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Current utilization, training and barriers to point of care ultrasound in intensive care units: a national survey

Yoğun bakımlarda yatak başı klinik ultrasonografi kullanımı, eğitimi ve engeller: ulusal anket çalışması

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ABSTRACT

Objective: This study examines the training and utilization of Point-of-Care Ultrasound (POCUS) among intensive care physicians in Türkiye, assessing its clinical use, training and barriers to implementation.

Materials and Methods: A prospective, observational, cross-sectional survey was conducted between November 10–25, 2024, among adult tertiary intensive care unit (ICU) physicians in Türkiye. The structured online questionnaire collected demographic data, POCUS training experiences, and clinical applications.

Results: A total of 152 ICU physicians participated. Lung ultrasound (78.3%) and cardiac ultrasound (71.0%) were the most frequently used POCUS applications, while cranial ultrasound (20.4%) was the least. Over half (52.6%) had no POCUS training during residency, and 53.3% had never attended a certified course; among attendees, 64.8% found the training duration insufficient. Online digital platforms were the primary self-learning resource (75.0%), and 92.1% expressed interest in further education.

Conclusion: The study highlights the need for structured POCUS training during residency and post-specialization. The absence of a standardized curriculum and experienced instructors were key barriers. Expanding post-specialization courses and improving access to high-quality digital resources may enhance POCUS competency.

Keywords: intensive care unit, POCUS, point of care ultrasound, bedside ultrasound, training

ÖZ

Giriş: Bu çalışma, Türkiye'deki yoğun bakım hekimleri arasında Yatak Başı Ultrason (POCUS) eğitimi ve kullanımını inceleyerek, klinik uygulamalarını, eğitim olanaklarını ve uygulamadaki engelleri değerlendirmektedir.

Gereç ve Yöntem: Türkiye'deki üçüncül erişkin yoğun bakım ünitelerinde (YBÜ) çalışan hekimler arasında 10-25 Kasım 2024 tarihleri arasında prospektif, gözlemsel ve kesitsel bir anket çalışması yürütüldü. Yapılandırılmış çevrimiçi anket, katılımcıların demografik verilerini, POCUS eğitimi ile ilgili deneyimlerini ve klinik

Bulgular: Çalışmaya toplam 152 YBÜ hekimi katıldı. En sık kullanılan POCUS uygulamaları akciğer ultrasonu (%78,3) ve kardiyak ultrason (%71,0) iken, en az kullanılan uygulama kraniyal ultrason (%20,4) oldu. Katılımcıların %52,6'sı uzmanlık eğitimi sırasında POCUS eğitimi almadığını, %53,3'ü ise sertifikalı bir kursa katılmadığını belirtti. Kurslara katılanların %64,8'i ise eğitim süresini yetersiz buldu. Katılımcıların %75,0'i çevrimiçi dijital platformları kendi kendine öğrenme kaynağı olarak kullanırken, %92,1'i ileri düzeyde POCUS eğitimi almakla ilgilendiğini ifade etti.

Sonuç: Çalışma, POCUS eğitiminin hem uzmanlık eğitimi hem de uzmanlık sonrası dönemde yapılandırılmış bir şekilde artırılması gerektiğini ortaya koymaktadır. Standart bir eğitim müfredatının olmaması ve deneyimli eğitmen eksikliği önemli engeller olarak belirlenmiştir. Uzmanlık sonrası POCUS kurslarının genişletilmesi ve yüksek kaliteli dijital eğitim materyallerine erişimin artırılması, POCUS kullanım yeterliliğini geliştirebilir.

Anahtar kelimeler: yoğun bakım ünitesi, POCUS, yatak başı ultrasonografi, yatak başı ultrason, eğitim

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Introduction

Ultrasonography (USG) is a rapidly expanding imaging modality in clinical practice due to its advantages, including the absence of radiation risk, low cost, and bedside applicability (1). Point-of-Care Ultrasonography (POCUS), is a practical and easily performed technique widely utilized by clinicians in intensive care units (ICUs) and operating rooms for the rapid assessment of targeted pathologies in the brain, airway, thorax, abdomen, and extremities as well as for guiding interventional procedures (2-5).

However, every USG technique requires comprehensive theoretical and practical training. Insufficient training can limit the accuracy of clinical assessments and lead to misleading results (6). Therefore, to ensure standardization in certain applications of POCUS, skill levels and corresponding minimum training requirements have been established (7).

