Recommendations for the Management of Symptomatic Hiatal Hernia in Saudi Arabia, With Regional Input From the Middle East: A Structured Expert Consensus Survey

Ann. Ital. Chir., 2026: 1–10
https://doi.org/10.62713/aic.4699

Ashraf Maghrabi[1,2], Mohammed Al Naami[3], Nizar Yamani[4,5], Emad Aljahdli[6,7], Moaz Abulfaraj[2]

[1]Thoracic Surgery Division, Department of Surgery, Faculty of Medicine, King Abdulaziz University Hospital, 21589 Jeddah, Saudi Arabia
[2]Department of Surgery, Faculty of Medicine, King Abdulaziz University, 21589 Jeddah, Saudi Arabia
[3]Department of Surgery, College of Medicine, King Khalid University, 61421 Abha, Saudi Arabia
[4]Department of Surgery, King Abdullah bin Abdulaziz University Hospital, 11564 Riyadh, Saudi Arabia
[5]Department of Surgery, Princess Nourah bint Abdulrahman University, 11671 Riyadh, Saudi Arabia
[6]Gastroenterology Division, Department of Medicine, Faculty of Medicine, King Abdulaziz University, 21589 Jeddah, Saudi Arabia
[7]Gastrointestinal Oncology Unit, King Abdulaziz University Hospital, 22252 Jeddah, Saudi Arabia

AIM: Gastroesophageal reflux disease (GERD) is prevalent in the Middle East, with hiatal hernia (HH) reported in nearly 30% of patients with GERD in Saudi Arabia. Management primarily involves lifestyle modifications and proton pump inhibitor therapy; however, patients with persistent symptoms may require surgical intervention. This study sought to establish expert-driven, best-practice recommendations to improve clinical outcomes in the management of HH through a Saudi-led structured expert consensus that also incorporated perspectives from the wider Middle East region.

METHODS: A structured expert consensus approach was conducted. A steering group of four experts collaboratively developed and ratified 32 Likert-scale statements encompassing five clinical domains: referral criteria, mesh utilization, risk mitigation, best practices, and guideline requirements. The ratified statements were subsequently distributed through a single-round online survey to surgeons performing HH repair across the Middle East, with a predefined consensus threshold of ≥75% agreement for each statement.

RESULTS: A total of 61 responses were analyzed, including 54 (88.5%) from Saudi Arabia and 7 (11.5%) from other Middle Eastern countries (Jordan, Qatar, Kuwait, Egypt, and the United Arab Emirates). Respondents comprised general surgeons (n = 42), thoracic surgeons (n = 8), upper gastrointestinal/bariatric surgeons (n = 8), and other specialists (n = 3). Nearly 40% of respondents had more than 10 years of specialty experience. Of the 32 statements, 31 (96.9%) achieved consensus (≥75%), with only one statement—regarding mesh use for hernias 4–6 cm—not reaching consensus (67%). Based on these findings, nine recommendations were developed addressing referral pathways, diagnostic evaluation, surgical indications, and mesh utilization.

CONCLUSIONS: Strong agreement across 31 of 32 statements among predominantly Saudi surgical experts reflects a shared recognition of challenges and areas for improvement in GERD and HH management. These findings provide a foundation for the future development of standardized care pathways for the diagnosis, referral, and surgical management of symptomatic HH, primarily within Saudi Arabia while also informing broader clinical practice across the Middle East.

Keywords: hiatal hernia; gastroesophageal reflux disease; expert consensus; antireflux surgery; surgical mesh; referral pathways; Saudi Arabia

Introduction

Hiatal hernia (HH) is defined as the protrusion of abdominal contents into the thoracic cavity through an enlarged esophageal hiatus [1]. HH is an important anatomical risk factor for the development of gastroesophageal reflux disease (GERD) and may increase the risk of reflux-related complications through impaired lower esophageal sphincter (LES) pressure, transient LES relaxations, reduced esophageal acid clearance, and delayed gastric emptying [2]. GERD is among the most frequently encountered conditions in gastroenterology, surgery, and primary care practice [3] and is associated with significant morbidity. Chronic acid exposure leads to esophageal mucosal injury, which may progress to erosive esophagitis and Barrett's esophagus. Even mild GERD can substantially impair quality of life, affecting physical activity, sleep quality, and overall well-being [4]. From a healthcare systems perspective, GERD is highly prevalent in the Middle East, reaching up to 45% in Saudi Arabia [2], thereby placing a considerable burden on healthcare services.

Submitted: 16 April 2026 Revised: 22 May 2026 Accepted: 9 June 2026 Published: 7 August 2026
Correspondence to: Moaz Abulfaraj, Department of Surgery, Faculty of Medicine, King Abdulaziz University, 21589 Jeddah, Saudi Arabia (e-mail: mabolafaraj@kau.edu.sa).
Editor: Weihua Gong

The diagnostic pathway for HH typically begins in primary care with presentation of GERD symptoms, including heartburn, acid regurgitation, food regurgitation, and occasional choking episodes [5]. Persistent symptoms despite a trial of proton pump inhibitors (PPIs) and lifestyle modification may warrant referral for further evaluation. Diagnostic workup commonly includes upper endoscopy, often complemented by barium swallow radiography and high-resolution esophageal manometry, which together can assist in identifying HH and evaluating reflux severity [3,6,7]. The 2024 Lyon Consensus 2.0 has further refined the diagnostic criteria for definitive evidence of pathological reflux [8]. The Saudi Gastroenterology Association recommends 6–8 weeks of standard-dose PPI therapy or potassium-competitive acid blocker treatment in patients without extraesophageal manifestations of GERD [7]. In Saudi cohort study of patients undergoing endoscopy for upper gastrointestinal symptoms, HH has been reported in approximately 30% of patients [2].

