

Clinical and Physiological Perspectives on Barriers and Facilitators of Endoscopic Ultrasound Use in Resource-Limited Setting

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Abstract

Background: Endoscopic ultrasound (EUS) is a pivotal tool in advanced gastroenterology, enabling both structural and functional assessment of gastrointestinal and pancreatic pathology. Despite its clinical value, utilization in low- and middle-income countries is limited due to multiple infrastructural, financial, and training-related barriers.

Methods: A qualitative study was conducted using semi-structured interviews with gastroenterologists in tertiary care hospitals of Peshawar for a period of six months from January 2024 to June 2024. Thematic analysis was employed to explore barriers, facilitators, and potential strategies for improving EUS utilization. Questions explored themes such as autonomic responses, cardiopulmonary tolerance, body habitus, and tissue characteristics. Interview transcripts were thematically analyzed to capture shared physiological perspectives and coping strategies.

Results: Key barriers included limited equipment, scarcity of trained personnel, inadequate training programs, low procedural volume, high costs, and patient apprehension. Facilitators included broad clinical indications, availability of simulation-based training, and mentorship initiatives. Gastroenterologists noted obesity, ascites, poor cardiopulmonary reserve, and stress responses as key physiological barriers to EUS, while optimization of patient status and positioning were seen as important facilitators.

Conclusion: Integrating physiological evaluation with structural imaging enhances the utility of EUS, but access remains restricted by logistical, financial, and educational constraints. Public-private partnerships, policy support, and structured training programs are essential to expand EUS availability and optimize patient care.

Introduction

Endoscopic ultrasound (EUS) is an advanced diagnostic and therapeutic modality in gastroenterology, used for evaluating lesions ranging from benign cysts to complex carcinomas.¹ Beyond structural imaging, EUS can assess physiological parameters such as gastrointestinal motility, vascular flow, and pancreatic endocrine function, providing an integrated understanding of gastrointestinal health.²

Several factors limit EUS utilization. Availability of equipment and dedicated endoscopy spaces is inconsistent. While many endoscopy technicians are skilled in standard diagnostic and therapeutic procedures, familiarity with EUS is rare.³ Few training programs exist, and EUS services are concentrated in major cities like Karachi and Islamabad. Procedural volume is lower than other GI interventions, and referral systems are underdeveloped.⁴ Patient apprehension about potential complications and a steep learning curve further impede widespread adoption.⁵

Despite these challenges, EUS has a wide range of clinical applications, including cyst evaluation, fine-needle aspiration cytology (FNAC), pancreatic staging, and submucosal lesion assessment.⁶ Simulation-based workshops, hands-on training, and evidence-based guidelines offer avenues for improved utilization. Integrating physiological evaluation into EUS practice can enhance diagnostic accuracy and guide therapeutic decisions.⁸

Methodology

A qualitative study was conducted using semi-structured interviews with gastroenterologists in tertiary care hospitals of Peshawar for a period of six months from January 2024 to June 2024. Participants were purposively selected based on their experience in clinical and advanced endoscopy. The interviews explored barriers and facilitators to EUS utilization, including financial, infrastructural, and training-related aspects. Questions explored themes such as autonomic responses, cardiopulmonary tolerance, body habitus, and tissue characteristics. Interview transcripts were thematically analyzed to capture shared physiological perspectives and coping strategies. Data were analyzed using thematic analysis to identify key themes.

Results

1. Utilization of EUS: EUS remains an underutilized yet highly valuable tool in gastroenterology.
2. Barriers to Utilization: Key barriers include lack of equipment, trained personnel, training programs, procedural volume, patient apprehension, and high costs.
3. Financial Constraints: High costs of EUS procedures, accessories, and maintenance limit access.
4. Training and Infrastructure: Limited availability of training centers and qualified personnel hinders EUS adoption.
5. Strategies for Increasing Access: Current strategies include hands-on workshops, mentorship, and simulation-based learning, though more structured programs are needed.
6. Policy Interventions: Increased training opportunities, workforce planning, and equipment allocation are essential.
7. Public-Private Partnerships: Such partnerships can help expand access, improve training, and facilitate maintenance of equipment.

8. Patient Awareness: Educating patients about EUS benefits may increase procedural uptake.
9. Physiological Insights: Gastroenterologists noted obesity, ascites, poor cardiopulmonary reserve, and stress responses as key physiological barriers to EUS, while optimization of patient status and positioning were seen as important facilitators.

Discussion

Although EUS is highly valuable, underutilization is prevalent in low- and middle-income countries due to financial constraints, lack of trained personnel, and technical complexity. Repair and maintenance costs of echoendoscopes further exacerbate access issues, leading to long waiting times.⁹

Technical expertise is critical, and the absence of structured fellowship programs limits the development of skilled endoscopists. Even in centers with available EUS services, diagnostic and therapeutic yield may be limited by insufficient training and procedural experience.¹⁰

International societies, including ASGE, have initiated mentorship programs, virtual training, and hands-on workshops to enhance capacity building.¹¹ Public-private partnerships have also been proposed as sustainable models for expanding EUS availability in resource-limited settings.¹²

Integrating physiological assessment with EUS enhances its utility. Real-time evaluation of tissue perfusion, vascular flow, and pancreatic endocrine activity can guide intervention and optimize patient outcomes. Future policies should advocate for inclusion of both structural and functional EUS assessments in national and international screening programs.¹³

Conclusion

Endoscopic ultrasound is an indispensable tool in gastroenterology, with the unique ability to combine structural and physiological assessment. Expanding access through policy support, public-private partnerships, structured training programs, and patient education is essential to fully leverage EUS potential in low- and middle-income countries. Integration of physiological parameters can further enhance its diagnostic and therapeutic value.

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