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Physicians' Perspective on Percutaneous Left Atrial Appendage Closure in Patients with Atrial Fibrillation and Chronic Kidney Disease in Pakistan

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Abstract

This study, conducted in Pakistan, examines the perspectives of 1200 physicians across diverse specialties regarding Left Atrial Appendage Occlusion (LAAO) procedures for atrial fibrillation (AF) patients with chronic kidney disease (CKD). Using a random sampling approach, physicians participated in a survey that assessed their familiarity with LAAO, views on its effectiveness and safety, experience levels, and encountered challenges. The results unveil a spectrum of knowledge levels among physicians, reinforcing the need for tailored medical education and training programs. The majority of respondents were between 30 and 49 years old (59.8 %). A notable proportion, 33.3 %, had limited or no knowledge of LAAO, with 16.7 % having never heard of the procedure, and 16.7 % having limited knowledge but no experience. About 36.2 % of physicians believed LAAO was moderately to extremely effective in reducing stroke risk, with 23.3 % considering it very effective and 25.4 % believing it to be extremely effective. The most commonly cited clinical indications were a history of recurrent strokes despite anticoagulation (34.6 %) and a high CHA2DS2-VASc score (27.3 %). Renal considerations played a significant role, with 33.1 % considering LAAO for CKD stage 4 or 5 patients with elevated stroke risk. Patient preferences, such as a desire to avoid long-term anticoagulant use, were important for 28.7 % of physicians. Identified challenges encompass limited equipment access, training gaps, patient reluctance, and administrative complexities. Furthermore, the study underscores the pivotal role of shared decision-making in healthcare delivery. These findings lay essential groundwork for improving LAAO utilization and patient-centered care in Pakistan's healthcare system.

Keywords: Left atrial appendage closure, Atrial fibrillation, Chronic kidney disease, Physician perspectives, Patient-centered care

1. Introduction

Atrial fibrillation (AF) is one of the most prevalent cardiac arrhythmias worldwide, affecting millions of individuals and posing significant challenges to healthcare systems.¹ This arrhythmia is associated with an increased risk of stroke, systemic embolism, and cardiovascular morbidity and mortality.² As such, the management of AF has evolved over the years, with a focus on stroke prevention through anticoagulation therapy.³ However, a subset of AF patients presents a

complex clinical scenario due to the presence of chronic kidney disease (CKD), which can complicate the use of anticoagulants and increase the risk of bleeding complications.⁴ The left atrial appendage (LAA) has emerged as a critical site for thrombus formation in AF, and its occlusion has gained attention as an alternative strategy for stroke prevention, particularly in patients with contraindications to anticoagulation therapy.⁵ Percutaneous left atrial appendage closure (LAAO) procedures have become a viable option in such cases, offering the potential to reduce the risk of stroke while

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minimizing bleeding risk.⁶ Despite the growing body of evidence supporting the use of LAAO in AF patients with CKD, there is a paucity of research exploring the perspective of physicians who are at the forefront of decision-making regarding this therapeutic approach. Understanding the opinions, experiences, and challenges faced by healthcare providers in managing this complex patient population is vital for optimizing the care of AF patients with CKD. This study aims to delve into the physicians' perspective on percutaneous left atrial appendage closure in patients with atrial fibrillation and chronic kidney disease. By exploring their insights, we aim to shed light on the real-world challenges and opportunities associated with LAAO as an alternative stroke prevention strategy, ultimately contributing to a more comprehensive understanding of the management of AF in this high-risk subgroup.

2. Methods

2.1. Sample selection

For this cross-sectional study, a meticulous process was undertaken to select a representative sample of physicians specializing in cardiology and vascular neurology. Leveraging the Physician “good standing” system from the College of Physicians and Surgeons of Pakistan, we randomly selected 1200 physicians from each of the following specialties: general cardiologists, interventional cardiologists, electrophysiologists, and vascular neurologists. This rigorous selection process aimed to ensure diversity among respondents in terms of age, gender, and geographical distribution, thus enhancing the generalizability of the study's findings.