Surgical repair of HH is associated with a risk of recurrence, which increases in the presence of obesity, type III HH, and a delay of more than 3 years between diagnosis and surgery. Additional risk factors include advanced age, emergency presentation, and limited surgeon experience [9]. The choice of surgical approach is multifactorial and may include laparoscopic complete or partial fundoplication, particularly in cases with esophageal dysmotility or subjective dysphagia. Long-term comparative study, including findings from the LOTUS trial, has shown sustained symptomatic improvement following laparoscopic antireflux surgery [10]. Mesh reinforcement may be considered in patients with risk factors for recurrence, especially in large HH, defined by defect size ≥7 cm, ≥50% intrathoracic gastric herniation, or hiatal surface area >10 cm^2 [11]. However, the use of mesh remains controversial; some surgeons avoid crural prostheses due to concerns regarding long-term outcomes and potential challenges in revision surgery [12], whereas others advocate its use in large hernias to reduce recurrence risk [13].

The aim of this consensus was to identify best-practice elements in the diagnosis and surgical management of HH and to formalize these practices, with a primary focus on Saudi practice patterns informed by additional regional input from the Middle East.

Methods

Study Design

This study employed a structured expert consensus methodology (Fig. 1) to identify current barriers to care and determine practical strategies to improve clinical practice in Saudi Arabia and the broader Middle East. Consensus derived through structured methods is considered more reliable than individual expert opinion [14,15]. Such approaches address common limitations of informal group discussions, including dominance by a few participants, peer pressure to conform, and group bias in decision-making [16]. Unlike the traditional Delphi process, the present study did not involve multiple rounds of external rating with controlled feedback between rounds. A single-round structured consensus survey was intentionally selected a priori to balance methodological rigor with feasibility and to maintain respondent engagement within the regional surgical community.

Steering Group and Statement Development

A steering group was established based on published literature, current roles in HH management, and regional clinical practice in the Middle East. It comprised three consultant surgeons and one advanced therapeutic endoscopist from Saudi Arabia. The group convened in March 2023 to discuss HH and GERD diagnosis, surgical referral pathways, and the use of mesh in HH repair.

Five domains were identified: (A) patients appropriate for surgical referral in GERD, (B) indications for mesh use, (C) mesh-related risk mitigation, (D) best practice in the management of referred GERD patients, and (E) guideline requirements. Based on these domains, 32 statements were initially developed. Following independent review by each steering-group member, 22 statements were accepted without modification, whereas 10 underwent revision before final ratification by the steering group prior to dissemination.

Survey Distribution and Analysis

A single-round online survey was distributed using Microsoft Forms (Microsoft Corporation, Redmond, WA, USA; https://forms.office.com) through snowball sampling via the steering group's professional networks. Four predefined completion criteria, all of which had to be met for the survey period to conclude, were specified: (i) a 6-month data collection period (May–October 2023); (ii) a minimum of 50 responses; (iii) at least 90% of statements reaching consensus; and (iv) a predefined consensus threshold of ≥75% agreement per statement. These thresholds were established a priori to balance methodological rigor with the practical constraints of recruiting a specialized regional surgical workforce. A minimum of 50 responses was selected to exceed the panel sizes commonly reported for structured surgical Delphi and consensus exercises, which typically comprise 10–50 participants [14,16], thereby providing a stable estimate of agreement for a niche subspecialty population. A per-statement agreement threshold of ≥75% reflects a widely applied benchmark for defining consensus in the Delphi and consensus-survey literature [14,16]. The requirement that at least 90% of statements reach consensus was intended to validate the overall coherence of the statement set and the adequacy of statement development before the findings were synthesized into recommendations. Finally, the 6-month data collection window was selected to allow sufficient time for snowball dissemination across the region while maintaining respondent engagement and

