound of voice (crying, talking) as most informative for determining an open airway, 58.2% indicated observing retractions as the main actions that does not contribute to diagnosing a tension pneumothorax, 55.2% indicated massive, visual hemorrhage as the C-problem that is treated prior to the actual ABCDE approach, 70.9% indicated Polyuria not being a sign of shock, 64.2% indicated that a prolonged capillary refill time could be present in the form of Hypothermia and shock. Moreover, 73.9% indicated that the aspects of the pupils that always have to be assessed for every critically ill patient are the size and light reactivity. More so, most of the participants 58.8% indicated that stridor (inspiratory) indicate upper airway obstruction. Finally, most of the participants 58.2% indicated that jugular venous distension is shown by; heat failure, pericardial tamponade and pneumothorax. However, some ABCDE approach

shown to have lower level of knowledge, this include, the identification of hypotension as a late sign of circulatory failure (48.5%) and recognizing lower airway obstruction in cases of expiratory wheezing (48.5%), the recognition of glucose as an always-included blood value in the primary survey (33.3%). Additionally, the prioritization of assessment steps showed diverse responses, with a 46.7% accuracy rate for classifying AVPU-score, capillary refill time assessment, look-listen-feel technique and temperature measurements among the rest of ABCDE approaches assessed (Table 2).

Table 2 Questions Assessing Knowledge of ABCDE Approach with Their Correct Answers and Percentage of Participants with Correct Response

Questions Assessing Knowledge of ABCDE Approach	Correct Answer	Percentage of Correct Responses
1. What is usually a late sign of circulatory failure?	Hypotension	48.5%
2. Where is the airway obstruction located when you hear expiratory wheezing?	Lower airway	48.5%
3. At which locations can an internal bleeding cause a hypovolemic shock?	Thorax, abdomen, pelvis, upper leg	61.2%
4. Which of the following aspects helps with assessing the effort of breathing, additional to frequency of breathing?	Use of accessory breathing muscles	68.5%
5. What blood value is always part of the primary survey?	Glucose	33.3%
6. A patient has a capillary refill time of 4 seconds on the sternum. This is.	Abnormal	80.0%
7. On which of the following moments in the assessment of the patient do you use the ABCDE approach?	Both of the above	50.9%
8. What does the P in the AVPU-score mean?	Patient responds to pain	61.2%
9. Classify the items below in order of priority according to the ABCDE approach: I. AVPU-score II. Assessing capillary refill time III. Look-listen-feel	3, 2, 1	46.7%
10. What aspect is not part of the D in the ABCDE approach?	Temperature measurement	46.7%
11. What is, at any age, most informative for determining an open airway?	Normal sound of voice (crying, talking)	61.2%
12. Which of the following actions does not contribute to diagnosing a tension pneumothorax?	Observing retractions	58.2%
13. Which C-problem is treated prior to the actual ABCDE approach?	Massive, visual hemorrhage	55.2%
14. What are the 4 most essential parts for assessing a patient's circulatory condition?	Blood pressure, capillary refill time, heart rate, pulsations	32.7%
15. Which of the following aspects is assessed in the E of the ABCDE approach?	Petechiae	34.5%
16. Which of the following parameters is most reliable when assessing the effectiveness of breathing (in ambient air)?	Oxygen saturation	49.7%
17. What is the most uniform sign of increased effort of breathing, for all ages?	Increased breathing rate	30.3%
18. Upon what is the fixed order of the ABCDE approach mostly based?	This is based upon priority	47.9%
19. Which item is assessed in the E of the ABCDE approach?	Body temperature	49.7%

(Continued)

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Table 2 (Continued).

