



EXPLORING PAKISTANI GENERAL SURGEONS' KNOWLEDGE, ATTITUDE, PRACTICE, AND BARRIERS TOWARD SHOULDICE INGUINAL HERNIA REPAIR: A CROSS-SECTIONAL STUDY.

Mehmooda Wasim^{*1}, Syed Muhammad Shafqatullah², Tooba Mahmud Gauhar³,
Shakeel Ahmed⁴, Tehreem Ahmed⁵, Fatima Imran⁶

¹Assistant professor, Surgery, UMDC and creek general hospital, Karachi

²Associate Professor, Surgery, Jinnah Postgraduate Medical Center, Karachi

³Associate Professor of Surgery, Al-Tibri Medical College, Karachi

⁴Assistant professor surgery, KMDC, Karachi

⁵Senior Registrar, General Surgery, UMDC and creek general hospital, Karachi

⁶United Medical and Dental College, Creek General Hospital, Karachi

ABSTRACT:

Introduction: The Shouldice repair is effective but declining due to limited training and support. This study aimed to evaluate Pakistani general surgeons' knowledge, attitudes, practices, and perceived barriers (KAPB) toward the Shouldice inguinal hernia repair technique. **Methodology:** A cross-sectional, survey-based study was conducted from December 2024 to June 2025 across public and private hospitals in Karachi. General surgeons aged 30–65 years who routinely perform inguinal hernia repairs were included. A self-administered, semi-structured questionnaire, developed through literature review and expert consultation, assessed demographics, knowledge, attitudes, practices, and barriers. Data were collected both online and in person. Associations between demographic characteristics and KAP outcomes were analyzed using Chi-square and Fisher's exact tests, with effect sizes reported as Cramér's V or Phi. A p-value ≤ 0.05 was considered statistically significant. **Results:** Of 420 surgeons approached, 384 were included. While 71.6% reported familiarity with the Shouldice technique, only 22.9% had formal training and 28.1% had ever performed the procedure. Confidence was low (14.3%), with mesh repair predominating (84.6%). The most reported barriers were lack of training (72.1%), limited residency exposure (65.9%), and institutional policies favoring mesh (51.0%). Surgeons older than 40 years, those with >10 years of experience, and fellowship-trained surgeons showed significantly higher knowledge, positive attitudes, and practice rates (all $p < 0.05$). **Conclusion:** Pakistani surgeons recognize the Shouldice repair's value but face systemic barriers to its practice. Targeted training, mentorship, and institutional support are essential to preserve this non-mesh option in contemporary hernia repair.

KEYWORDS: Hernia, Inguinal surgery, Hernioplasty, Knowledge, Attitudes, Practice, Pakistan.

INTRODUCTION:

Inguinal hernias represent one of the most common surgical conditions worldwide, comprising a substantial proportion of elective procedures [1]. Among repair options, the Shouldice technique a non-mesh, tissue-based method developed at the Shouldice Hospital in Canada remains a well-validated approach, with recurrence rates as low as 0.9–1.5% and postoperative complications

around 1% [2–4]. Although mesh-based repairs have become the global standard due to availability and perceived ease, the Shouldice repair retains clear value for patients in whom mesh is contraindicated or undesirable [4]. Its global decline reflects limited surgical training, lack of institutional emphasis, and perceptions that mesh techniques are quicker and simpler [4–7], leaving many surgeons without the knowledge, confidence, or technical skill to perform it. This narrowing of options is concerning in complex or recurrent cases, where a durable mesh-free alternative may be advantageous [5,8–9]. The issue is particularly pertinent in low- and middle-income countries, including Pakistan, where resource constraints, cost considerations, and patient preferences strongly influence surgical decision-making. Addressing gaps in training, institutional support, and surgeon attitudes is therefore essential to preserve the Shouldice technique and maintain breadth in contemporary hernia repair practice. This study aims to assess the knowledge, attitudes, practices, and perceived barriers of Pakistani general surgeons regarding Shouldice inguinal hernia repair, hypothesizing that limited knowledge, mixed attitudes, and inconsistent practices largely driven by inadequate training, lack of institutional support, and resource constraints impede its wider adoption. By identifying these gaps and barriers, the study seeks to provide evidence to guide targeted training initiatives and policy interventions, thereby helping to preserve access to safe and effective non-mesh repair options such as the Shouldice technique in Pakistan.