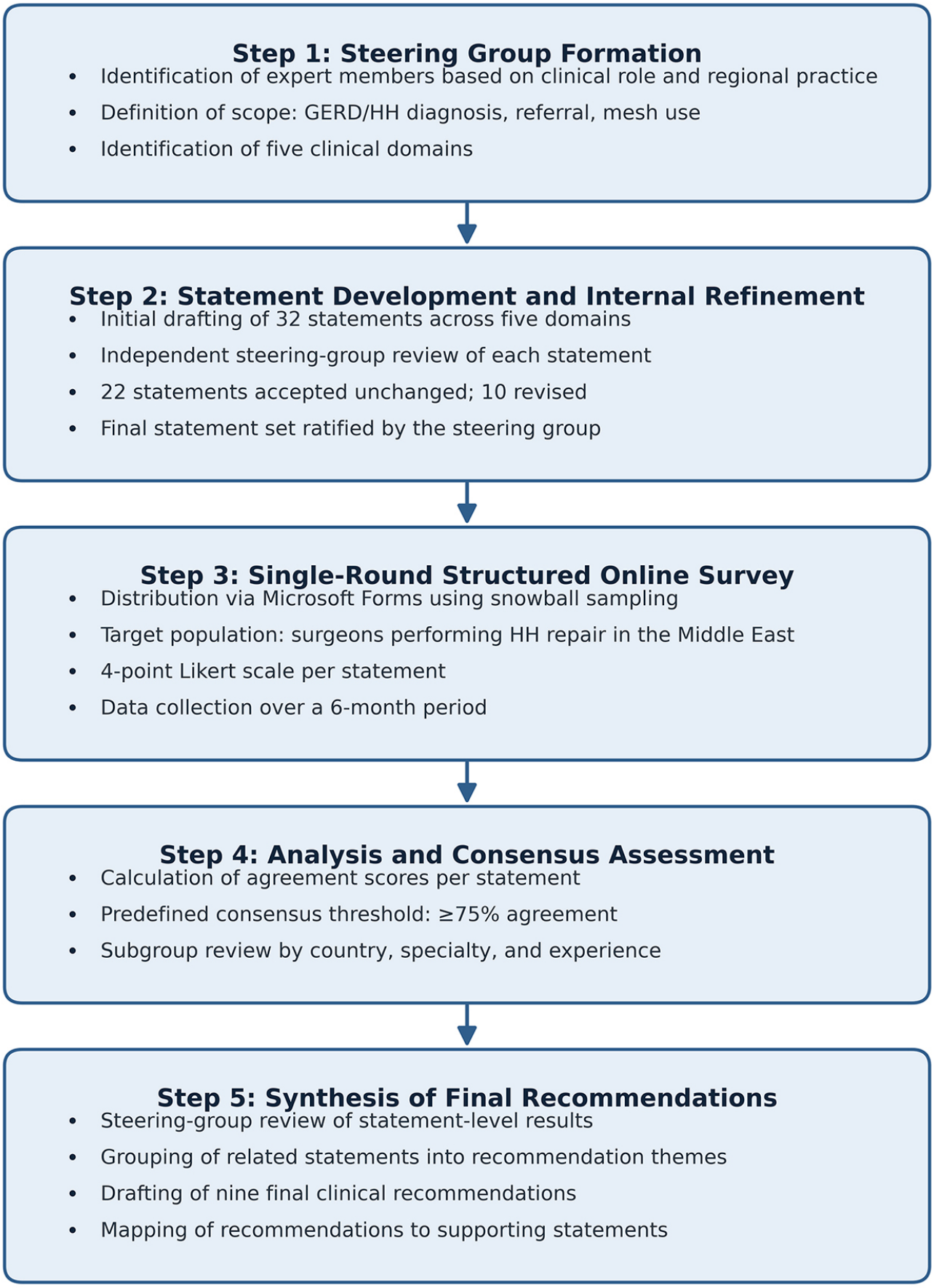

Fig. 1. Workflow illustrating the structured expert consensus survey. GERD, gastroesophageal reflux disease; HH, hiatal hernia.

decreasing temporal drift in clinical practice during data collection. Only responses from participants based in the Middle East were included. Statements demonstrating borderline agreement (75%–80%), together with the sole non-consensus statement regarding mesh use in 4–6-cm hernias, were reviewed post hoc by the steering group. Following deliberation, the group concluded that conducting a repeat survey was unlikely to meaningfully alter agreement levels, given the consistency of the underlying clinical evidence and the relative homogeneity of the respondent cohort. Consequently, the original survey findings were retained and reported transparently without undertaking further rounds of re-surveying.

Each statement was rated using a 4-point Likert scale ("strongly agree", "tend to agree", "tend to disagree", "strongly disagree"). Agreement was defined as the combined proportion of "strongly agree" and "tend to agree" responses. Collected demographic variables included geographic region within the Middle East, surgical specialty, and years of clinical practice. Implied informed consent was obtained through voluntary survey completion and submission; as the study collected anonymous opinions from healthcare professionals and did not involve patient data or identifiable personal information, formal ethical approval was not required. Completed responses were analyzed using descriptive statistics (arithmetic agreement scores) in Microsoft Excel version 16 (Microsoft Corporation, Redmond, WA, USA). The results were subsequently reviewed by the steering group, which synthesized the rated statements into nine final clinical recommendations.

Results

A total of 61 responses meeting the inclusion criteria were analyzed. Most responses were from Saudi Arabia (n = 54), with additional responses from Jordan (n = 2), Qatar (n = 2), Kuwait (n = 1), Egypt (n = 1), and the United Arab Emirates (n = 1). Consequently, respondents from Saudi Arabia represented 88.5% of the analyzed responses, and the findings should therefore be interpreted as primarily reflecting clinical practice patterns in Saudi Arabia, supplemented by limited regional input from other Middle Eastern countries.

Responses by specialty included general surgery (n = 42), thoracic surgery (n = 8), upper gastrointestinal/bariatric/metabolic surgery (n = 8), minimally invasive/advanced laparoscopic surgery (n = 1), colorectal surgery (n = 1), and gastroenterology (n = 1). Twenty-four respondents (39.3%) had more than 10 years of specialty experience, and approximately two-thirds reported more than 5 years of specialty experience.

Of the 32 statements, 31 (96.9%) achieved consensus (≥75%), while 1 (3.1%) did not meet the predefined threshold. The statements and corresponding consensus levels are presented in Table 1. Overall agreement levels are shown in Fig. 2, where statement numbers correspond directly to those listed in Table 1.

Following review and synthesis of the 32 rated statements, the steering group developed nine clinical recommendations (Table 2 summarizes the relationship between the recommendations and their supporting statements):

1. Patients presenting with GERD symptoms should undergo at least a 4-week trial of lifestyle modification and medical therapy prior to referral for endoscopy or surgical evaluation.
2. All patients with GERD should have access to endoscopic evaluation following failure of a 4-week trial of lifestyle and medical management.
3. Following unsuccessful medical and lifestyle therapy, further evaluation with endoscopy, barium swallow radiography, esophageal manometry (when clinically indicated), and ambulatory pH monitoring should guide subsequent management.
4. Early surgical referral should be considered for patients who are intolerant of or decline PPI therapy, those with LES pressure <10 mmHg, those with DeMeester score >14.72, diabetic patients with GERD, patients undergoing primary bariatric surgery with GERD, and post-bariatric patients with persistent GERD.
5. All patients should be informed of non-surgical treatment options prior to surgical referral, with emphasis on lifestyle modification and conservative management alongside antireflux therapy.
6. Complete diagnostic results and a comprehensive clinical history should accompany all referrals for surgical evaluation.
7. The use of mesh should be individualized based on clinical judgment, with consideration in complex cases, including hernias measuring 5–10 cm, weakened hiatal musculature, or recurrent HH.
8. Patients should receive preoperative counseling regarding risks, potential complications, and postoperative activity restrictions to reduce recurrence risk.
9. Postoperative follow-up should occur within 6 months of surgery, and patients should be counseled on the importance of adherence to follow-up visits.

