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Original article

Motivation and barriers to the use of Point-of-Care Ultrasound (POCUS) among physicians in Bosnia and Herzegovina: a dual survey study

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Summary

Introduction. Point-of-care ultrasound (POCUS) is increasingly recognized as an extension of the physical examination, enhancing bedside diagnostic accuracy and real-time clinical decision-making. Although widely integrated into medical education and practice internationally, its routine implementation in Bosnia and Herzegovina remains inconsistent and structurally constrained. This study aimed to identify key motivators for POCUS utilization and to examine systemic and organizational barriers limiting its broader adoption in primary and secondary healthcare settings.

Methods. A cross-sectional study was conducted using two structured anonymous questionnaires administered to physicians attending an ultrasound training course during the "Dom zdravlja" Doboj symposium in September 2025. After data cleaning, 41 fully completed questionnaires were included in the motivation analysis (general practitioners n = 11; specialists n = 30), and 43 were included in the barriers analysis. The instruments assessed professional characteristics, self-reported ultrasound familiarity, motivators, perceived barriers, and institutional support. Descriptive statistics were applied, with χ^2 and Fisher's exact tests used for subgroup comparisons ($p < 0.05$).

Results. Respondents demonstrated strong motivation for POCUS use, particularly for rapid diagnostic clarification and disease monitoring. Most participants supported formal curricular integration and recognized the professional value of ultrasound practice. Major barriers included insufficient structured training, lack of mentorship, limited access to ultrasound devices, time constraints, absence of clear institutional guidelines, and the need for financial recognition. No significant differences were observed between general practitioners and specialists.

Conclusion. Physicians in Bosnia and Herzegovina show high motivation toward POCUS adoption. However, implementation is predominantly hindered by systemic and institutional barriers. Coordinated educational, infrastructural, and policy-level interventions are necessary to enable sustainable integration into routine clinical practice.

Key words: Point-of-Care ultrasound, implementation, motivation, barriers, primary healthcare, physicians

Introduction

Point-of-care ultrasound (POCUS) has evolved over the past two decades from a specialized imaging modality into a widely adopted bedside clinical tool. It has been described as the "fifth pillar" of physical examination, complementing inspection, palpation, percussion, and auscultation with real-time insonation [1]. This conceptual shift reflects the integration of focused ultrasound into routine clinical reasoning, enabling direct visualization of anatomical structures and pathophysiological processes during patient assessment.

Unlike comprehensive radiological ultrasound examinations, POCUS is limited in scope and is indication-driven. It is performed by the treating physician to answer focused clinical questions and guide immediate decision-making [2]. Evidence suggests that POCUS improves diagnostic efficiency, enhances procedural safety, and increases clinician confidence, particularly in time-sensitive and resource-limited environments.

A systematic review by Andersen et al. demonstrated that general practitioners increasingly perceived POCUS as an extension of clinical examination rather than a replacement for radiological imaging [3]. Surveys among family physicians, internists, and emergency physicians have consistently reported positive attitudes, emphasizing benefits such as improved diagnostic speed, enhanced monitoring, and greater professional autonomy [4].

Educational frameworks have expanded accordingly, with several initiatives defining core competencies and curricular standards. For example, Delphi consensus studies from France and Slovenia have defined core competencies for POCUS use in general practice and emphasized the need for structured, competency-based training [8, 9]. Residency programs increasingly incorporate ultrasound training [10], and professional organizations such as the American Academy of Family Physicians recommend formal curricular integration [11].

Despite expanding acceptance and educational initiatives, translation into routine clinical practice remains uneven. Commonly reported barriers include limited equipment access, insufficient structured training, time constraints, lack of institutional support, and unclear professional boundaries [5, 6]. These barriers appear predominantly systemic rather than motivational.

In Bosnia and Herzegovina, empirical data regarding physicians' motivation, perceived competence, and implementation barriers are limited. Understanding these factors is essential for developing evidence-based strategies tailored to the national healthcare context. In the Republic of Srpska, the extent to which ultrasound training translates into routine clinical use remains unclear.

This study therefore aimed to assess both motivational drivers and systemic barriers associated with POCUS use through two complementary surveys conducted among physicians attending an ultrasound training course.

Methods

Study design

This cross-sectional study used two structured anonymous questionnaires to assess physicians' motivation and perceived barriers related to POCUS implementation. The dual-survey approach was designed to capture both attitudinal and structural dimensions within the same educational setting.

Setting and participants

Data collection was conducted during the ultrasound training course organized as part of the "Dom zdravlja" Doboj symposium in September 2025. Physicians from primary and secondary healthcare institutions across Bosnia and Herzegovina attended the course.