Objectives

The primary objective of the study was to evaluate the level of knowledge, attitudes, and practices related to the Shouldice inguinal hernia repair among practicing general surgeons in Pakistan, as well as to identify perceived barriers and facilitators influencing its adoption. Secondary objectives included examining associations between surgeons' demographic and professional characteristics and their KAP outcomes, and exploring implications for surgical training and institutional policy.

Methodology

This observational, cross-sectional, survey-based study was designed to evaluate the knowledge, attitudes, practices, and perceived barriers (KAPB) of Pakistani general surgeons regarding the Shouldice inguinal hernia repair technique. The study was conducted between December 2024 and June 2025 across public and private hospitals in Karachi, Pakistan, including tertiary care centers, teaching hospitals, and private surgical practices, to ensure representation of diverse institutional settings and professional backgrounds. Ethical approval was obtained prior to study initiation, and the study adhered to the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants, who were informed about the purpose of the study, the voluntary nature of participation, their right to withdraw at any stage without consequence, and the measures taken to ensure confidentiality. No financial incentives were offered, and all responses were anonymized at the point of collection, with data stored on secure, password-protected devices accessible only to the research team.

Eligible participants were general surgeons aged 30–65 years who were actively practicing in Pakistan and routinely performing inguinal hernia repairs. Participants were recruited through convenience sampling using professional surgical networks, institutional contacts, and on-site hospital visits, as well as online distribution through email lists, professional WhatsApp groups, and surgical social media platforms.

Data were collected using a self-administered questionnaire developed through literature review, expert consultation, and pilot testing. The questionnaire had 6 sections: demographics, knowledge, attitudes, practices, barriers, and facilitators regarding the Shouldice technique. It included multiple-choice, Likert-scale, and open-ended questions, refined after pilot testing with 20 surgeons.

The study looked at factors influencing Shouldice repair knowledge, attitudes, and practices among surgeons. Independent variables included demographics (age, gender, hospital type), experience (years practicing, hernia repairs/year), and training (formal Shouldice instruction). Dependent variables were knowledge (familiarity, indications, benefits, etc.), attitudes (confidence, willingness,

etc.), and practices (performance, frequency, etc.). Barriers (training gaps, resource limits) and facilitators (workshops, mentorship) were also assessed

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics version 22.0. Descriptive statistics were used to summarize participant characteristics and survey responses, while inferential analyses employed Chi-square tests of independence or Fisher's exact tests where appropriate to assess associations between demographic variables and KAP outcomes. Effect sizes were reported using Cramér's V or Phi coefficients, and statistical significance was defined as a p-value ≤ 0.05 .

Results

A total of 384 general surgeons practicing in hospitals across Karachi participated in the study. The majority of respondents were male (78.9%), with the largest age group being 36–45 years (42.4%).