Discussion

Principal Findings

This structured expert consensus survey achieved consensus on 31 of 32 statements (96.9%) regarding HH referral and management among surgeons practicing predominantly in Saudi Arabia. The high level of consensus demonstrates substantial agreement among Saudi-based experts across most aspects of HH care; however, this finding should be interpreted in the context of a respondent population that was predominantly Saudi (88.5%) with limited representation from other Middle Eastern countries. Where appropriate below, we distinguish between agreement generated by the present consensus exercise and the external clinical evidence cited to support the plausibility of each recommendation.

Table 1. Approved statements disseminated for response and corresponding levels of agreement.

No.	Statement	Agreement
Domain A: Which patients should be referred for surgery in GERD with hiatal hernia		
1	Access to diagnostic modalities for GERD with hiatal hernia is not universally available across the Middle East.	84%
2	Access to diagnosis of GERD with hiatal hernia varies across the Middle East.	92%
3	A 4-week trial of medical therapy (e.g., PPIs) should be completed prior to referral for surgical evaluation.	82%
4	The quality of surgical referrals varies across the Middle East.	95%
5	Greater consistency in referral practices from gastroenterology would be beneficial.	100%
6	A 4-week stepwise trial of interventions should be completed prior to escalation of treatment and endoscopic evaluation.	84%
7	Patients with persistent GERD symptoms after 4 weeks should be reconsidered for surgical referral.	87%
8	Patients with GERD who are unable to tolerate or are contraindicated for PPI therapy should be referred for surgical intervention.	77%
9	Patients with a LES pressure <10 mmHg should be considered for hiatal hernia surgery.	87%
10	Patients with a DeMeester score >14 should be referred for hiatal hernia surgery.	98%
11	Patients with diabetes and GERD should be considered for surgical referral for hiatal hernia.	75%
12	Patients undergoing bariatric surgery with GERD should be considered for surgical referral.	82%
13	Patients with persistent GERD following bariatric surgery should be referred for surgical evaluation.	93%
Domain D: Best practice for patients with GERD referred for surgery		
14	Patients should be counseled regarding the importance of continued medical and conservative management options.	100%
15	Preoperative endoscopy should be routinely performed in bariatric patients prior to surgery.	92%
16	Postoperative endoscopic evaluation should be performed in bariatric patients within 1 year of surgery.	93%
17	All patients should undergo comprehensive gastroenterological evaluation within 18 months prior to surgery.	95%
18	All surgical referrals should be accompanied by complete investigation results.	100%
19	All patients should have complete and documented medical records available at referral.	100%
20	All patients should be offered a non-surgical treatment plan prior to surgical referral.	100%
21	Patients who fail non-surgical therapy should be referred for surgical evaluation.	98%
22	Surgeons should verify and review all referral documentation upon receipt.	100%
Domain B: Patients in whom mesh is most appropriate		
23	Mesh may be most appropriate for hiatal hernias measuring 4–6 cm in diameter.	67%
24	Mesh may be most appropriate for complex hiatal hernias measuring 5–10 cm.	98%
25	Mesh may be considered in patients with weakened hiatal musculature, such as older patients.	92%
26	Mesh may be considered in recurrent hiatal hernia cases.	98%
Domain C: Patient education and risk mitigation		
27	Patients should receive proactive education regarding risks and potential complications.	98%
28	Patients should be advised on postoperative lifestyle modifications, including activity restrictions to reduce recurrence risk.	93%
29	Patients should be counseled on the importance of postoperative follow-up.	100%
30	Postoperative follow-up should occur within 6 months of surgery.	100%
Domain E: Guideline development and applicability		
31	Expert consensus guidelines can improve detection and management of GERD and hiatal hernia in the Middle East.	98%
32	International guidelines are not always directly applicable to local practice settings.	92%

GERD, gastroesophageal reflux disease; PPIs, proton pump inhibitors; LES, lower esophageal sphincter.

Several patterns within our own consensus data must be emphasized before these findings are situated against the wider literature. First, the agreement was strongest and most uniform for statements concerning documentation, referral completeness, counseling on non-surgical options, and postoperative follow-up, each of which reached an agreement of 100% (statements 5, 14, 18–20, 22, 29, and 30). This near-unanimity across process-of-care items, rather than across specific technical indications, indicates that the surveyed surgeons perceive the principal gaps in regional HH care to lie in pathway organization and communication rather than in operative technique. Second, the lowest levels of agreement clustered around just two areas—the size threshold for mesh reinforcement and the inclusion of diabetes as a stand-alone referral criterion—identifying these as the specific points of genuine clinical equipoise within the panel, each of which is examined in detail below. Notably, even the single non-consensus statement was internally consistent with the strong agreement reached on the adjacent mesh indications, suggesting that disagreement was confined to an ambiguously specified size band rather than to the principle of selective mesh use. Taken together, these internal patterns—rather than the external literature alone—define the contribution of this consensus and frame the interpretation that follows.