Questions Assessing Knowledge of ABCDE Approach	Correct Answer	Percentage of Correct Responses
20. What is not a sign of shock?	Polyuria	70.9%
21. A prolonged capillary refill time could be present in which of the following situations? I. Hypertension II. Hypothermia III. Shock	2 and 3	64.2%
22. Which abnormality in a patient's posture is most severe?	Stretching arms and legs	31.5%
23. What is the safest maneuver to secure the airway of a trauma patient?	Jaw thrust	37.6%
24. Which aspects of the pupils always have to be assessed for every critically ill patient?	Size and light reactivity	73.9%
25. What is the look-listen-feel method namely meant for?	Assessing the airway	44.2%
26. Which muscle is an accessory breathing muscle?	Sternocleidomastoid muscle	46.1%
27. What does a stridor (inspiratory) indicate?	Upper airway obstruction	58.8%
28. What does jugular venous distension indicate? I. Anaphylaxis II. Heart failure III. Pericardial tamponade IV. Pneumothorax	2, 3, 4	58.2%
29. With what can you make a quick estimation of a patient's awareness?	AVPU-score	49.1%

The median knowledge score for all participants was 15.0, with an associated interquartile range (IQR) of 10.0 to 20.0. Notably, statistically significant disparities emerged in knowledge scores based on the primary area of practice (p = 0.011) with intensive care medicine having the highest score 19.0 (IQR: 12.0–21.0) and anesthesiology having the lowest score 7.5 (IQR: 4.0–13.5). In addition, a statistically significant difference emerged in knowledge scores based on the level of experience (p < 0.001) with senior registrar having the highest score 20.0 (IQR: 14.0–22.0) while fellows got the lowest score 8.5 (IQR: 7.0–13.0). Finally, a statistically significant difference emerged in knowledge scores in regards to the duration worked in the profession (p < 0.001). This was shown by knowledge scores of those who had practiced for 10 to 15 years having the highest score 20.0 (IQR: 16.0–23.0) while those who had been working for less than 5 years, had lowest score of 12.0 (IQR: 8.5–16.5) (Table 3).

In terms primary area of practice, Intensive care medicine had the highest median score of 19.0 while Anesthesiology had the lowest median score of 7.5 (Figure 1)

According to the level of experience, Senior Registrars had the highest median score of 20.0 while Fellows had the lowest median score of 8.5. Residents and Interns had median score between 10 and 15 (Figure 2).

Regarding the duration of professional experience, those practicing for 10 to 15 years exhibited the highest median score of 20.0 while participants with less than 5 years of experience had the lowest median score of 12.0. Participants with more than 15 years of experience had a median score of 19.0 (Figure 3).

Discussion

The research involved 165 participants from Riyadh, Saudi Arabia, representing a diverse range of medical practices. Among the primary areas of medical practice, Family Medicine emerged as the most prevalent at 19.4%. Considering the participants' experience levels, the distribution was widespread. The largest group consisted of residents at 33.9%. In

Table 3 Association of Knowledge of ABCDE Approach with Area of Practice, Level of Experience and Duration Worked in Profession

		Knowledge Score		
		Median	**IQR**	**P-value** [a]
Overall Score		15.0	10.0–20.0	-
Primary Area of Practice[±] (N=163)	Intensive Care Medicine	19.0	12.0–21.0	0.011*
	Internal Medicine	17.0	13.0–20.0	
	Graduate Medical Student	16.5	15.0–21.0	
	Surgery / Trauma	16.0	13.5–19.5	
	Family Medicine	15.5	10.0–20.0	
	Emergency Medicine	15.5	10.0–23.0	
	Pediatrics	14.0	13.0–18.0	
	Obstetrics and Gynecology	14.0	11.0–17.0	
	Cardiology	8.0	4.0–10.0	
	Anesthesiology	7.5	4.0–13.5	
Level of Experience	Senior Registrar	20.0	14.0–22.0	<0.001*
	Registrar	19.0	16.0–22.0	
	Consultant	17.0	11.0–21.0	
	Resident	14.0	10.5–20.0	
	Intern	12.0	8.0–16.0	
	Fellow	8.5	7.0–13.0	
Duration Worked in Profession (since first graduating as a doctor)	10 to 15 years	20.0	16.0–23.0	<0.001*
	More than 15 years	19.0	17.0–22.0	
	5 to 10 years	16.5	11.0–20.0	
	Less than 5 years	12.0	8.5–16.5	