All participants were invited to complete the questionnaires voluntarily. Participation was

anonymous, and no identifiable information was collected. Because recruitment occurred during an ultrasound-focused educational event, the sample represented a convenience cohort that may be positively predisposed toward POCUS.

Data integrity and sample size

A total of 105 physicians were invited to participate, with an overall response rate of 40.9%. Due to a technical issue during data export, part of the dataset was lost. After data cleaning and exclusion of incomplete responses, the final analytic sample included:

- 41 fully completed motivation questionnaires (general practitioners n = 11; specialists n = 30);
- 43 fully completed barriers questionnaires.

The anonymous design prevented matching individual responses across surveys. No priori power calculation was performed due to the exploratory nature of the study.

Survey instruments

Two structured instruments were developed based on thematic domains identified in previously published international POCUS surveys [4, 7]. Items were adapted to the local healthcare context.

The motivation questionnaire included 10 items covering professional status, years of experience, self-assessed ultrasound familiarity, motivators, clinical application interests, institutional support, and career impact. Multiple responses were allowed for motivational domains.

The barriers questionnaire included 10 structured statements addressing educational, equipment, workflow, institutional, and professional climate factors. Responses were recorded using a three-point agreement scale (agree / partly agree / disagree). A three-level scale was selected to ensure clarity and high completion rates within the time-constrained educational setting. The questionnaires were based on previously published instruments and adapted to the local context.

Formal psychometric validation was not performed due to the exploratory design.

Statistical analysis

Categorical variables were presented as frequencies and percentages. Group comparisons were conducted using χ^2 tests or Fisher's exact test when appropriate. Statistical significance was set at $p < 0.05$. No correction for multiple comparisons was applied.

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki and approved by the institutional Ethics Committee (Approval number: 5362/25). Participation was voluntary and anonymous, and completion of the questionnaire was considered informed consent.

Results

Demographic and professional characteristics

A total of 41 fully completed questionnaires were included in the motivation survey analysis. Specialists constituted 73.2% of respondents, while general practitioners (GPs) accounted for 26.8%. Most participants (61.0%) reported 11–20 years of professional experience, indicating a predominantly mid-career cohort.

Self-assessed ultrasound familiarity revealed moderate perceived competence. The largest proportion rated their knowledge as average (39.0%), followed by good (26.8%). Notably, 26.9% reported poor or no familiarity, while only 7.3% considered their knowledge excellent (Table 1).

Table 1. Demographic and professional characteristics (N = 41)

Variable	Category	n (Number)	% (Percentage)
Professional status	General practitioner	11	26.8%
	Specialist	30	73.2%
Years of experience	≤10 years	9	22.0%
	11–20 years	25	61.0%
	>20 years	7	17.1%
Ultrasound familiarity	Excellent	3	7.3%
	Good	11	26.8%
	Average	16	39.0%
	Poor	7	17.1%
	None	4	9.8%

Motivational drivers and professional attitudes

Participants were allowed to select multiple motivators (Table 2). Rapid diagnostic clarification (82.9%) and disease monitoring (70.7%) were the most frequently reported drivers. Guiding procedures (36.6%) and visualization of anatomy (29.3%) were less frequently selected.

Support for formal curricular integration was high (92.7%), and 78.0% believed that ultrasound practice significantly enhanced professional development.

Nearly all respondents (97.6%) disagreed with the statement that ultrasound should be performed exclusively by radiologists. Additionally, 82.9% perceived increased professional recognition associated with ultrasound practice. No statistically significant differences were observed between professional groups ($p > 0.05$).

Table 2. Motivational factors and professional attitudes (N = 41)

Variable	n (number)	% (percentage)
Rapid diagnosis	34	82.9%
Disease monitoring	29	70.7%
Guiding procedures	15	36.6%
Visualization of anatomy	12	29.3%
Support for curricular integration	38	92.7%
Significant impact on career	32	78.0%
Disagree that only radiologists should perform ultrasound	40	97.6%
Perceived greater professional recognition	34	82.9%

Table 3. Preferred ultrasound application areas by professional status

Area of Application	GP (n=11)	Specialists (n=30)	p-value
Abdominal	11	26	> 0.05
Thyroid	10	18	> 0.05
Musculoskeletal	3	11	> 0.05
Other	1	6	> 0.05

Table 4. Perceived barriers to POCUS implementation (N = 43)

Domain	Barrier	n (Number)	% (Percentage)
Educational	Insufficient structured training	36	83.7%
	Lack of mentorship	40	93.0%
Equipment	Lack of permanent device access	33	76.7%
Workflow	Time constraints	28	65.1%
Institutional	Need for financial recognition	40	93.0%
	Lack of clear guidelines	40	93.0%
Professional climate	Concern about colleague criticism	30	69.8%

Areas of clinical interest

Abdominal ultrasound was selected by all general practitioners and by 26 specialists. Thyroid ultrasound was selected by 10 general practitioners and 18 specialists, while musculoskeletal ultrasound was more frequently selected by specialists (n = 11) than general practitioners (n = 3). No statistically significant differences were identified between groups (Table 3).

