



Adoption of minimally invasive mitral valve surgery: single-centre implementation experience in Vietnam

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Abstract

The adoption of minimally invasive mitral valve surgery (MIMVS) has become a prominent trend in mitral valve procedures. This article emphasizes that the success of the MIMVS program relies not only on effective teamwork but also on comprehensive hospital support and a clearly defined training strategy. Additionally, targeted marketing initiatives that highlight the value of the heart valve centre are crucial for sustaining the program's success and attracting a consistent patient flow. The implementation of these strategies requires diligent execution, consistent maintenance, and continuous improvement to ensure the triumph of the MIMVS program. This article aims to share our experience in implementing MIMVS at our centre, providing valuable insights for centres that have yet to adopt this approach or have low adoption rates. While acknowledging that sharing our centre's experience cannot guarantee success in all centres, customizing the implementation by selecting appropriate features and access points is vital. Each centre may encounter unique challenges, and tailoring the strategy to address specific needs will enhance the effectiveness of the MIMVS program.

Keywords: implementation experience, minimally invasive mitral valve surgery

Introduction

Mitral valve disease, particularly mitral regurgitation, affects a significant number of adults, making it the second most common reason for valve surgery^[1,2]. Studies have demonstrated that mitral valve repair yields better outcomes compared to valve replacement for the treatment of mitral regurgitation^[3–5]. In line with current guidelines, it is recommended to pursue early valve repair, even in the absence of symptoms, for individuals with severe mitral regurgitation at specialized heart valve centres^[5,6]. Moreover, Vietnam faces a substantial burden of patients with mitral valve stenosis resulting from rheumatic heart disease^[7,8]. Consequently, there exists a significant population of individuals

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HIGHLIGHTS

- This article emphasizes that the success of the minimally invasive mitral valve surgery (MIMVS) program relies not only on effective teamwork but also on comprehensive hospital support and a clearly defined training strategy.
- Additionally, targeted marketing initiatives that highlight the value of the heart valve centre are crucial for sustaining the program's success and attracting a consistent patient flow.
- The implementation of these strategies requires diligent execution, consistent maintenance, and continuous improvement to ensure the triumph of the MIMVS program.
- This article aims to share our experience in implementing MIMVS at our centre, providing valuable insights for centres that have yet to adopt this approach or have low adoption rates. While acknowledging that sharing our centre's experience cannot guarantee success in all centres, customizing the implementation by selecting appropriate features and access points is vital. Each centre may encounter unique challenges, and tailoring the strategy to address specific needs will enhance the effectiveness of the MIMVS program.

with mitral valve disease who necessitate surgical intervention in the country.

The current trend in minimally invasive mitral valve surgery (MIMVS) is increasing worldwide. Furthermore, the mortality rate, as well as the duration of aortic clamping and cardiopulmonary bypass (CPB) time, are approaching those of conventional sternotomy procedures^[9]. Meanwhile, the effectiveness

of this approach is evident in shorter hospital stays, reduced blood usage, faster recovery, and lower overall costs^[1,9,10]. Moreover, it has been observed that the rates of valve repair are higher in MIMVS when compared to conventional sternotomy procedures^[11]. Consequently, Vietnam is presented with a promising opportunity to embrace MIMVS.

However, the global adoption rate of MIMVS displays considerable variation across different countries. For instance, the United States has implemented this approach in 23% of cases, whereas the United Kingdom has a lower adoption rate of 8%. In contrast, Germany has achieved a significantly higher adoption rate of 55%, while some centres in Vietnam has reached a commendable rate of 50%^[11,12,13]. It is important to highlight that even within Vietnam, the adoption rate can vary among different medical centres. In MIMVS cases at our centre between 2014 and 2018, the prevalence of rheumatic mitral valve disease was recorded at 40.7%^[8]. Moreover, the current rate of isolated mitral valve surgery at our centre surpasses 95%, showcasing a resolute dedication to prioritizing minimally invasive approaches. However, some other centres in Vietnam still have a notably low rate of adopting minimally invasive techniques.

The our centre has been dedicatedly implementing the MIMVS program since 2014, and we would like to share our experience in implementing MIMVS at our centre. By doing so, we aim to provide a valuable reference for centres that have not yet adopted this approach or have low adoption rates.