Notes: [a]Independent Samples Kruskal–Wallis Test. *p<0.05, Significant. [±]Two Participants with Multiple Primary Area of Practices were Excluded.

terms of the duration of their medical profession since initial graduation, the majority (55.8%) had less than 5 years of experience. These results collectively provide a comprehensive snapshot of the participants' distribution across medical specialties, experience levels, and years of practice since graduation.

Our study revealed important findings regarding the assessment of participants' familiarity with the ABCDE approach. Notably, a significant percentage of participants correctly identified that hypotension is a late indicator of circulatory failure, highlighting their grasp of this crucial clinical concept.[7] An equal percentage of participants recognized that expiratory wheezing indicates lower airway obstruction, indicating a solid understanding of respiratory issues, highlighting their grasp of this crucial clinical concept.[8] For instance, Hagedoorn et al, found that some participants correctly identified hypotension as a late sign of circulatory failure, which is slightly lower than our observed 48.5%.[9] Although all profession categories are supposed to be familiar with the contents of the ABCDE approach, the assessment was conducted with assumption that they are all present.
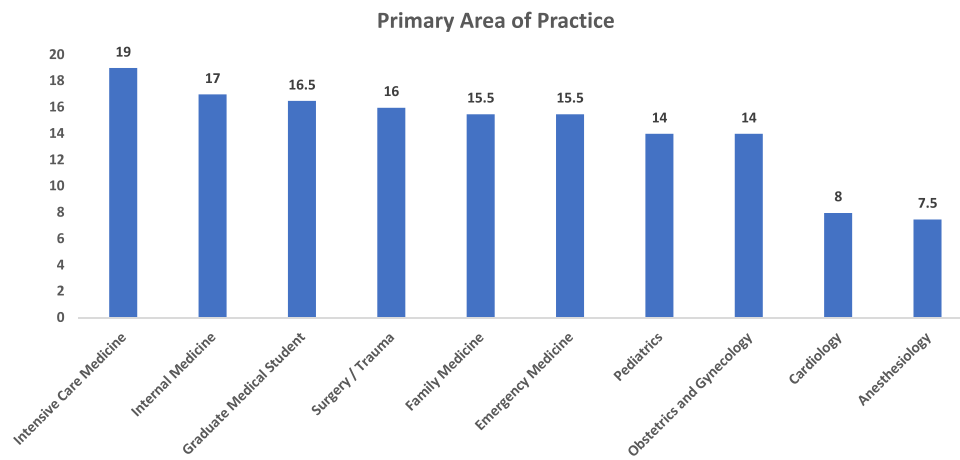
Primary Area of Practice

Figure 1 Association of Knowledge of ABCDE Approach with Primary area of Practice.