Perceived barriers to implementation

A total of 43 responses were included in the barriers analysis (Table 4).

Educational barriers were highly prevalent, with 83.7% reporting insufficient structured training and 93.0% reporting lack of mentorship. Equipment limitations were also substantial (76.7% reported lack of permanent device access). Workflow-related time constraints were reported by 65.1%.

Institutional barriers were the most prominent overall: 93.0% indicated need for financial recognition and 93.0% reported absence of clear clinical guidelines. Additionally, 69.8% reported concern regarding colleague criticism or professional conflict.

Discussion

The present study provides a comprehensive assessment of both motivational readiness and structural constraints influencing the implementation of point-of-care ultrasound (POCUS) among physicians in Bosnia and Herzegovina. When the findings are interpreted in integrative way, a distinct implementation paradox becomes apparent: professional willingness is strong, yet systemic capacity remains insufficient. This divergence between readiness and infrastructure appears to represent the central implementation bottleneck. These findings are consistent with reports

from other healthcare systems, particularly related to limited equipment availability and the lack of integration of POCUS into routine clinical workflows [4-7]. This further supports the interpretation that structural rather than motivational factors play a key role in limiting POCUS use.

Motivational readiness as a pre-implementation phase

The high proportion of respondents identifying rapid diagnostic clarification and disease monitoring as key motivators (Table 2) reflects a clinically pragmatic understanding of POCUS. Rather than viewing ultrasound as a technological novelty, physicians perceive it as a tool that enhances bedside reasoning and accelerates clinical decision-making. This aligns with international literature conceptualizing POCUS as an extension of physical examination rather than a substitute for radiological imaging [1–3].

Importantly, near-universal rejection of radiologist exclusivity (97.6%) suggests that professional identity has already evolved toward clinician-performed ultrasound. This finding is not trivial. It signals that resistance is not ideological. The professional community appears to be conceptually prepared for scope expansion.

Furthermore, the perception of increased professional recognition (82.9%) indicates that POCUS is associated not only with clinical utility but also with symbolic professional value. This dual motivational dimension, functional and reputational, may accelerate adoption once structural barriers are removed.

The competency gap: motivation without infrastructure

Despite high motivational readiness, self-perceived competence remains moderate (Table 1). Nearly one third of respondents reported poor or absent familiarity with ultrasound. This discrepancy between aspiration and perceived capability highlights a structural training deficit.

Educational barriers reported in Table 4, particularly insufficient structured training and lack of mentorship, confirm this interpretation. Short-term courses may stimulate interest but are unlikely to produce durable competency without supervised longitudinal practice. International Delphi studies and curriculum frameworks emphasize competency-based progression, supervised scanning thresholds, and formal assessment standards [8–11]. The absence of such systems may contribute to hesitation in routine clinical integration despite positive attitudes.

Thus, the limiting factor appears not to be lack of willingness, but absence of structured educational pathways capable of translating interest into confident practice.

Institutional alignment and accountability

Institutional barriers emerged as the most prominent constraint. Over 90% of respondents reported absence of clear guidelines and need for financial recognition (Table 4). These findings suggest a perceived imbalance between clinical responsibility and institutional acknowledgment.

POCUS introduces diagnostic accountability, documentation requirements, and potential medicolegal implications. Without formal policy frameworks, reimbursement models, or institutional endorsement, clinicians may experience uncertainty regarding scope boundaries and liability. This may inhibit full integration even in motivated environments.

The presence of professional climate concerns (69.8%) further indicates that interdisciplinary clarity remains incomplete. Although exclusivity is rejected conceptually, practical boundaries between radiology and clinician-performed ultrasound may not be

formally delineated yet. Clear governance structures could mitigate these concerns.

Equipment and workflow realities

Limited device access (76.7%) represents a tangible infrastructural barrier. Implementation science consistently identifies resource availability as a determinant of adoption. Even highly motivated clinicians cannot sustain practice without reliable equipment access.