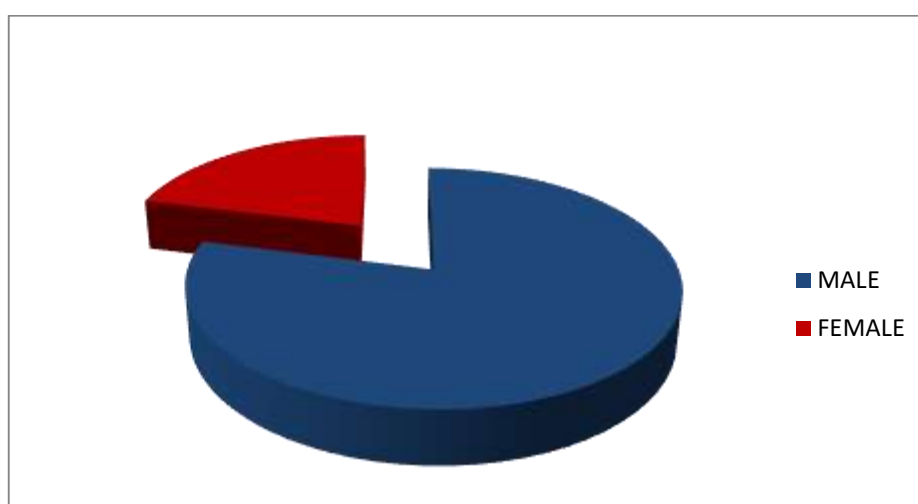


Fig 1 showed the Gender wise distribution of the surgeon's Participants

Nearly half of the participants (46.9%) reported 6–15 years of surgical experience, and more than half (55.7%) were employed in government-sector hospitals. Most surgeons (60.4%) performed more than 25 inguinal hernia repairs annually; however, only 22.9% had received formal training in the hernia repair.

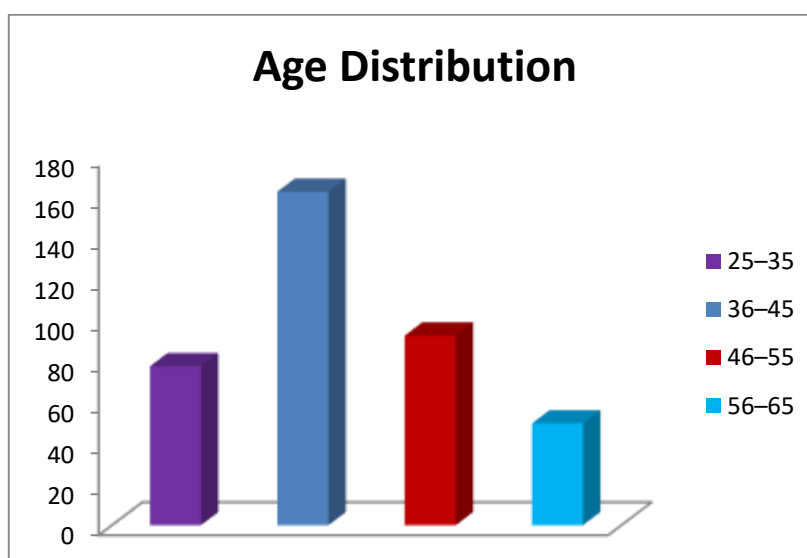


Fig 2 showed Age wise distribution of the surgeon's Participants

Regarding knowledge of the Shouldice repair (Table 2), 71.6% (n = 275) of respondents reported some level of familiarity with the technique, although only 18.5% described themselves as very familiar. Initial exposure to the procedure most commonly occurred during surgical residency (52.6%), followed by undergraduate medical education (30.7%). Knowledge gaps were evident, as fewer than half of participants (39.6%) were aware of recurrence rates relative to mesh-based repairs. The most frequently recognized advantages of the Shouldice technique were the absence of foreign material (68.5%) and lower infection rates (52.1%). Chronic groin pain and hematoma were the most commonly identified complications, while only 42.7% of surgeons reported awareness of contraindications to mesh-based repairs.

Attitudes toward the Shouldice repair were generally favorable but tempered by low confidence levels (Table 3). Most respondents (58.6%) considered the Shouldice technique to be as effective as mesh-based repairs, and an additional 21.6% regarded it as more effective in selected cases. Despite these positive perceptions, only 14.3% of surgeons reported high confidence in performing the procedure.