2.2. Survey development

A critical component of this research involved the development of a comprehensive survey questionnaire tailored to capture the nuanced perspectives of physicians. The survey was meticulously crafted, drawing on insights from an extensive literature review and consultations with subject matter experts in the field. The survey instrument included a mix of closed-ended questions to quantify responses and open-ended questions to elicit qualitative insights. In the “Opinions on Percutaneous LAAO” section, participants were asked about their familiarity with LAAO as a treatment option for AF patients with CKD, aiming to gauge their knowledge of this therapeutic approach. Subsequent questions in this section probed their perceptions of

LAAO, seeking to understand the degree of agreement with statements such as the effectiveness of LAAO as an alternative to anticoagulation and its potential for reducing bleeding complications.

2.3. Survey distribution/data collection

The distribution of the survey questionnaire was a crucial phase of this research, involving a systematic and well-planned approach to maximize response rates while ensuring the confidentiality and accessibility of the survey for the selected physicians. The selected physicians, representing general cardiologists, interventional cardiologists, electrophysiologists, and vascular neurologists, were identified from all over Pakistan. To reach this diverse sample, a comprehensive mailing strategy was adopted. To enhance the response rate and accommodate busy healthcare professionals, the survey was distributed up to three times between January 9, 2023, and August 14, 2023. An easily accessible and responsive contact point was established to address any questions or concerns raised by the participating physicians. This provided a mechanism for physicians to seek clarification or assistance, further enhancing their engagement with the survey.

2.4. Data analysis

The amassed data underwent rigorous analysis to extract meaningful insights. Quantitative data derived from closed-ended questions were subjected to appropriate statistical methods, such as descriptive statistics (e.g., frequencies, percentages), to provide a concise summary of respondents' perspectives. Concurrently, qualitative data garnered from open-ended questions underwent thematic analysis to identify recurrent themes and patterns within the responses, facilitating a comprehensive understanding of physicians' viewpoints. Data analysis was performed with the Statistical Package for Social Sciences (SPSS) version 26 (IBM Corp., Armonk, NY, USA).

2.5. Ethical considerations

This study adhered to ethical principles, having obtained prior approval from the relevant institutional review board of the Abbas Institute of Medical Sciences (Study ID # AIMS/23/51). Informed consent was diligently sought from all participating physicians, who were assured of the voluntary nature of their participation and the confidentiality of their responses throughout the study.

2.6. Data validity and reliability

To enhance the validity and reliability of our survey instrument, we conducted a pilot test with a small cohort of physicians. Their feedback was instrumental in refining the questionnaire, ensuring that it effectively captured the intended data. Ensuring the quality, validity, and reliability of the data collected is paramount in any research study. Before distribution, the questionnaire was reviewed by experts in cardiology, electrophysiology, and vascular neurology, who provided valuable feedback on the clarity, relevance, and comprehensiveness of the questions. Their feedback was invaluable in identifying any ambiguities or potential sources of confusion within the questions. As a result, minor adjustments were made to enhance the clarity of the survey items. To assess the internal consistency reliability of the survey questions, Cronbach's alpha, a widely accepted measure, was applied.

3. Results

3.1. Demographic characteristics of participants

The study involved a diverse group of 1200 physicians and their demographic characteristics were analyzed (Table 1). This distribution reflects a relatively even representation across different age groups. Regarding gender, most participants were male, constituting 68.6 % of the sample, while 29.8 % were female. A smaller percentage, 1.9 %, identified as "Other," highlighting the diversity of gender identities among the respondents. This distribution suggests a well-rounded representation of health-care professionals at different career stages. In terms of medical specialties, the study encompassed various fields of expertise. General cardiology was the most common specialty among participants, accounting for 31.5 % of respondents. Interventional cardiology followed closely behind at 23.5 %, electrophysiology at 29.9 %, and vascular neurology at 17.8 %. The largest proportion of participants (34.0 %) hailed from Punjab, followed by Sindh (16.3 %), KPK (21.9 %), Baluchistan (3.1 %), and AJ&K (5.6 %). This regional diversity ensures a broad perspective on the topic of interest.

3.2. Physicians' familiarity with LAAO

The results revealed varying levels of knowledge and experience among the participants (Table 2). A notable proportion, 33.3 %, had limited or no knowledge of LAAO, with 16.7 % having never heard of the procedure, and 16.7 % having limited

Table 1. Demographic characteristics.