Level of Experience
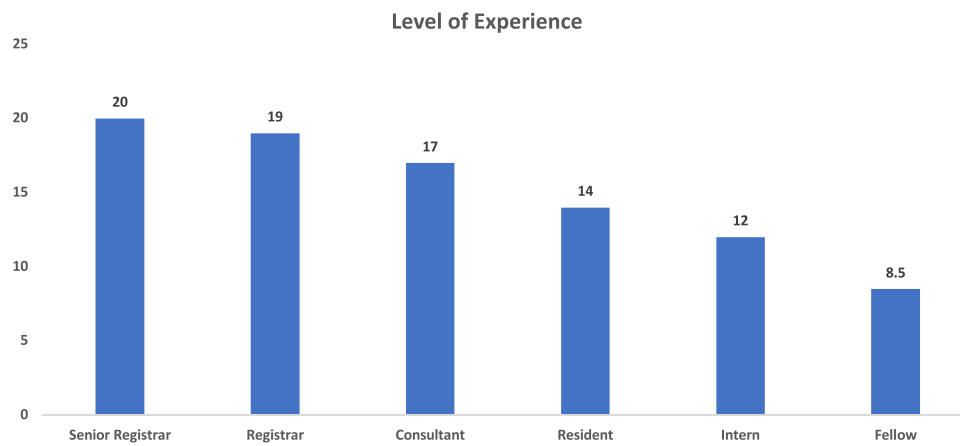
Figure 2 Association of Knowledge of ABCDE Approach with Level of Experience.
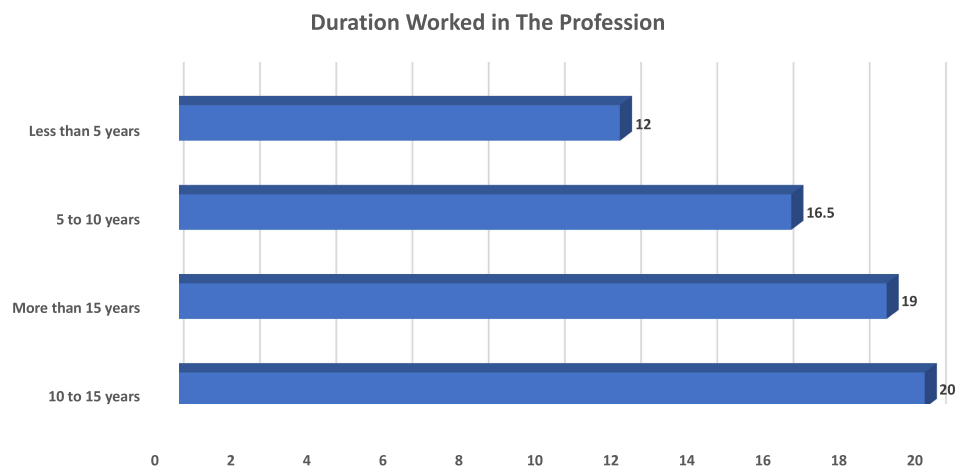
Duration Worked in The Profession

Figure 3 Association of Knowledge of ABCDE Approach with Duration Worked in The Profession.

Interestingly, a substantial number of participants (61.2%) demonstrated accurate awareness of the correlation between internal bleeding in specific areas and the risk of hypovolemic shock. This finding underscores the participants' recognition of the critical implications of bleeding in various anatomical regions. Moreover, a noteworthy consensus

(80.0%) was reached on the abnormality of a 4-second capillary refill time on the sternum,[10] suggesting a high level of agreement on the significance of this clinical marker. In a study by Taghavi et al, few participants correctly linked internal bleeding to hypovolemic shock, demonstrating a lower awareness compared to our 61.2% consensus.[11]

Further, our study identified certain areas where participant accuracy was lower. For instance, only 33.3% of respondents correctly recognized glucose as an always-included blood value in the primary survey, indicating a gap in knowledge regarding this critical aspect.[12] Additionally, there was a variation in responses when it came to prioritizing assessment steps, with an accuracy rate of 46.7% in correctly classifying the AVPU score, capillary refill time, and the look-listen-feel technique.

However, our study also highlighted strong understanding of pivotal components within the ABCDE approach. A significant majority of participants (73.9%) correctly grasped the importance of assessing pupils for size and light reactivity.[13] These findings suggest that while there are areas where improvement is needed, participants generally demonstrate sound comprehension of key components within the ABCDE approach. Further training and education could address the gaps identified and enhance overall clinical competence.