Table 1 showed the Knowledge, Attitudes, and Practices (KAP) Regarding Shouldice Inguinal Hernia Repair among General Surgeons (n = 384)

Domain	Question	Response	n (%)
Knowledge	Familiarity with Shouldice technique	Very familiar	71 (18.5)
		Somewhat familiar	108 (28.1)
		Slightly familiar	96 (25.0)
		Not familiar at all	109 (28.4)
	First learned about Shouldice technique	Medical school	118 (30.7)
		Surgical residency	202 (52.6)
		Consultancy/other	64 (16.7)
	Awareness of recurrence rate	Yes	152 (39.6)
		No	232 (60.4)
	Benefits over mesh-based repair*	No foreign material used	263 (68.5)
		Lower infection rate	200 (52.1)
		Lower recurrence rate	142 (37.0)
		Reduced cost	134 (34.9)
	Known complications*	None	42 (10.9)
		Chronic pain	186 (48.4)
		Hematoma	174 (45.3)
		Infection	162 (42.2)
		Seroma	120 (31.3)
	Awareness of contraindications to mesh	None	58 (15.1)
		Yes	164 (42.7)
		No	220 (57.3)
Attitudes	Perceived effectiveness	More effective	83 (21.6)
		Equally effective	225 (58.6)
		Less effective	76 (19.8)
	Confidence in performing Shouldice	Very confident	55 (14.3)
		Somewhat confident	142 (37.0)
		Not confident	187 (48.7)
	Shouldice should be taught more extensively	Strongly agree	245 (63.8)
		Agree	94 (24.5)
		Neutral/Disagree	45 (11.7)

	Would perform if mesh contraindicated	Definitely	158 (41.1)
		Probably	119 (31.0)
		Unsure	53 (13.8)
		Probably/Definitely not	54 (14.1)
	Preference in recurrent hernia	Prefer Shouldice	140 (36.5)
		Prefer mesh	184 (47.9)
		Unsure	60 (15.6)
Practices	Ever performed Shouldice repair	Yes	108 (28.1)
		No	276 (71.9)
	Times performed in past year	0	276 (71.9)
		1–5	78 (20.3)
		6–10	18 (4.7)
		>10	12 (3.1)
	Primary hernia repair method	Mesh-based	325 (84.6)
		Shouldice	36 (9.4)
		Other	23 (6.0)
	Factors influencing procedure choice*	Surgeon familiarity	278 (72.4)
		Hospital protocols	225 (58.6)
		Patient age/health	168 (43.8)
		Complexity of hernia	144 (37.5)
		Patient preference	84 (21.9)
	Tracking surgical outcomes	Yes	151 (39.3)
		No	233 (60.7)

A substantial majority (63.8%) strongly supported the inclusion of structured Shouldice training within surgical curricula. When mesh use was contraindicated, 72.1% indicated that they would definitely or probably opt for a Shouldice repair, although only 36.5% preferred it over mesh in recurrent hernia cases.

Actual surgical practice of the Shouldice repair remained limited (Table 4). Only 28.1% of respondents reported having ever performed the procedure, with most performing it no more than five times in the preceding year. Mesh-based repair dominated current practice, being the primary technique used by 84.6% of surgeons. Choice of repair method was influenced predominantly by surgeon familiarity with the technique (72.4%) and institutional protocols (58.6%). Outcome monitoring was inconsistent, as fewer than half of the respondents (39.3%) reported routinely tracking postoperative results.

Multiple barriers to the adoption of the Shouldice repair were identified (Table 5). The most commonly reported obstacle was lack of formal training (72.1%), followed by limited exposure during residency (65.9%) and institutional policies favoring mesh-based repair (51.0%). Additional barriers included time constraints and limited patient demand. In contrast, the most frequently endorsed facilitators included access to specialized hands-on training programs (80.2%), mentorship from experienced surgeons (64.3%), and availability of dedicated surgical instruments required for the technique (53.6%).