Trial of conservative management: Respondents agreed that access to definitive diagnostic evaluation for GERD with HH is not universally available (84%) and that diag-

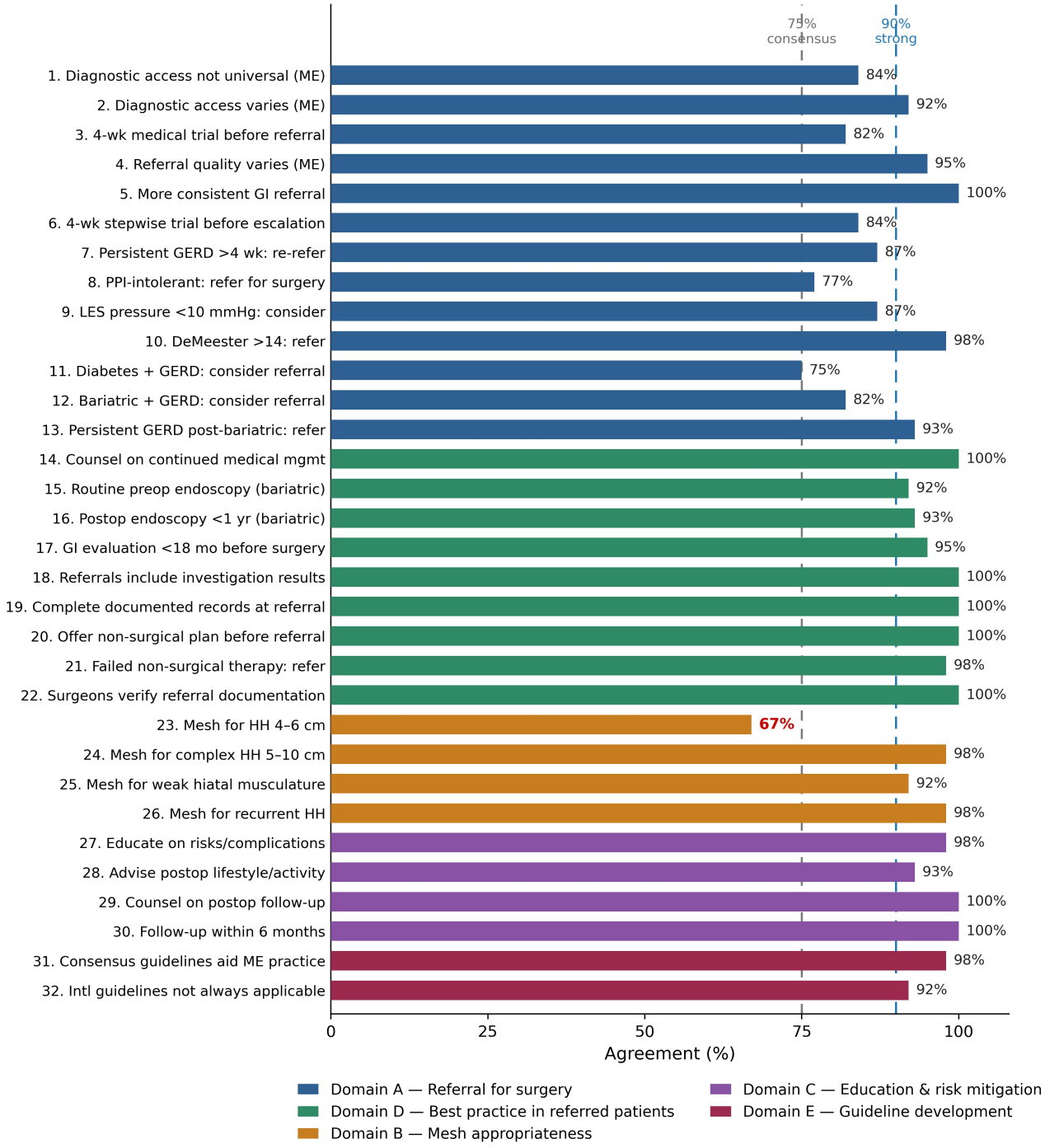

Fig. 2. Consensus agreement levels across statements, grouped and colour-coded by clinical domain. The dashed grey line indicates the predefined consensus threshold (75%), and the dashed blue line indicates the threshold for very strong agreement (90%). Statement numbers correspond to those listed in Table 1.

nostic availability varies across the Middle East (92%). The steering group adopted a 4-week threshold for the initial trial of lifestyle modification and medical therapy based on two considerations. First, the consensus reflected the pragmatic recognition that a substantial proportion of patients in the region present after prolonged self-medication and delayed primary care assessment. Consequently, the 6–8 week course of standard-dose PPI or potassium-competitive acid blocker therapy recommended by the 2024 Saudi Gastroenterology Association consensus [7], as well as the 8-week trial recommended by the 2022 American College of Gastroenterology guideline [3], may have already been completed before a patient's initial specialist consultation. Second, the 4-week threshold was intended to identify the point at which persistent symptoms despite supervised therapy should prompt objective diagnostic evaluation, rather

Table 2. Mapping of final clinical recommendations to supporting consensus statements and corresponding levels of agreement.

Rec. No.	Recommendation (summary)	Supporting statements (Table 1)	Agreement range
1	4-week trial of lifestyle and medical therapy before referral.	S3, S6	82–84%
2	Endoscopic access after failed 4-week trial.	S1, S2, S6, S7	84–92%
3	Comprehensive workup (endoscopy, barium swallow, manometry, pH) after failed therapy.	S15, S17, S21	92–98%
4	Early referral for PPI-intolerant, LES <10, DeMeester >14.72, diabetes, bariatric, post-bariatric.	S8, S9, S10, S11, S12, S13	75–98%
5	Inform patients of non-surgical options before referral.	S14, S20	100%
6	Complete diagnostics and history with all referrals.	S5, S18, S19, S22	100%
7	Mesh use individualized; consideration in 5–10 cm, weak hiatus, recurrent HH.	S24, S25, S26	92–98%
8	Preoperative counseling on risks and activity restrictions.	S27, S28	93–98%
9	Postoperative follow-up within 6 months and adherence.	S29, S30	100%

HH, hiatal hernia. The identifiers in the Supporting Statements column (e.g., S3, S6) denote the corresponding statement numbers listed in Table 1. For example, S3, S6 refer to statements 3 and 6, respectively. The Agreement Range column reports the lowest and highest agreement values among the supporting statements for each recommendation.

than serve as the minimum total duration of medical treatment. We acknowledge that this differs from the 6–8-week threshold cited in the Introduction and recommend that local implementation strategies adapt the treatment duration according to the timing of patient presentation within the respective healthcare setting.