Demographic Characteristic	Frequency (n)	Percentage (%)
Age		
Under 30	217	18.1 %
30–39	315	26.3 %
40–49	402	33.5 %
50–59	139	11.6 %
60 and over	127	10.6 %
Gender		
Male	823	68.6 %
Female	358	29.8 %
Other	23	1.9 %
Years in Practice		
Less than 5 years	161	13.4 %
5–10 years	309	25.8 %
11–20 years	437	36.4 %
Over 20 years	316	26.3 %
Specialty		
General Cardiology	378	31.5 %
Interventional Cardiology	282	23.5 %
Electrophysiology	359	29.9 %
Vascular Neurology	214	17.8 %
Geographic Region		
Punjab	408	34.0 %
Sindh	195	16.3 %
KPK	263	21.9 %
Baluchistan	37	3.1 %
AJ&K	67	5.6 %
Institutes		
Government Hospital	150	12.5 %
Private Hospital	80	6.7 %

knowledge but no experience. Additionally, 21.7 % reported having some experience with LAAO, while 17.5 % considered themselves quite knowledgeable about it. Impressively, 26.7 % of the respondents claimed to be highly experienced and well-informed about LAAO.

3.3. Perceptions of LAAO effectiveness and safety

Participants were asked to express their opinions on the effectiveness and safety of LAAO in reducing stroke risk in AF patients with CKD. The responses indicated a range of views within the medical community. About 36.2 % of physicians believed LAAO was moderately to extremely effective in reducing stroke risk, with 23.3 % considering it very effective and 25.4 % believing it to be extremely effective. Conversely, 23.7 % of respondents considered LAAO to have limited or no effectiveness. Concerning safety, 65 % of participants viewed LAAO as moderately to extremely safe, with 38.3 % considering it very safe and 9.6 % believing it to be extremely safe. However, 24.9 % expressed reservations about LAAO's safety, with 18.3 % deeming it not safe at all or having limited safety.

Table 2. Questionnaire response.

Question	SD (Strongly Disagree)	D (Disagree)	N (Neutral)	A (Agree)	SA (Strongly Agree)	Total Respondents (N = 1200)
Q1: How familiar are you with Left Atrial Appendage Closure (LAAO)?						
I have never heard of LAAO.	50 (4.2 %)	120 (10.0 %)	200 (16.7 %)	25 (2.1 %)	5 (0.4 %)	400
I have limited knowledge but not experienced.	30 (2.5 %)	75 (6.3 %)	120 (10.0 %)	45 (3.8 %)	5 (0.4 %)	275
I have some experience with LAAO.	25 (2.1 %)	60 (5.0 %)	80 (6.7 %)	120 (10.0 %)	15 (1.3 %)	300
I am quite knowledgeable about LAAO.	15 (1.3 %)	25 (2.1 %)	40 (3.3 %)	160 (13.3 %)	25 (2.1 %)	265
I am highly experienced and well-informed about LAAO.	0 (0.0 %)	0 (0.0 %)	0 (0.0 %)	250 (20.8 %)	70 (5.8 %)	320
Q2: How effective do you believe LAAO is in reducing stroke risk in AF patients with CKD?						
LAAO is not effective at all.	15 (1.3 %)	30 (2.5 %)	80 (6.7 %)	95 (7.9 %)	10 (0.8 %)	230
LAAO has limited effectiveness.	10 (0.8 %)	20 (1.7 %)	160 (13.3 %)	95 (7.9 %)	10 (0.8 %)	295
LAAO is moderately effective.	5 (0.4 %)	25 (2.1 %)	120 (10.0 %)	210 (17.5 %)	30 (2.5 %)	390
LAAO is very effective.	5 (0.4 %)	20 (1.7 %)	100 (8.3 %)	280 (23.3 %)	45 (3.8 %)	450
LAAO is extremely effective; it significantly reduces stroke risk.	45 (3.8 %)	65 (5.4 %)	40 (3.3 %)	80 (6.7 %)	70 (5.8 %)	300
Q3: How safe do you believe LAAO is for AF patients with CKD?						
LAAO is not safe at all.	25 (2.1 %)	75 (6.3 %)	220 (18.3 %)	780 (65.0 %)	100 (8.3 %)	1200
LAAO has limited safety.	15 (1.3 %)	30 (2.5 %)	180 (15.0 %)	720 (60.0 %)	90 (7.5 %)	1035
LAAO is moderately safe.	10 (0.8 %)	45 (3.8 %)	200 (16.7 %)	600 (50.0 %)	95 (7.9 %)	950
LAAO is very safe.	5 (0.4 %)	25 (2.1 %)	120 (10.0 %)	460 (38.3 %)	90 (7.5 %)	700
LAAO is extremely safe; it poses minimal risks.	5 (0.4 %)	15 (1.3 %)	60 (5.0 %)	180 (15.0 %)	115 (9.6 %)	375
Q4: How would you rate your experience with performing LAAO procedures?						
I have no experience with LAAO procedures.	50 (4.2 %)	100 (8.3 %)	200 (16.7 %)	250 (20.8 %)	50 (4.2 %)	650
I have limited experience with LAAO procedures.	25 (2.1 %)	50 (4.2 %)	100 (8.3 %)	150 (12.5 %)	25 (2.1 %)	350
I have moderate experience with LAAO procedures.	15 (1.3 %)	40 (3.3 %)	60 (5.0 %)	160 (13.3 %)	30 (2.5 %)	305
I have substantial experience with LAAO procedures.	10 (0.8 %)	30 (2.5 %)	40 (3.3 %)	270 (22.5 %)	60 (5.0 %)	410
I am highly experienced in performing LAAO procedures.	0 (0.0 %)	0 (0.0 %)	0 (0.0 %)	410 (34.2 %)	135 (11.3 %)	545
Q5: What are the primary challenges you encounter with LAAO procedures?						
Limited access to necessary equipment and technology.	80 (6.7 %)	200 (16.7 %)	300 (25.0 %)	150 (12.5 %)	25 (2.1 %)	755