Table 5: Barriers and Facilitators to Performing Shouldice Repair

Barrier	n (%)
Lack of training	277 (72.1)
Limited exposure in residency/fellowship	253 (65.9)
Lack of equipment	146 (38.0)
Time-consuming procedure	130 (33.9)

Limited cases requiring non-mesh repair	164 (42.7)
Personal preference for mesh	112 (29.2)
Institutional policy favoring mesh	196 (51.0)
Concerns regarding outcomes	98 (25.5)
Facilitator	n (%)
Specialized training/workshops	308 (80.2)
Mentorship/proctorship	247 (64.3)
Dedicated instruments	206 (53.6)
Institutional support/guidelines	184 (47.9)
Patient education materials	148 (38.5)
Research evidence on outcomes	124 (32.3)
Financial/reimbursement support	92 (24.0)
Note: Barriers and Facilitators are Multi-response variables.	

Analysis of associations between demographic and professional characteristics and KAP outcomes demonstrated several significant relationships (Table 6). Surgeons older than 40 years exhibited significantly higher levels of adequate knowledge ($\chi^2 = 8.80$, $p = 0.003$, $V = 0.15$), more positive attitudes ($\chi^2 = 6.85$, $p = 0.009$, $V = 0.13$), and higher rates of prior practice ($\chi^2 = 5.79$, $p = 0.016$, $V = 0.12$) compared with those aged 40 years or younger. Similarly, surgeons with more than 10 years of experience showed significantly greater knowledge ($\chi^2 = 7.13$, $p = 0.008$, $V = 0.14$), more favorable attitudes ($\chi^2 = 10.29$, $p = 0.001$, $V = 0.16$), and higher likelihood of having performed the procedure ($\chi^2 = 14.75$, $p < 0.001$, $V = 0.20$). Fellowship training demonstrated the strongest associations with knowledge ($\chi^2 = 51.29$, $p < 0.001$, $V = 0.37$) and attitude ($\chi^2 = 57.77$, $p < 0.001$, $V = 0.39$), and was also significantly associated with practice ($\chi^2 = 7.12$, $p = 0.008$, $V = 0.14$). Gender was not significantly associated with knowledge or attitude; however, male surgeons were more likely to report having performed a Shouldice repair ($\chi^2 = 6.48$, $p = 0.011$, $V = 0.13$). Hospital type showed no significant association with knowledge, but surgeons working in private hospitals demonstrated significantly more positive attitudes ($\chi^2 = 8.70$, $p = 0.003$, $V = 0.15$) and higher practice rates ($\chi^2 = 4.63$, $p = 0.031$, $V = 0.11$) compared with those in government institutions.

Discussion

A survey of 384 Karachi-based general surgeons found familiarity with Shouldice repair (72%), but limited formal training (25%) and low confidence (14%) in performing it. Most recognized benefits, but mesh repair dominates (85%). Barriers include lack of training and institutional preference for mesh. Senior, experienced, and fellowship-trained surgeons showed more knowledge and practice, highlighting a potential expertise gap as they retire.

Our KAP findings closely parallel international trends. Mesh repair remains the global standard for inguinal hernias, endorsed by guidelines for its low recurrence and ease of use [10-12]. Nearly all respondents preferred mesh, mirroring international surveys where 98% of surgeons favor prosthetic mesh, with Lichtenstein as the dominant technique [13]. Likewise, 95% of British surgeons rarely or never perform tissue repairs [14]. In our cohort, mesh use and minimal Shouldice adoption align with these global patterns, indicating widespread uptake of mesh-first approaches in Pakistan. Notably, three-quarters of surgeons reported familiarity with Shouldice, reflecting its persistence in theoretical training despite limited practical application. This gap reflects a broader global shift: modern training emphasizes mesh repairs, while Shouldice remains confined to specialized centers and surgeons with dedicated expertise.