Certain patient populations may benefit from earlier surgical referral, including those with significant comorbidities or contraindications to medical therapy, patients with Los Angeles grade C or D esophagitis, those with extraesophageal symptoms that respond poorly to medical management, and those unable to afford long-term pharmacologic therapy. The American Society for Gastrointestinal Endoscopy guidelines recommend using the lowest effective PPI dose for the shortest duration necessary [17]. Lifestyle modification should include weight loss, smoking cessation, head-of-bed elevation, and avoidance of late evening meals [17]. The ICARUS international consensus [18] supports surgical candidacy in patients with GERD symptoms and endoscopically confirmed HH.

Surgical referral criteria: The panel reached consensus on several physiological and comorbidity-based referral criteria, each of which aligns with established external evidence. There was agreement that a hypotensive LES (<10 mmHg) should prompt referral—a well-recognized mechanism in GERD associated with increased reflux burden, for which fundoplication has been shown to restore the antireflux barrier in appropriately selected patients [19,20]. Consensus on a DeMeester-based threshold likewise reflects the historically established criterion for abnormal esophageal acid exposure (>14.72), based on the original Johnson and DeMeester 24-h pH monitoring scoring system [21]; we note that the survey statement (Statement 10, Table 1) used a simplified rounded value of >14, a pragmatic wording choice rather than a distinct clinical cutoff. Notably, the agreement for the diabetes- and bariatric-related criteria was weaker (75% and 82%, respectively). These values reflect expert consensus among predominantly Saudi respondents rather than direct outcome-based evidence in this regional population. Therefore, prospective validation is warranted. However, the underlying associations are themselves well-established—diabetes is linked to autonomic neuropathy, delayed gastric emptying, and more severe GERD, with esophageal dysmotility reported in up to 63% of patients [22], and the association between obesity, GERD, and HH is well-documented [23], with the consensus regarding bariatric patients reflecting the need for careful evaluation and individualized management in this population [24].

Preoperative workup timing: The panel reached strong consensus (95% agreement) that a preoperative evaluation within 18 months is acceptable for the Middle East—a pragmatic extension of the 12-month interval recommended by the ICARUS consensus that likely reflects regional variations in healthcare access while maintaining clinical adequacy. The steering group nevertheless recommends a 12-month preoperative evaluation interval as the preferred standard where feasible.

Documentation and follow-up: The panel reached a unanimous agreement (100%) on documentation standards for surgical referrals, and a strong consensus on structured postoperative follow-up and endoscopic surveillance. This unanimity reflects the recognition of real gaps in current practice: a previous study from Riyadh identified significant deficiencies in the documentation of investigation results, treatment details, and clinical examination findings [25]. The emphasis on follow-up is particularly relevant given that GERD symptoms may take up to 6 months to become clinically evident following bariatric surgery [26].

Mesh utilization: The only statement not reaching consensus concerned mesh use in HH measuring 4–6 cm in diameter (67% agreement), reflecting ongoing controversy regarding reinforcement in moderate-sized defects. We acknowledge that Statement 23 (4–6 cm) and Statement 24 (5–10 cm) overlap in the 5–6-cm range, which likely contributed to the markedly different agreement levels (67%

vs. 98%). This overlap likely reflects variability in respondents' thresholds for mesh use in moderate-sized defects rather than a true disagreement in clinical opinion. Future iterations of this work should refine size categories to ensure that they are mutually exclusive (e.g., <4 cm, 4 to <6 cm, 6 to <10 cm, and ≥10 cm). By contrast, the panel reached a strong consensus for mesh use in larger hernias (5–10 cm, 98%), weak hiatal musculature (92%), and recurrent HH (98%). These positions are well-supported externally. The 2024 SAGES guidelines acknowledge the uncertainty in moderate-sized defects and recommend shared decision-making between surgeons and patients when considering mesh reinforcement [27], while a systematic review by Lima et al. [28] evaluating biosynthetic mesh reported recurrence rates ranging from 0.9% to 25%, with no reported cases of mesh erosion or explantation, supporting the acceptable safety profile of newer materials. The panel's positions on larger and recurrent hernias are likewise consistent with the EAES 2023 rapid guidelines, which support mesh consideration in paraesophageal hernias based on individualized patient factors [29], and with additional regional and single-center data on newer-generation biosynthetic mesh [30,31,32]. Finally, the wording of the statement may have influenced response variability; specifying "biosynthetic resorbable mesh" rather than the generic term "mesh" might have resulted in higher levels of agreement.

Strengths and Limitations

This study has several strengths. It represents the first Saudi-led structured expert consensus, with regional input from the Middle East, addressing HH referral and management. The structured methodology provided a transparent and reproducible approach to aggregating expert opinion while minimizing the influence of dominant participants. The high consensus rate (96.9%) and participation of surgeons from multiple subspecialties further enhance the credibility and clinical relevance of the recommendations.

Several limitations should be acknowledged. The predominance of responses from Saudi Arabia (88.5%) limits the generalizability of findings across the broader Middle East region. External respondents completed a single round of structured ratings without the opportunity to revise responses following controlled feedback. As a result, the methodology more closely reflects a structured consensus survey rather than a traditional multi-round Delphi process. This distinction should be considered when interpreting agreement levels, particularly for statements with borderline consensus (75%–80%) or non-consensus results (67%). The snowball sampling approach may have introduced selection bias, potentially favoring surgeons with practice patterns similar to those of the steering group. The study did not include input from patients or primary care physicians, who are often involved in the initial diagnosis and referral of GERD. Finally, while structured expert consensus is appropriate for aggregating existing knowledge into pragmatic recommendations, it does not generate new clinical evidence but rather reflects expert opinion grounded in existing literature and clinical experience.