Workflow-related time constraints were reported by two thirds of respondents. However, compared to institutional and educational barriers, workflow constraints appeared secondary. This suggests that time barriers may be adaptive challenges diminishing training, equipment access, and institutional integration improvement.

Systemic convergence across professional groups

The absence of statistically significant differences between general practitioners and specialists suggests a shared perception landscape. Barriers and motivations appear systemic rather than specialty-dependent. This simplifies policy implications: reform efforts may be designed at system level rather than tailored to professional subgroups.

Implementation interpretation

Collectively, findings suggest that Bosnia and Herzegovina has reached a pre-implementation phase characterized by high motivational readiness but incomplete structural integration. Educational standardization, mentorship frameworks, equipment accessibility, institutional guidelines, and formal recognition mechanisms represent the critical levers for progression.

Once these structural conditions are aligned, rapid diffusion of POCUS into routine practice appears plausible.

Conclusion

Physicians in Bosnia and Herzegovina demonstrate strong motivation and positive attitudes toward POCUS adoption. However, implementation is predominantly limited by systemic and institutional barriers rather than lack of professional interest.

Sustainable integration requires coordinated educational reform, structured mentorship, improved equipment access, institutional guidelines, and formal recognition mechanisms. Future multicenter studies with larger samples and objective utilization measures are recommended to further guide implementation strategies.

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Ethical approval. The Ethics Committee of the University of East Sarajevo, Faculty of Medicine Foča, Republic of Srpska, Bosnia and Herzegovina, approved the study (No. 5362/25) and informed consent was obtained from all individual respondents. The research was conducted according to the Declaration of Helsinki.

Conflicts of interest. The authors declare no conflict of interest.

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Motivacija i barijere za primjenu Point-of-Care ultrazvuka (POCUS) među ljekarima u Bosni i Hercegovini: dvojna anketna studija

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Uvod. Ultrazvuk na mjestu pružanja zdravstvene zaštite (POCUS) sve se više prepoznaje kao produžetak fizikalnog pregleda, koji unapređuje dijagnostičku tačnost uz bolesnički krevet i omogućava donošenje kliničkih odluka u realnom vremenu. Iako je široko integrisan u medicinsko obrazovanje i praksu na međunarodnom nivou, njegova rutinska primjena u Bosni i Hercegovini i dalje je neujednačena i strukturno ograničena. Cilj ovog istraživanja bio je da identifikuje ključne motivacione faktore za primjenu POCUS i ispita sistemske i organizacione barijere koje ograničavaju njegovu širu primjenu u primarnoj i sekundarnoj zdravstvenoj zaštiti.

Metode. Sprovedena je studija presjeka korišćenjem dva strukturisana anonimna upitnika, distribuirana ljekarima koji su pohađali kurs ultrazvuka tokom simpozijuma „Dom zdravlja" Doboj u septembru 2025. godine. Nakon čišćenja podataka, 41 u potpunosti popunjen upitnik uključen je u analizu motivacije (ljekari opšte prakse n = 11; specijalisti n = 30), a 43 u analizu barijera. Instrumenti su procjenjivali profesionalne karakteristike, samoprocjenu poznavanja ultrazvuka, motivacione faktore, percipirane barijere i institucionalnu podršku. Primijenjena je deskriptivna statistika, dok su za poređenje podgrupa korišćeni χ^2 test i Fišerov egzaktni test ($p < 0,05$).

Rezultati. Ispitanici su pokazali snažnu motivaciju za primjenu POCUS, naročito u cilju brzog dijagnostičkog razjašnjenja i praćenja bolesti. Većina učesnika podržala je formalnu integraciju u nastavni plan i program, i prepoznala profesionalnu vrijednost ultrazvučne prakse. Glavne barijere uključivale su nedostatak strukturisane edukacije, izostanak mentorstva, ograničen pristup ultrazvučnim aparatima, vremenska ograničenja, nepostojanje jasnih institucionalnih smjernica, kao i potrebu za finansijskim priznanjem. Nisu uočene statistički značajne razlike između ljekara opšte prakse i specijalista.

Zaključak. Ljekari u Bosni i Hercegovini pokazuju visoku motivaciju za usvajanje POCUS. Međutim, implementacija je pretežno ograničena sistemskim i institucionalnim barijerama. Koordinisane intervencije na obrazovnom, infrastrukturnom i zdravstveno-političkom nivou neophodne su za održivu integraciju u rutinsku kliničku praksu.

Ključne riječi: *Point-of-Care* ultrazvuk, implementacija, motivacija, barijere, primarna zdravstvena zaštita, ljekari