The increasing global utilization of POCUS has necessitated its integration into training programs across various medical specialties. However, POCUS training varies not only between countries but also among different centers within the same country (3,6). The lack of standardization limits the reliability of POCUS applications and impacts the quality of patient care (8). Furthermore, gaps in knowledge regarding the adequacy of training programs, the effectiveness of teaching methods, and the availability of specialized assessment tools hinder the advancement of POCUS education (8).

The aim of this study is to investigate the current frequency of POCUS use among intensive care physicians in Türkiye, assess available training opportunities, and identify barriers to its utilization.

Materials and Methods

This study was designed as a prospective, observational, and cross-sectional research. Prior to the initiation of the study, ethical approval was obtained from the Necmettin Erbakan University Ethics Committee for Non-Pharmaceutical and Non-Medical Device Research (Approval No: 2024/5318). Data were collected between November 10 and November 25, 2024, through an web based survey administered via "Google Forms" to physicians working in adult tertiary ICUs across Türkiye. Structured questionnaire, consisting of multiple-choice, Likert-scale, and forced-choice questions (yes, no, or undecided), was used as the data collection tool (see Appendix A for the full questionnaire). The survey included participants' demographic characteristics, POCUS training, experience and use in practice, institutional resources for education and equipment, and potential barriers to POCUS implementation.

Statistical analysis

Statistical analyses were performed using SPSS 27.0 software (IBM Inc., Chicago, IL, USA). Categorical (qualitative) variables were expressed as frequency (n) and percentage (%), while quantitative variables were presented as the interquartile range and median (min-max).

Results

This study was announced through the social media platforms of relevant associations and researchers, making it impossible to determine the exact number of ICU physicians who received the invitation. A total of 152 intensive care physicians completed the survey. The demographic and professional characteristics of the participants are summarized in Table 1. The diagnostic areas in which POCUS is utilized in intensive care units are detailed in Table 2.

Table 1. Demographic characteristics of the participants

Question	Answer	Frequency	Percent (%)
Age	25-45	123	80,92%
	≥ 45	29	19,08%
Gender	Male	78	51,32%
	Female	74	48,68%
Work experience in the ICU	> 10 year	39	25,66%
	< 10 year	113	74,34%

Table 2. POCUS applications in diagnostic procedures

Application Area	Frequency (N)	Percent (%)
Lung	119	78,3%
Cardiac	108	71,0%
Abdomen	92	60,5%
Airway	78	51,3%
Ocular	65	42,7%
Cranial	31	20,4%

Comprehensive information regarding the POCUS training received by participants, including courses attended and their related perspectives, is provided in Table 3. Physicians' evaluations of POCUS training and competency during their intensive care specialization are presented in Table 4. Data on equipment availability, frequency of clinical use, preferences, and individual learning approaches are outlined in Table 5.

Table 3. Participants' POCUS training

Question	Answer	Frequency (N)	Percent (%)
Have you attended a certified POCUS course?	Yes	71	46,7%
	No	81	53,3%
If your answer to the previous question is 'No,' what are the primary reasons preventing you from attending POCUS courses and training programs? *	High course fees	21	25,9%
	The distant locations of the courses	24	29,6%
	Insufficient number of courses	23	28,4%
	Not feeling the need for a course	13	16,1%
What was the total duration of the POCUS courses you attended?	1 day only	49	69%
	2 days only	22	31%
Was the duration of the POCUS courses you attended sufficient?	Yes	25	35,2%
	No	46	64,8%
What was the duration of the workshop training in the POCUS courses you attended?*	A few hours	27	38%
	Half a day	34	47,9%
	1 day	10	14,1%
Was the duration of the workshop training in the POCUS courses you attended sufficient?	Yes	26	36,6%
	No	45	63,4%
How many trainees were assigned per instructor during the workshop sessions in the POCUS courses you attended?	>10	10	14,1%
	5-10	49	69%
	<5	12	16,9%

* Multiple response options were allowed for this question, and percentages were calculated based on the total frequencies of the selected responses.