Conclusions

This structured expert consensus survey demonstrates strong agreement among predominantly Saudi surgeons regarding optimal approaches to HH referral and management. The overall consensus rate of 96.9% (31/32 statements) provides a basis for the future development of standardized care pathways, although readiness for implementation will require additional assessment of feasibility, resource requirements, organizational capacity, and patient outcomes. The nine resulting recommendations address the full patient pathway, from initial presentation with GERD through referral criteria, indications for mesh use, and postoperative follow-up. These recommendations are intended primarily for Saudi clinical practice and may serve as a starting point for adaptation across the broader Middle East. Implementation studies are needed to evaluate their effect on variation in clinical practice and on timely, appropriate management of symptomatic HH.

Availability of Data and Materials

The data analyzed are available from the corresponding author upon reasonable request.

Author Contributions

Conceptualization, EA, AM, MAN and MA; methodology, AM, MAN and MA; statement development and refinement, AM, MAN, NY, EA and MA; investigation and data collection, AM, NY, and MA; formal analysis, AM and MA; data curation, AM and MA; writing—preparation of the original draft, AM and MA; supervision, MAN and EA; project administration, MA; research design, EA. All authors have been involved in revising the manuscript critically for important intellectual content. All authors gave final approval of the version to be published. All authors have participated sufficiently in the work to take public responsibility for appropriate portions of the content and agreed to be accountable for all aspects of the work in ensuring that questions related to its accuracy or integrity.

Ethics Approval and Consent to Participate

This study collected anonymous responses from healthcare professionals using a structured online survey and did not involve patient data, identifiable personal information, or clinical interventions. In accordance with applicable institutional and national regulations, formal ethical approval was not required. Participation was voluntary, and informed consent was considered implied upon completion and submission of the survey.

Acknowledgment

The authors thank all surgical colleagues across the Middle East who participated in the consensus survey for their time and clinical insights.

Funding

This research received no external funding.

Conflict of Interest

The authors declare no conflict of interest.

References

[1] Hyun JJ, Bak YT. Clinical significance of hiatal hernia. Gut and Liver. 2011; 5: 267–277. https://doi.org/10.5009/gnl.2011.5.3.267

[2] Almadi MA, Almousa MA, Althwainy AF, Altamimi AM, Alamoudi HO, Alshamrani HS, et al. Prevalence of symptoms of gastroesopahgeal reflux in a cohort of Saudi Arabians: a study of 1265 subjects. Saudi Journal of Gastroenterology : Official Journal of the Saudi Gastroenterology Association. 2014; 20: 248–254. https://doi.org/10.4103/1319-3767.136982

[3] Katz PO, Dunbar KB, Schnoll-Sussman FH, Greer KB, Yadlapati R, Spechler SJ. ACG Clinical Guideline for the Diagnosis and Management of Gastroesophageal Reflux Disease. The American Journal of Gastroenterology. 2022; 117: 27–56. https://doi.org/10.14309/ajg.0000000000001538

[4] Fuchs KH, Musial F, Eypasch E, Meining A. Gastrointestinal Quality of Life in Gastroesophageal Reflux Disease: A Systematic Review. Digestion. 2022; 103: 253–260. https://doi.org/10.1159/000524766

[5] Sandhu DS, Fass R. Current Trends in the Management of Gastroesophageal Reflux Disease. Gut and Liver. 2018; 12: 7–16. https://doi.org/10.5009/gnl16615

[6] Sfara A, Dumitrascu DL. The management of hiatal hernia: an update on diagnosis and treatment. Medicine and Pharmacy Reports. 2019; 92: 321–325. https://doi.org/10.15386/mpr-1323

[7] Alzahrani MA, Alqaraawi AM, Alzubide SR, Abufarhaneh E, Alkhowaiter SS, Alsulaimi M, et al. The Saudi Gastroenterology Association consensus on the clinical care pathway for the diagnosis and treatment of GERD. Saudi Journal of Gastroenterology : Official Journal of the Saudi Gastroenterology Association. 2024; 30: 353–368. https://doi.org/10.4103/sjg.sjg_82_24

[8] Gyawali CP, Yadlapati R, Fass R, Katzka D, Pandolfino J, Savarino E, et al. Updates to the modern diagnosis of GERD: Lyon consensus 2.0. Gut. 2024; 73: 361–371. https://doi.org/10.1136/gutjnl-2023-330616

[9] Ortenzi M, Balla A, Fontana G, Marinucci F, Reggiani A, Capomagi P, et al. Factors influencing recurrence after minimally invasive treatment of hiatal hernia—a single center experience. Laparoscopic Surgery. 2020; 4: 39. https://doi.org/10.21037/ls-20-63

[10] Lundell L, Attwood S, Ell C, Fiocca R, Galmiche JP, Hatlebakk J, et al. Comparing laparoscopic antireflux surgery with esomeprazole in the management of patients with chronic gastro-oesophageal reflux disease: a 3-year interim analysis of the LOTUS trial. Gut. 2008; 57: 1207–1213. https://doi.org/10.1136/gut.2008.148833

[11] Rajkomar K, Berney CR. Large hiatus hernia: time for a paradigm shift? BMC Surgery. 2022; 22: 264. https://doi.org/10.1186/s12893-022-01705-w

[12] Furnée EJB, Draaisma WA, Broeders IAMJ, Gooszen HG. Surgical reintervention after failed antireflux surgery: a systematic review of the literature. Journal of Gastrointestinal Surgery : Official Journal of the Society for Surgery of the Alimentary Tract. 2009; 13: 1539–1549. https://doi.org/10.1007/s11605-009-0873-z

[13] Müller-Stich BP, Kenngott HG, Gondan M, Stock C, Linke GR, Fritz F, et al. Use of Mesh in Laparoscopic Paraesophageal Hernia Repair: A Meta-Analysis and Risk-Benefit Analysis. PloS One. 2015; 10: e0139547. https://doi.org/10.1371/journal.pone.0139547

[14] Diamond IR, Grant RC, Feldman BM, Pencharz PB, Ling SC, Moore AM, et al. Defining consensus: a systematic review recommends methodologic criteria for reporting of Delphi studies. Journal of Clinical Epidemiology. 2014; 67: 401–409. https://doi.org/10.1016/j.jclinepi.2013.12.002

[15] Jünger S, Payne SA, Brine J, Radbruch L, Brearley SG. Guidance on Conducting and REporting DElphi Studies (CREDES) in palliative care: Recommendations based on a methodological systematic review. Palliative Medicine. 2017; 31: 684–706. https://doi.org/10.1177/0269216317690685

[16] Murphy MK, Black NA, Lamping DL, McKee CM, Sanderson CF, Askham J, et al. Consensus development methods, and their use in clinical guideline development. Health Technology Assessment (Winchester, England). 1998; 2: i—iv, 1–88.