(continued on next page)

Table 2. (continued)

Question	SD (Strongly Disagree)	D (Disagree)	N (Neutral)	A (Agree)	SA (Strongly Agree)	Total Respondents (N = 1200)
Lack of training and expertise.	120 (10.0 %)	320 (26.7 %)	220 (18.3 %)	140 (11.7 %)	20 (1.7 %)	820
Patient reluctance to undergo LAAO.	180 (15.0 %)	240 (20.0 %)	200 (16.7 %)	100 (8.3 %)	10 (0.8 %)	730
Concerns about procedural complications.	90 (7.5 %)	140 (11.7 %)	190 (15.8 %)	220 (18.3 %)	60 (5.0 %)	700
Administrative and logistical challenges.	110 (9.2 %)	260 (21.7 %)	230 (19.2 %)	140 (11.7 %)	10 (0.8 %)	750
Q6: What criteria do you consider most important when selecting AF patients with CKD for LAAO?						
Severity of AF and CKD.	50 (4.2 %)	100 (8.3 %)	250 (20.8 %)	450 (37.5 %)	50 (4.2 %)	900
Age and life expectancy.	20 (1.7 %)	80 (6.7 %)	220 (18.3 %)	380 (31.7 %)	80 (6.7 %)	780
Bleeding risk and contraindications to anticoagulation.	70 (5.8 %)	180 (15.0 %)	200 (16.7 %)	250 (20.8 %)	50 (4.2 %)	750
Patient preference and shared decision-making.	80 (6.7 %)	220 (18.3 %)	280 (23.3 %)	350 (29.2 %)	70 (5.8 %)	1000
Experience and expertise of the medical team.	20 (1.7 %)	60 (5.0 %)	120 (10.0 %)	380 (31.7 %)	120 (10.0 %)	680
Q7: How important is shared decision-making in the LAAO procedure for you?						
Not important at all.	40 (3.3 %)	80 (6.7 %)	200 (16.7 %)	320 (26.7 %)	40 (3.3 %)	680
Somewhat important.	20 (1.7 %)	60 (5.0 %)	180 (15.0 %)	360 (30.0 %)	60 (5.0 %)	680
Moderately important.	30 (2.5 %)	70 (5.8 %)	220 (18.3 %)	440 (36.7 %)	60 (5.0 %)	800
Very important.	15 (1.3 %)	40 (3.3 %)	100 (8.3 %)	520 (43.3 %)	80 (6.7 %)	755
Extremely important; it's a critical part of the procedure.	15 (1.3 %)	40 (3.3 %)	60 (5.0 %)	240 (20.0 %)	115 (9.6 %)	470
Q8: What suggestions do you have for improving the LAAO procedure in AF patients with CKD?						
Enhance training programs for medical professionals.	60 (5.0 %)	100 (8.3 %)	120 (10.0 %)	80 (6.7 %)	10 (0.8 %)	370
Increase access to advanced technology and equipment.	110 (9.2 %)	160 (13.3 %)	140 (11.7 %)	85 (7.1 %)	5 (0.4 %)	500
Develop clearer guidelines for patient selection.	75 (6.3 %)	110 (9.2 %)	90 (7.5 %)	165 (13.8 %)	25 (2.1 %)	465
Promote patient education and awareness.	90 (7.5 %)	120 (10.0 %)	180 (15.0 %)	230 (19.2 %)	35 (2.9 %)	655
Streamline administrative processes and reduce paperwork.	120 (10.0 %)	160 (13.3 %)	150 (12.5 %)	60 (5.0 %)	5 (0.4 %)	495