Culture

One of our initial experiences can be viewed as the establishment of organizational culture. Organizational culture refers to the values, rituals, attitudes, and norms that are shared among members of an organization. These elements need to be learned and embraced by new members of the organization^[14]. Numerous studies have demonstrated the impact of organizational culture on patient outcomes and healthcare quality^[15-17]. It is widely acknowledged that the culture within an organization significantly influences the success of implementing new programs in a hospital setting^[18]. When the organizational culture is characterized by cooperation and support, the implementation of MIMVS is more likely to thrive and achieve positive outcomes.

In the majority of hospitals, obtaining prior approval from a hospital committee is necessary for all new procedures. This committee takes into account various factors such as ethics, cost, patient outcomes, and management considerations. The purpose of this process is to guarantee patient safety, emphasize clinical governance, and uphold quality control standards^[19]. At our hospital, we have fostered a patient-centred organizational culture where the well-being of the patient is paramount. Guided by our slogan of pioneering, understanding, standard, and safety, we place great emphasis on carefully assessing new programs, ensuring they meet rigorous standards. When implementing a new method, it must be proven safe and widely applicable, and our leaders undergo comprehensive training to ensure quality expertise.

From the initial stages of implementing the MIMVS program, we have diligently prepared documentation showcasing its application, providing ample evidence of its safety and effectiveness for patients. Additionally, our leaders have received specialized training in minimally invasive surgery at renowned

centres such as Leipzig Heart Center in Germany. As a result, we have garnered strong support and consensus from the hospital management and non-surgical colleagues alike.

Furthermore, during the implementation of the MIMVS program, we actively collaborate with other associates to establish a heart team that ensures standardized practices right from the outset. We also participate in other hospital programs such as enhanced recovery after surgery and preventing postoperative infections. This comprehensive approach fosters an environment of trust and mutual support, which is integral to the success of the program. It reflects the culture of our hospital, where a patient-centric approach and a commitment to excellence are deeply ingrained.

Attitude

In our perspective, the attitude of the surgeon and other members of the heart team plays a pivotal role in driving the success of the MIMVS program. Numerous studies have highlighted that a positive attitude towards the program greatly contributes to its success^[20,21]. Specifically, the motivation and attitude of the leading surgeon who heads the MIMVS team hold significant importance. This attitude not only influences other surgeons but also impacts other members of the heart team. It contributes to the overall enhancement of treatment quality and patient care within the program, subsequently elevating the hospital's reputation. As a result, the program attracts a larger number of patients, further contributing to the success of the MIMVS program.

The attitude of cardiologists towards the MIMVS program holds significant importance as well. Cardiologists play an active role in the design of the MIMVS program and patient selection. They serve not only as a source of referrals but also as strong advocates for the team^[21]. At our centre, cardiologists actively participate in postoperative care, ensuring a balanced perspective within our multidisciplinary heart team. As cases grow, we plan to establish a valve clinic led by cardiac surgeons and cardiologists, enhancing our collaborative approach.

The success of the MIMVS program also relies on the positive attitude of other team members, including anesthesiologists, surgical technicians, and operating room nurses. Their positive mindset enables them to actively engage in learning new techniques that contribute to the program's success.

The active attitude displayed by our team members serves as the cornerstone of our voluntary commitment to cooperation, driven by a patient-centred culture within our hospital. We place great emphasis on recognizing and fostering the professional growth of each individual within the heart team. Through tailored intensive development strategies, we strive to instill a sense of motivation and drive in every team member. This motivation plays a significant role in shaping their positive attitude towards the MIMVS program.

Operative volume

Patient volume plays a crucial role in determining the success of the MIMVS program^[21,22]. The quantity of cases directly impacts operating costs, hospital profitability, patient outcomes, and serves as a benchmark for heart valve centres^[6,23,24]. Patient volume in surgery serves the dual purpose of preserving the main

surgeon's experience and providing a valuable learning opportunity for young surgeons. To be recognized as a competent reference mitral valve surgeon, it is generally expected to handle a minimum of 40 cases per year. Moreover, in order to fully complete the learning curve of MIMVS and attain optimal proficiency, surgeons typically need to manage a range of 75–125 cases^[2,5]. As patient volume increases, surgeons gain more experience, leading to improved patient outcomes and healthcare quality, which instills confidence in cardiologists to refer patients for surgery at the asymptomatic stage, consequently contributing to an increased volume. Our centre implements the following strategies to boost patient volume.