[17] ASGE Standards of Practice Committee, Desai M, Ruan W, Thosani NC, Amaris M, Scott JS, et al. American Society for Gastrointestinal Endoscopy guideline on the diagnosis and management of GERD: summary and recommendations. Gastrointestinal Endoscopy. 2025; 101: 267–284. https://doi.org/10.1016/j.gie.2024.10.008

[18] Pauwels A, Boecxstaens V, Andrews CN, Attwood SE, Berrisford R, Bisschops R, et al. How to select patients for antireflux surgery? The ICARUS guidelines (international consensus regarding preoperative examinations and clinical characteristics assessment to select adult patients for antireflux surgery). Gut. 2019; 68: 1928–1941. https://doi.org/10.1136/gutjnl-2019-318260

[19] Slater BJ, Dirks RC, McKinley SK, Ansari MT, Kohn GP, Thosani N, et al. SAGES guidelines for the surgical treatment of gastroesophageal reflux (GERD). Surgical Endoscopy. 2021; 35: 4903–4917. https://doi.org/10.1007/s00464-021-08625-5

[20] Lee R, Mittal RK, Chang KJ, Nguyen NT. Nature of antireflux barrier formed by Nissen fundoplication surgery. Scientific Reports. 2025; 15: 34047. https://doi.org/10.1038/s41598-025-14104-x

[21] Johnson LF, Demeester TR. Twenty-four-hour pH monitoring of the distal esophagus. A quantitative measure of gastroesophageal reflux. The American Journal of Gastroenterology. 1974; 62: 325–332.

[22] Krishnan B, Babu S, Walker J, Walker AB, Pappachan JM. Gastrointestinal complications of diabetes mellitus. World Journal of Diabetes. 2013; 4: 51–63. https://doi.org/10.4239/wjd.v4.i3.51

[23] Friedenberg FK, Xanthopoulos M, Foster GD, Richter JE. The association between gastroesophageal reflux disease and obesity. The American Journal of Gastroenterology. 2008; 103: 2111–2122. https://doi.org/10.1111/j.1572-0241.2008.01946.x

[24] Ghanem OM, Ghazi R, Abdul Razzak F, Bazerbachi F, Ravi K, Khaitan L, et al. Turnkey algorithmic approach for the evaluation of gastroesophageal reflux disease after bariatric surgery. Gastroenterology Report. 2023; 11: goad028. https://doi.org/10.1093/gastro/goad028

[25] Al-Yousef M, Al-Rajhi A, Al-Askar Y, Al-Omari N. Current quality level of referral letters and feedback reports in the First Health Cluster in Riyadh Health Cluster Primary Healthcare Centers. Saudi Journal of Medical and Pharmaceutical Sciences. 2024; 10: 465–471. https://doi.org/10.36348/sjmps.2024.v10i07.007

[26] Almutairi BF, Aldulami AB, Yamani NM. Gastroesophageal Reflux Disease and Hiatal Hernia After Laparoscopic Sleeve Gastrectomy: A Retrospective Cohort Study. Cureus. 2022; 14: e23024. https://doi.org/10.7759/cureus.23024

[27] Daly S, Kumar SS, Collings AT, Hanna NM, Pandya YK, Kurtz J, et al. SAGES guidelines for the surgical treatment of hiatal hernias. Surgical Endoscopy. 2024; 38: 4765–4775. https://doi.org/10.1007/s00464-024-11092-3

[28] Lima DL, de Figueiredo SMP, Pereira X, Murillo FR, Sreeramoju P, Malcher F, et al. Hiatal hernia repair with biosynthetic mesh reinforcement: a qualitative systematic review. Surgical Endoscopy. 2023; 37: 7425–7436. https://doi.org/10.1007/s00464-023-10379-1

[29] Markar SR, Menon N, Guidozzi N, Kontouli KM, Mavridis D, An-

dreou A, et al. EAES Multidisciplinary Rapid Guideline: systematic review, meta-analysis, GRADE assessment and evidence-informed recommendations on the surgical management of paraesophageal hernias. Surgical Endoscopy. 2023; 37: 9013–9029. https://doi.org/10.1007/s00464-023-10511-1

[30] Asti E, Sironi A, Bonitta G, Lovece A, Milito P, Bonavina L. Crura augmentation with Bio-A® mesh for laparoscopic repair of hiatal hernia: single-institution experience with 100 consecutive patients. Hernia : the Journal of Hernias and Abdominal Wall Surgery. 2017; 21: 623–628. https://doi.org/10.1007/s10029-017-1603-1

[31] Chang CG, Thackeray L. Laparoscopic Hiatal Hernia Repair in 221 Patients: Outcomes and Experience. JSLS : Journal of the Society of Laparoendoscopic Surgeons. 2016; 20: e2015.00104. https://doi.org/10.4293/JSLS.2015.00104

[32] Balagué C, Fdez-Ananín S, Sacoto D, Targarona EM. Mesh placement for hiatal hernia repair: can we solve the controversy? Laparoscopic Surgery. 2021; 5: 6. https://doi.org/10.21037/ls-20-89