Our findings also highlight how knowledge and practice of the Shouldice technique in Pakistan compare with other low-resource settings. In many such contexts, non-mesh repairs are expected to be more prevalent due to cost constraints. Surveys from sub-Saharan Africa, report widespread use of tissue-only techniques [15]. International guidelines recognize this reality, recommending

Shouldice as the preferred non-mesh alternative when mesh is unavailable. Paradoxically, however, the Shouldice technique remains underused even in these settings [12]. In Senegal, only 1.9% of trainees had performed a Shouldice, citing its steep learning curve and limited mentorship [16]. In Pakistan, mesh is more readily available, reducing economic pressure to adopt tissue repairs and further limiting the incentive to learn Shouldice. This reflects a broader LMIC trend: despite its proven efficacy, the Shouldice technique is being sidelined due to training gaps and the ease of mesh-based repairs.

Crucially, our study also highlights modifiable barriers to revitalizing the Shouldice technique. Training gaps are documented across settings: surveys and learning-curve studies show residency experience is concentrated in mesh techniques, with non-mesh training inconsistent; for example, among Senegalese residents only 1.9% had performed a Shouldice as primary operator, and European surveys describe heterogeneous, largely apprenticeship-based learning for inguinal hernia repair [16-17]. Over half (53.6%) pointed to the need for access to appropriate instruments, such as fine sutures and other specialized tools required for multilayer hernia closure. These practical suggestions echo findings in the broader surgical education literature: structured training sessions and mentorship are among the most commonly reported facilitators for adopting new surgical methods. For instance, in one UK study, 93% of higher surgical trainees believed that formal mentorship would be beneficial, and 80% felt that they currently lacked suitable mentorship opportunities [19]. In the U.S., about two-thirds of general surgery residents report having a “meaningful mentor,” with mentorship associated with increased operative autonomy and lower burnout rates [20]. In low-resource settings, surgical mentorship programs are increasingly viewed as feasible and high-yield strategies to build capacity despite constraints on infrastructure or funding [21-22].

The disparities we observed across age, experience, gender, and hospital type offer additional insight into how knowledge and practice of Shouldice might be improved. Older surgeons and those with >10 years’ experience were significantly more likely to know about and have performed Shouldice repairs [23]. This trend is likely reflective of historical exposure, surgeons who trained a decade or more ago may have had mentors who still practiced Shouldice, or at least they may have encountered more cases before mesh became utterly predominant [24-25]. In contrast, the youngest generation of surgeons (<40 years old) in our sample largely lacked such exposure, correlating with their much lower confidence and usage. This generational divide has been noted in other contexts; for example, some senior European surgeons continue to perform Shouldice in select patients, whereas younger colleagues stick to what they learned (mesh repair) [26]. Our findings suggest that without deliberate intervention, the proficiency in Shouldice will “age out” of the workforce as those senior surgeons retire. Fellowship training was another differentiator - those with post-residency fellowships (whether in surgical subspecialties or abroad) had higher KAP scores for Shouldice. This could be because fellowships often expose surgeons to high-volume centers or subspecialist mentors, where they might pick up techniques not commonly practiced in general training. It implies that including a hernia-focused rotation or elective in fellowship programs (or short observerships at places known for Shouldice) could enhance skill transfer.

Gender and sector differences exist in Shouldice practice: male surgeons and private practitioners are more likely to perform it. This likely reflects structural factors like mentorship opportunities for male surgeons and autonomy in private practice. Equitable training access can address these gaps [27-28]. Equitable training access will be crucial to address this gap [29]. Sectoral differences were also evident: private practitioners showed a more positive attitude toward Shouldice and performed it more often, likely due to greater autonomy in technique selection, responsiveness to patient preferences, and the presence of senior surgeons who retain older skills [30-31]

Conclusion

The study highlighted that Pakistani general surgeons value the Shouldice inguinal hernia repair technique but struggle to implement it due to inadequate training and lack of institutional support.