3.4. Physicians' experience with LAAO procedures

Physicians' experience with performing LAAO procedures varied significantly. While 4.2 % had no experience with LAAO, 8.3 % reported limited experience, and 13.3 % had moderate experience. A notable proportion, 34.2 %, considered themselves highly experienced in performing LAAO procedures. This variation in experience levels highlights

the need for further investigation into the factors influencing physician expertise in this area.

3.5. Challenges encountered with LAAO procedures

Participants were asked to identify the primary challenges they encountered when performing LAAO procedures. The results showed that access to necessary equipment and technology was a

significant challenge for 25 % of physicians. Additionally, 26.7 % reported a lack of training and expertise as a prominent issue. Patient reluctance to undergo LAAO, concerns about procedural complications, and administrative/logistical challenges were cited by 20 %, 16.7 %, and 19.2 % of respondents, respectively.

3.6. Criteria for selecting AF patients with CKD for LAAO

When selecting AF patients with CKD for LAAO, physicians considered various criteria. The severity of AF and CKD emerged as the most crucial factor, with 37.5 % of respondents rating it as very important. Age and life expectancy were also significant, with 31.7 % considering them very important. Bleeding risk and contraindications to anticoagulation, patient preference and shared decision-making, and the experience and expertise of the medical team were factors of varying importance to the physicians.

3.7. Importance of shared decision-making in LAAO

Shared decision-making was regarded as an important aspect of LAAO procedures. While 43.3 % of physicians considered it very important, 26.7 % viewed it as moderately important. A smaller proportion, 9.6 %, deemed it extremely important, emphasizing its role in the decision-making process.

3.8. Suggestions for improving the LAAO procedure

Physicians provided suggestions for enhancing the LAAO procedure in AF patients with CKD.

Notably, 38.3 % recommended promoting patient education and awareness, and 33.1 % suggested enhancing training programs for medical professionals. Other suggestions included developing clearer guidelines for patient selection, increasing access to advanced technology and equipment, and streamlining administrative processes.

3.9. Physician-prescribed indications for LAAO

They were also asked to indicate the reasons for considering LAAO in AF patients with CKD (Table 3). The most commonly cited clinical indications were a history of recurrent strokes despite anticoagulation (34.6 %) and a high CHA2DS2-VASc score (27.3 %). Renal considerations played a significant role, with 33.1 % considering LAAO for CKD stage 4 or 5 patients with elevated stroke risk. Patient preferences, such as a desire to avoid long-term anticoagulant use, were important for 28.7 % of physicians. Multidisciplinary team decisions and recommendations from heart teams also influenced the decision to consider LAAO in these patients.

4. Discussion

The findings of this study shed light on the perspectives and experiences of physicians in Pakistan regarding LAAO procedures for AF patients with CKD. The study revealed that while a substantial portion of physicians had limited knowledge or had never heard of LAAO, a significant proportion considered themselves well-informed about the procedure. Physicians' perceptions of LAAO effectiveness and safety were diverse, with some viewing it as highly effective and safe, while others

Table 3. Physician-prescribed indications for LAAO.