Table 4. POCUS training and competency during residency

Question	Answer	Frequency (N)	Percent (%)
Did you receive POCUS training at your hospital during your residency?	Yes	72	47,4%
	No	80	52,6%
If your answer to the previous question is "Yes," who mentored you during your POCUS training throughout your residency?	Faculty Members	66	%85,71
	Senior Research Fellows	11	14.3%
Was the POCUS training provided during your residency sufficient?	Yes	49	32,2%
	No	103	67,7%
Would you have found a radiology rotation beneficial during your training	Yes	23	15,1%
	No	129	84,8%

Table 5. Equipment, frequency of clinical use, and individual learning preferences of POCUS

Question	Answer	Frequency (N)	Percent (%)
Is the number of ultrasound devices in your clinic sufficient?	Yes	78	51,3%
	No	74	48,7%
What is your frequency of POCUS usage?	Never	30	19,7%
	Daily	19	12,5%
	Several times a week	103	67,8%
Do you use POCUS in intensive care for purposes other than vascular interventional procedures?	Yes	115	75,7%
	No	37	24,3%
Would you like to receive further training in POCUS?	Yes	140	92,1%
	No	12	7,9%
Which additional learning methods do you use for ultrasound training?	Online trainings	71	46,7%
	Youtube	114	75,0%
	Textbook	49	32,2%
	Articles	51	33,5%
	Course	61	40,1%
If you detect a lung point and barcode sign during POCUS in a patient with suspected pneumothorax, would you proceed with an interventional procedure without additional imaging?	Yes	54	35,5%
	No	63	41,4%
	Undecided	35	23,0%

Discussion

This study represents the first national-level research evaluating the knowledge, training status, and perceived barriers to POCUS utilization among physicians working in adult intensive care units (ICUs) in our country. A total of 68% of participants reported that the current POCUS training was insufficient. More than half of the participants reported not receiving POCUS training during their residency, and over half had never attended a certified POCUS course. Among those who had participated in a POCUS course, 64.8% considered the training duration inadequate. Notably, the vast majority of participants (92.1%) expressed a strong desire for additional POCUS training.

Consistent with the findings of this study, research conducted in Canada, one of the most developed countries, has also highlighted variability in POCUS training within intensive care residency programs and identified significant educational gaps (9). A Canadian study reported that while 64% of intensive care programs provided PUS training in accordance with national recommendations, challenges such as a lack of qualified instructors and limited hands-on training opportunities remained prevalent.

Similar studies have also identified the most frequently cited barriers to POCUS education as the shortage of trained faculty members and the absence of a standardized curriculum (10). The adequacy of teaching faculty plays a crucial role in improving the quality of training. Both in our study and previous research, one of the most prominent shortcomings is the lack of a widely accepted, structured, and standardized POCUS curriculum, along with an insufficient number of competent instructors.

According to the results of this study, the most frequently used POCUS applications for diagnostic purposes were lung ultrasound (78.3%) and cardiac ultrasound (71.0%), while cranial ultrasound (20.4%) was the least utilized. Although the lower frequency of cranial ultrasound use compared to lung ultrasound is expected, the lack of adequate training in this area may also contribute to this finding.

Only 12.5% of participants reported using POCUS daily, while 19.7% stated that they never used it, and 67.8% reported using it several times a week. Regarding POCUS use in interventional procedures, 24.3% of participants indicated that they used it exclusively for vascular access. A national survey conducted in Brazil found that POCUS was primarily used for central venous catheterization (49.4%) and bedside echocardiographic evaluation (33.9%) (11).

Both national and international societies organize numerous postgraduate training courses on POCUS. In this study, half of the participants reported not attending such courses, citing high course fees, limited course availability, and the distant locations of these courses as the primary barriers. The findings of this study indicate that residents prefer digital platforms (e.g., YouTube) over traditional textbook-based learning methods. This trend highlights the increasing demand for digital resources in medical education. Therefore, it is recommended that educational materials be enriched and adapted for digital platforms to enhance accessibility. Additionally, ensuring the accuracy and reliability of content on these platforms through supervision by academic institutions and experts would be beneficial.

Lung USG is frequently utilized in the ICU due to its ease of bedside application, its ability to provide reliable diagnostic information, its advantage of avoiding radiation exposure compared to chest radiography, and its cost-effectiveness (12). In this study, lung USG was identified as the most frequently used ultrasound technique in intensive care units, with 78% of participants reporting regular use.