This expertise is mainly with senior and fellowship-trained surgeons, raising concerns it'll fade as they retire. Without addressing these gaps, the Shouldice technique might disappear, limiting surgical options and patient care. Preserving this non-mesh repair skill is crucial for versatile surgery and robust hernia management in Pakistan.

REFERENCES:

1. Morrison Z, Kashyap S, Nirujogi VL. Adult inguinal hernia. In: StatPearls [Internet]. Treasure Island FL: StatPearls Publishing; 2024.
2. Bracale U, Melillo P, Piaggio D, et al. Is Shouldice the best non-mesh inguinal hernia repair technique? A systematic review and network meta-analysis of randomized controlled trials comparing Shouldice and Desarda. *Int J Surg.* 2019;62(1):12-21. DOI: 10.1016/j.ijssu.2019.01.001
3. Singh KJ, Mohanty SKV, Maudar KK. A comparative study of repair of inguinal hernias by Shouldice technique vis-à-vis Bassini's technique. *Med J Armed Forces India.* 1999;55(4):322-324. DOI: 10.1016/S0377-1237(17)30360-X
4. Amato B, Moja L, Panico S, et al. Shouldice technique versus other open techniques for inguinal hernia repair. *Cochrane Database Syst Rev.* 2012;(4):CD001543. DOI: 10.1002/14651858.CD001543.pub4
5. Trevisonno M, Kaneva P, Watanabe Y, et al. A survey of general surgeons regarding laparoscopic inguinal hernia repair: practice patterns, barriers, and educational needs. *Hernia.* 2015;19(5):719-724. DOI: 10.1007/s10029-014-1287-8
6. Nordin P, Bartelmess P, Jansson C, et al. Randomized trial of Lichtenstein versus Shouldice hernia repair in general surgical practice. *Br J Surg.* 2002;89(1):45-49. DOI: 10.1046/j.0007-1323.2001.01960.x
7. Niebuhr H, Pawlak M, Köckerling F. Differentiated application of recommended guideline techniques for treatment of inguinal hernia. *Chirurg.* 2017;88(3):276-280. DOI: 10.1007/s00104-017-0379-2
8. Chan CK, Chan G. The Shouldice technique for the treatment of inguinal hernia. *J Minim Access Surg.* 2006;2(3):124-128. DOI: 10.4103/0972-9941.27723
9. Kingsnorth AN, Gray MR, Nott DM. Prospective randomized trial comparing the Shouldice technique and plication darn for inguinal hernia. *Br J Surg.* 1992;79(10):1068-1070. DOI: 10.1002/bjs.1800791026
10. Köckerling F, Simons MP. Current concepts of inguinal hernia repair. *Visc Med.* 2018;34(2):145-150. DOI: 10.1159/000487278
11. International guidelines for groin hernia management. *Hernia.* 2018;22(1):1-165. DOI: 10.1007/s10029-017-1668-x
12. Stabilini C, van Veenendaal N, Aasvang E, et al. Update of the international HerniaSurge guidelines for groin hernia management. *BJS Open.* 2023;7(5):zrad080. DOI: 10.1093/bjsopen/zrad080
13. Nanayakkara KDL, Viswanath NG, Wilson M, et al. An international survey of 1014 hernia surgeons: outcome of GLACIER (global practice of inguinal hernia repair) study. *Hernia.* 2023;27(5):1235-1243. DOI: 10.1007/s10029-023-02818-8
14. Light D, Stephenson BM, Sanders DL. Management of the uncomplicated primary inguinal hernia in 2019: the practice amongst members of the British Hernia Society. *Ann R Coll Surg Engl.* 2020;102(3):191-193. DOI: 10.1308/rcsann.2019.0152
15. Ndong A, Tendeng JN, Diallo AC, et al. Adult groin hernia surgery in sub-Saharan Africa: a 20-year systematic review and meta-analysis. *Hernia.* 2023;27(1):157-172. DOI: 10.1007/s10029-022-02669-9
16. Ndong A, Diallo AC, Falola A, et al. Choice of surgical technique in groin hernia surgery among residents in Senegal: experience and influencing factors. *J Abdom Wall Surg.* 2025;4:14076. DOI: 10.3389/jaws.2025.14076