Full regionalization

In our country, the medical landscape is naturally divided into three regions based on geography, and due to limited resources, cardiac surgery has been fully regionalized. As part of this regionalization, hospitals in major cities within each region serve as centres of expertise (Fig. 1). In the southern region, for instance, our centre, affiliated with University—a nationally renowned university—holds a significant advantage in terms of prestige. Leveraging this reputation, we prioritize the training of surgeons, particularly those in leadership roles, at esteemed international centres. This strategic approach ensures that our centre's brand reputation aligns closely with our professional standing, thereby cementing our position as a distinguished cardiac surgery facility within the country.

Furthermore, our hospital actively collaborates with local hospitals in the region to establish a comprehensive network for the seamless transfer of patients requiring surgical intervention from their respective localities to our facility. We maintain regular communication and engagement with cardiologists from local hospitals, sharing knowledge about MIMVS and providing direct consultations to patients. Once the surgery is successfully completed and the patient's condition stabilizes, those who were initially referred from local hospitals for postoperative outpatient monitoring are transferred back to their original healthcare providers for further treatment. This collaborative approach not only enables local cardiologists to witness the outcomes of our surgical interventions but also strengthens our connection and fosters a deeper professional relationship with them.

Marketing

Marketing plays a pivotal role in increasing patient volume by effectively promoting our services. It serves as a means for patients to become familiar with our offerings when surgical intervention is required, while also assisting cardiologists and healthcare professionals in directing patients with surgical indications to the most suitable hospital. In the field of marketing, a range of models can be utilized, including Business-to-Business (B2B), Business-to-Consumer (B2C), and Consumer-to-Consumer (C2C)^[26,27]. In our marketing program focusing on MIMVS, we incorporate all three models, demonstrating their comprehensive applicability.

The primary recipients of information regarding the MIMVS program are undoubtedly the patients themselves. To effectively communicate with patients, we employ the B2C model, utilizing various channels and strategies. These encompass disseminating details about our hospital culture, patient outcomes, and patient experiences at our heart centre through diverse social media

platforms such as Facebook, Zalo, YouTube, our dedicated app, and e-mail marketing initiatives. Additionally, we engage in direct interactions by actively participating in sharing experiences with local hospitals and conducting outpatient consultations within our outpatient consultation clinic. Furthermore, we provide consultation and counselling services for patients and their families before surgery.

Engaging in communication with cardiologists and healthcare professionals through the B2B model is a highly significant strategy. It involves disseminating information about patient outcomes, allowing for a comparison of our results with global benchmarks. This process instills confidence in these specialists, encouraging them to promptly refer patients with surgical indications to our facilities. This professional connection is fostered through continuing medical education sessions hosted at our hospital, as well as fortuitously through scientific conferences organized by cardiology associations, regional seminars, and conferences held by local hospitals themselves.

The MIMVS team places utmost importance on the patient experience, recognizing its significance. Objective measures, such as accelerated functional recovery, prompt return to work, shortened length of hospital stay, and minimized bleeding and transfusion requirements, contribute to a positive patient experience^[21]. Importantly, it is the patients who have undergone surgery at our centre who share these favourable experiences with other patients, thereby embodying the essence of the C2C marketing model. We harness the power of this model to enhance the overall patient experience and actively contribute to the positive journey of future patients seeking care at our centre.

The foundation of a robust marketing program lies in its alignment with the inherent value of the program itself. In pursuit of this objective, accentuating the provision of high-quality healthcare and fostering positive patient outcomes through enhanced collaboration among specialists within our hospital, alongside continuous surgeon training, assumes an integral role. Additionally, the cost difference between MIMVS surgery and conventional open surgery is no more than 10%, thanks to the utilization of endoscopes from other surgical specialties and the generous donation of surgical instruments by organizations. This cost reduction makes MIMVS surgery more affordable and appealing to our patients. Furthermore, an essential component of our strategy entails bolstering international cooperation, as elucidated in the subsequent sections of this paper. Through our comprehensive marketing program, patients acquire a profound comprehension of the manifold advantages offered by the MIMVS program, thereby enabling them to discern and value the exceptional quality of healthcare and the positive patient outcomes consistently delivered by our centre. Consequently, these astute strategic endeavours have consistently yielded remarkable growth in patient demand for our services throughout the years (Fig. 2). Such sustained patient volume fortifies the enduring success and enduring sustainability of the MIMVS program.