The investigation into factors influencing knowledge of the ABCDE approach revealed interesting insights. With a median knowledge score of 15.0 and an interquartile range (IQR) between 10.0 and 20.0, suggests that the context in which healthcare professionals operate can impact their familiarity with the ABCDE approach. For instance, participants in certain areas of practice may encounter the methodology more frequently, leading to a higher knowledge level. Similarly, individuals with greater experience and a longer duration of professional work might have accumulated more exposure to the approach, contributing to higher scores.[4] The study by Scoheber et al, found similar patterns, where variations in knowledge scores were linked to both the level of experience and the field of practice.[4]

Upon examining the primary area of practice, it's evident that participants specializing in Intensive Care Medicine demonstrated the highest median knowledge score of 19.0 concerning the ABCDE approach. This underscores the notion that those dealing more closely with critical care scenarios tend to possess a deeper understanding of this methodology.[14] Similarly, participants in Internal Medicine also exhibited a notable median score of 17.0, suggesting a robust grasp of the approach among medical practitioners dealing with general internal health concerns. On the other hand, Cardiology and Anesthesiology specialists displayed relatively lower median scores of 8.0 and 7.5 respectively, potentially indicating areas for further focus and education.

In terms of experience levels, the results highlight that Senior Registrars demonstrated the highest median knowledge score, showcasing the positive influence of accumulated experience on comprehension.[15] Conversely, Fellows recorded the lowest median score, revealing a potential need for enhanced training or exposure in this context. Regarding the duration of professional experience, those practicing for 10 to 15 years and more than 15 years exhibited the highest median scores of 20.0 and 19.0 respectively. This aligns with the idea that a longer professional path correlates with a more comprehensive understanding of clinical methodologies.[1] In contrast, participants with less than 5 years of experience had a median score of 12.0, suggesting a potential learning curve for those newer to the field.

To augment these insights, our study also visually underscores these trends, showing the relationship between knowledge scores and experience level, as well as duration worked in the profession. These graphical representations effectively reinforce the findings, emphasizing the influence of experience and duration in the medical field on participants' knowledge of the ABCDE approach.[4] These findings are consistent with those obtained by other studies, such as the work by Nofal et al, which also identified experience as a key factor impacting knowledge scores in emergency care practices.[16] However, contrary findings in our data may be explained by differences in the frequency, intensity, and type of education or by a more executable role in clinical practice. The ABCDE approach may also be more commonly accepted in a culture where younger participants received their education, but our data did not permit the analysis of educational differences. Ultimately, unless demonstrated differently, there is no direct correlation between the outcomes of theoretical knowledge tests and clinical practice adherence.

The research study presents key findings on medical practitioners; however, the study is constrained by certain limitations. The geographical restriction to Riyadh may hinder the broader generalizability of the results to other healthcare settings. The exclusive inclusion of medical practitioners might overlook insights from other healthcare professionals involved in the ABCDE approach. The study's cross-sectional design limits the ability to establish causal

relationships or track changes in knowledge over time. The self-reporting method for assessing knowledge might introduce response bias. Furthermore, the study's quantitative approach may not fully capture the complexities of real-world clinical application. Based on the findings of our study, we recommend developing medical education programs and healthcare institutions to improve physicians' knowledge and application of the systematic ABCDE approach.

Conclusion

Physicians exhibited varying levels of knowledge regarding the ABCDE approach, with strengths in recognizing key aspects such as capillary refill time abnormalities and identifying life-threatening conditions. This study emphasizes the need for ongoing education and targeted training to improve patient care, especially in areas where knowledge gaps exist. However, although the study reveals the participants had substantial theoretical knowledge of ABCDE approach, it's unclear to what extent knowledge will improve clinical performance. Therefore, future studies should concentrate on finding new factors that influence practice adherence to the ABCDE approach and tying theoretical knowledge to clinical practice.

Ethical Consideration

The Institutional Review Board committee at Imam Mohammad ibn Saud Islamic University, Riyadh, Saudi Arabia, has diligently reviewed and granted approval for this research under project number 442/2023, dated 22 February 2023. Furthermore, we affirm that informed consent was obtained from all study participants. Our research adheres to the ethical guidelines outlined in the Declaration of Helsinki.

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Disclosure

The authors report no conflicts of interest in this work.

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