17. Nazari T, Dankbaar MEW, Sanders DL, et al. Learning inguinal hernia repair? A survey of current practice and preferred methods of surgical residents. *Hernia*. 2020;24(5):995-1002. DOI: 10.1007/s10029-020-02270-y
18. Vitous CA, Jafri SM, Seven C, et al. Exploration of surgeon motivations in management of abdominal wall hernias: a qualitative study. *JAMA Netw Open*. 2020;3(9):e2015916. DOI: 10.1001/jamanetworkopen.2020.15916
19. Houston R, Hettige R, Sheena Y, et al. Mentorship in higher surgical training—what do trainees really want? *Int J Surg*. 2016;36(Suppl 1):S96. DOI: 10.1016/j.ijso.2016.08.331
20. Silver CM, Yuce TK, Clarke CN, et al. Disparities in mentorship and implications for US surgical resident education and wellness. *JAMA Surg*. 2024;159(6):687-695. DOI: 10.1001/jamasurg.2024.0533
21. Awuah WA, Tan JK, Bharadwaj HR, et al. Surgical mentorship in low-resource environments: opportunities and challenges, a perspective. *Health Sci Rep*. 2024;7(8):e2258. DOI: 10.1002/hsr2.2258
22. Khalid MU, Mac A, Biderman M, Errett L, et al. Partnering to build surgical capacity in low-resource settings: a qualitative study of Canadian global surgeons. *BMJ Open*. 2023;13(3):e070148. DOI: 10.1136/bmjopen-2022-070148
23. Bhat S, Chia B, Babidge W, Maddern GJ. Assessing performance in ageing surgeons: systematic review. *Br J Surg*. 2023;110(11):1425-1427. DOI: 10.1093/bjs/znad158
24. Asserson DB, Janis JE. The aging surgeon: evidence and experience. *Aesthet Surg J*. 2022;42(1):121-127. DOI: 10.1093/asj/sjab145
25. Waljee JF, Ohye RG. Surgeon experience and outcomes: an age old question. *Circ Cardiovasc Qual Outcomes*. 2017;10(7):e003981. DOI: 10.1161/CIRCOUTCOMES.117.003981
26. Jung Y, Kim K, Choi ST, et al. Association between surgeon age and postoperative complications/mortality: a systematic review and meta-analysis of cohort studies. *Sci Rep*. 2022;12(1):11251. DOI: 10.1038/s41598-022-15275-7
27. Janjua MB, Inam H, Martins RS, et al. Gender discrimination against female surgeons: a cross-sectional study in a lower-middle-income country. *Ann Med Surg (Lond)*. 2020;57:157-162. DOI: 10.1016/j.amsu.2020.07.033
28. Iqbal Y, Khan W, Mooghal M. Impediment to leadership opportunities for female doctors—gender disparity in Pakistani healthcare system. *Adv Med Educ Pract*. 2022;13:213-215. DOI: 10.2147/AMEP.S348255
29. Dawood MH, Roshan M, Daniyal M, et al. Gender inequity in clinical clerkships and its influence on career selection: a cross-sectional survey. *J Med Educ Curric Dev*. 2024;11:23821205241257401.
30. Kruse FM, Stadhouders NW, Adang EM, et al. Do private hospitals outperform public hospitals regarding efficiency, accessibility, and quality of care in the European Union? A literature review. *Int J Health Plann Manage*. 2018;33(2):e434-e453. DOI: 10.1002/hpm.2502
31. Barrenho E, Miraldo M, Propper C, Walsh B. The importance of surgeons and their peers in adoption and diffusion of innovation: an observational study of laparoscopic colectomy adoption and diffusion in England. *Soc Sci Med*. 2021;272:113715.