Training

Training program

Training is a vital component in building a highly qualified team of healthcare professionals, thereby enhancing the quality of treatment and the reputation of the hospital, ultimately contributing to the success of the MIMVS program^[19,21]. We

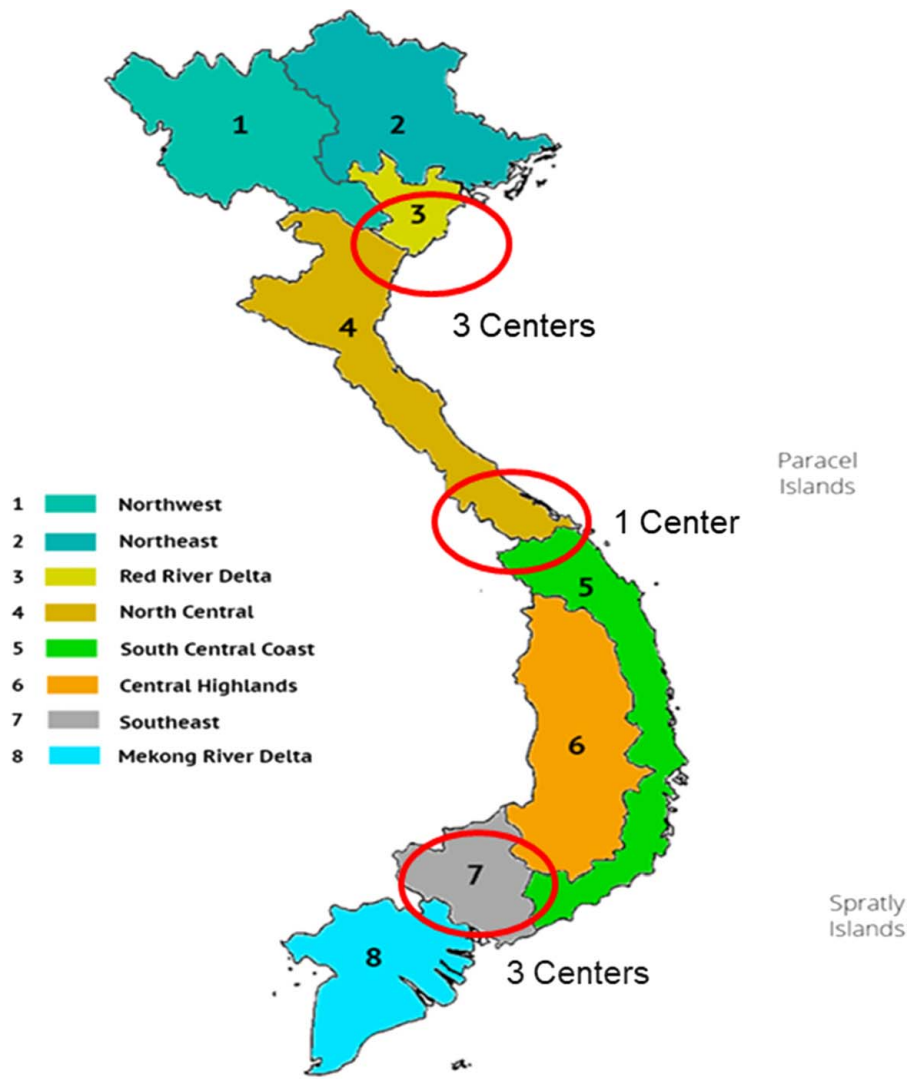


Figure 1. Minimally invasive centres in the our country.

prioritize training for the entire team, including surgeons, cardiologists, machine operators, and anesthesiologists, and have developed internal training programs for each subject area. These programs are overseen by our hospital management university. Beginning to overcome limitations in training, we have implemented innovative techniques. For instance, we simulate a restricted surgical field by utilizing a soft drink can and long-sharp instruments while working on a pig's heart. This method helps trainees become comfortable with operating in small and narrow spaces. As we progress and acquire more resources, we plan to invest in less invasive cardiac surgery models to create simulation practice rooms for fellow practitioners.