However, when asked, *'If you detect a lung point and barcode sign during POCUS in a patient with suspected pneumothorax, would you proceed with an interventional procedure without additional imaging?',* only 35% of physicians responded affirmatively. This finding suggests that the majority of physicians prefer to integrate ultrasound findings with other diagnostic parameters rather than relying solely on USG, even when the findings are highly suggestive.

Additionally, nearly half of the participants reported that their clinical settings lacked a sufficient number of ultrasound devices. This indicates that equipment shortages may be one of the limiting factors in the widespread utilization of POCUS.

This study highlights the need for a more standardized POCUS training program, particularly for intensive care physicians. The guidelines provided by the European Society of Intensive Care Medicine (ESICM) define the essential ultrasound skills that intensive care physicians should acquire for the assessment of critically ill patients (13). Such guidelines can serve as a fundamental framework for intensive care training programs and help address existing educational deficiencies

Conclusion

This study evaluates the training level, attitudes, preferences, frequency of use, and perspectives of intensive care physicians in Türkiye regarding POCUS, highlighting both the current state and existing gaps in education that require improvement. The primary barriers to POCUS utilization include the lack of technical equipment, an insufficient number of experienced instructors for resident training, and the absence of a standardized national curriculum. Our findings underscore the need to increase the frequency and duration of postgraduate POCUS courses, as well as to enhance the availability and quality of digital educational materials under the supervision of academic institutions and experts. We believe that these steps are essential for the widespread adoption and improved effectiveness of POCUS in clinical practice.

Ethical approval

This study has been approved by the Necmettin Erbakan University Ethics Committee for Non-Pharmaceutical and Non-Medical Device Research (approval date: 01.10.2024, number: 2024/5318).

Author contribution

Study conception and design: MA; data collection: ÖK, TA; analysis and interpretation of results: AK; draft manuscript preparation: MNK, AY. The author(s) reviewed the results and approved the final version of the article.

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Conflict of interest

The authors declare that there is no conflict of interest.

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Appendix A. Survey questions

1) What is your age?
2) What is your gender?
3) What is your medical specialty?
4) How long have you been working in intensive care units?
5) What is your academic title at your current institution?
6) What is your current workplace?
7) Have you attended any certified course on Point-of-Care Ultrasonography (POCUS)?
8) Do you think the POCUS courses conducted in our country are beneficial?
9) What was the duration of the POCUS courses you attended?
10) Do you think the duration of the POCUS courses you attended was sufficient?
11) Were hands-on workshop sessions on mannequins included in the POCUS courses you attended?
12) What was the duration of the hands-on workshop sessions on mannequins in the POCUS courses you attended?
13) Do you think the duration of the hands-on workshop sessions on mannequins was sufficient?
14) How many trainees were assigned per instructor during the hands-on workshop sessions in the POCUS courses you attended?
15) What is the primary reason preventing you from attending POCUS courses and training programs?
16) Did you receive POCUS training at your hospital during your residency?
17) If your answer to question 16 is "Yes," who mentored you during your POCUS training?
18) Did you receive POCUS training outside of your hospital during your residency?
19) Did you receive POCUS training after completing your residency?
20) How many ultrasound procedures did you perform during your residency?
21) Do you think the use of POCUS was sufficient during your residency?
22) Do you think the POCUS training provided during your residency was adequate?
23) Which ultrasound applications have you received theoretical training on during courses or at your hospital? (Please select all that apply.)
24) Would you like to receive further training in POCUS?
25) Do you use additional learning methods for ultrasound training?
26) Should a radiology rotation be included in the intensive care fellowship training program?
27) Is the number of ultrasound devices in your clinic sufficient?
28) How frequently do you use POCUS?
29) Do you use POCUS for diagnostic and therapeutic purposes (excluding interventional procedures) in intensive care?
30) Do you use POCUS while performing interventional procedures in intensive care?
31) Do you feel competent enough to make independent clinical decisions using POCUS?
32) How important do you consider POCUS skills in your professional career?
33) In which clinical situations do you use lung ultrasound?
34) In a scenario where you detect a lung point and barcode sign during POCUS in a patient with suspected pneumothorax, would you proceed with an interventional procedure without requesting any additional imaging?
35) In which clinical situations do you use cardiac ultrasound?
36) In which clinical situations do you use abdominal ultrasound?
37) In which clinical situations do you use cranial ultrasound?
38) In which clinical situations do you use airway ultrasound?
39) In which clinical situations do you use ocular ultrasound?