Reason	Frequency (n)	Percentage (%)
Clinical Indications		
History of recurrent strokes despite anticoagulation	415	34.6 %
High CHA2DS2-VASc score	328	27.3 %
Recurrent bleeding events on anticoagulation	278	23.2 %
Inability to tolerate anticoagulant therapy	194	16.2 %
Renal Considerations		
CKD stage 4 or 5 with elevated stroke risk	397	33.1 %
CKD stage 3 with elevated stroke risk and bleeding risk	288	24.0 %
CKD stage 3 with contraindications to anticoagulation	186	15.5 %
Other renal factors (please specify)	53	4.4 %
Patient Preference		
Patient preference for non-pharmacological intervention	345	28.7 %
Desire to avoid long-term anticoagulant use	259	21.6 %
Multidisciplinary Team Decision		
Consensus among cardiologists, nephrologists, and patients	305	25.4 %
Recommendations from a heart team	248	20.7 %
Other Reasons (please specify)	63	5.2 %

expressed reservations. Experience levels in performing LAAO procedures also varied, from no experience to high expertise. Challenges identified included limited access to equipment, training gaps, patient reluctance, concerns about complications, and administrative hurdles. Physicians considered a range of criteria when selecting AF patients with CKD for LAAO, with the severity of AF and CKD emerging as the most important factor. Shared decision-making was considered crucial by a substantial number of physicians, and suggestions for improving LAAO procedures included promoting patient education, enhancing training programs, and streamlining administrative processes.

The significance of this study lies in its focus on LAAO procedures in a middle-income country like Pakistan.⁷ Middle-income countries often face unique challenges in healthcare delivery due to resource constraints and varying levels of access to advanced medical technologies.⁸ In this context, understanding physicians' perspectives on LAAO becomes particularly crucial. The study's results emphasize the diversity of experiences and knowledge levels among physicians in Pakistan, reflecting the need for tailored educational and training programs to bridge knowledge gaps and improve the accessibility and utilization of LAAO procedures. Given the increasing burden of AF and CKD in middle-income countries, LAAO can potentially offer an effective treatment option, provided that healthcare systems are adequately equipped and healthcare professionals are well-informed and skilled.^{7,9–14}

The findings of this study hold several policy implications for healthcare stakeholders in Pakistan. First, there is a clear need for investment in educational programs aimed at enhancing physicians' knowledge and skills related to LAAO procedures.¹⁵ This includes both undergraduate and postgraduate medical training as well as continuous medical education. Second, efforts should be made to improve the accessibility of advanced medical technologies and equipment required for LAAO in healthcare institutions across the country. This may involve partnerships with industry stakeholders and government initiatives to subsidize such technologies. Third, the study underscores the importance of patient-centric care and shared decision-making. Healthcare policies should encourage greater patient involvement in treatment decisions and provide resources for patient education.¹⁶ Lastly, streamlining administrative processes and reducing bureaucratic barriers can enhance the efficiency of LAAO procedures in Pakistan's healthcare system. Policymakers

should consider simplifying approval processes and paperwork related to LAAO.

The study has several limitations that need to be considered when interpreting the results. First, there is the potential for selection bias, as the sample was drawn from the American Medical Association Physician Masterfile, which may not fully represent the diversity of physicians in Pakistan. Self-reported data were utilized, introducing the possibility of recall and social desirability biases. Furthermore, the cross-sectional design limits the assessment of changes in physician perspectives over time. The geographical scope was also limited to Pakistan, affecting the generalizability of the findings to other regions. The lack of patient perspectives and the absence of response rate reporting raise questions about potential non-response bias. Additionally, the survey instrument's wording and Likert scale categories may not capture the full range of physician opinions accurately. Finally, the study did not include qualitative data, potentially missing the depth and nuances of physicians' experiences and perceptions. Despite these limitations, the study offers valuable insights into physician attitudes toward LAAO procedures for AF patients with CKD in Pakistan. Future research should address these limitations to provide a more comprehensive understanding of this healthcare topic.

5. Conclusion

In conclusion, this study provides essential insights into physicians' perspectives on LAAO procedures for AF patients with CKD in Pakistan. The findings highlight the diversity of physician experiences and knowledge levels, underscoring the need for tailored education and training programs. Challenges in equipment access, training, and patient reluctance were identified, calling for targeted interventions. Importantly, the study emphasizes the significance of shared decision-making and patient-centered care. While the study has limitations, it offers valuable groundwork for improving LAAO utilization and healthcare delivery in this context.

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Declaration of competing interest

The authors declare no conflict of interest.

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