Training in MIMVS is ideally initiated during the cardiothoracic fellowship, targeting individuals still in the training phase^[17]. To ensure a comprehensive educational experience, our hospital actively encourages our surgeons, cardiologists, anesthesiologists, operating room technicians, and nurses to participate in fellowship programs offered in advanced countries such as France, America, Germany, and Korea. This practice has become

a mandatory standard, reflecting our unwavering commitment to excellence. The expertise gained from these international fellowships serves as the foundation for training the entire team, enabling us to effectively train and prepare our young employees for future fellowships. This dedicated human resource plays a vital role in building a strong knowledge base and skill set, ensuring the continued advancement of MIMVS within our hospital and cementing our reputation as leaders in the field.

In addition, we take pride in organizing MIMVS courses that cater to the training needs of doctors from other hospitals. By extending our expertise and knowledge to a wider audience, we contribute not only to the professional growth of these fellows but also enhance the overall quality of our own hospital. The valuable feedback and insights we receive from these doctors serve as an invaluable tool for continuous improvement. This reciprocal exchange of knowledge and experiences enables us to further refine our practices, facilitating our evolution and excellence in the field. The collaborative efforts of training fellows

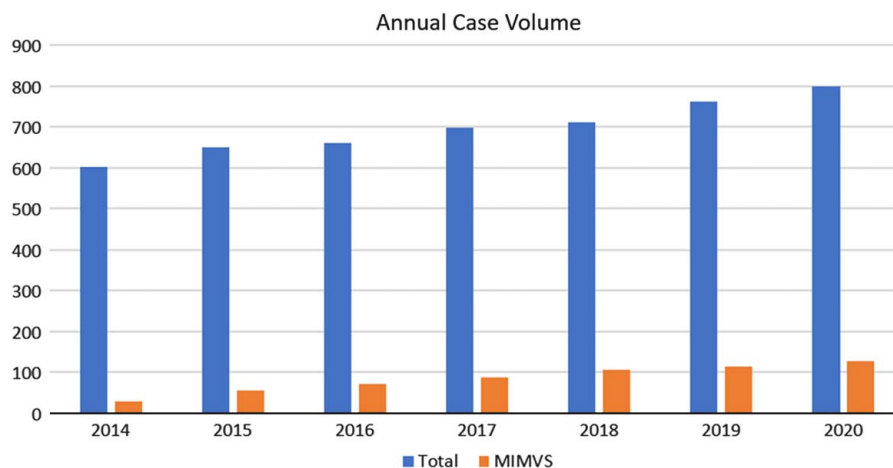


Figure 2. Illustrates our annual case volume for total procedures and minimally invasive mitral valve surgery (MIMVS). The total procedure category includes various cardiac procedures such as coronary artery bypass grafting, aortic valve replacement, transcatheter aortic valve replacement, as well as MIMVS and more.

from other hospitals play a pivotal role in our ongoing quest for continuous improvement and excellence.

Learning curve

MIMVS presents greater technical complexity compared to conventional procedures^[21]. Achieving mastery in MIMVS requires performing a significant number of cases, typically ranging from 50 to 150 procedures. To ensure reduced adverse events, it is crucial to maintain a minimum of two cases per week^[25]. Our centre's study revealed that the learning curve for mini-mitral valve surgery ranges from 75 to 125 cases, while valve repair averages around 75 cases, and valve replacement around 60 cases^[13]. Establishing a heart valve centre with a high patient volume and consistent operating schedule is essential to meet these benchmarks.

In addition to addressing concerns related to patient volume and the development of a heart valve centre, we prioritize fostering a cohesive hospital culture and implementing standardized attitudes that guide our training and recruitment processes. We also leverage fellowship opportunities with renowned surgeons locally and globally. Patient selection is key in MIMVS implementation, with a focus on simpler lesions such as mitral regurgitation caused by prolapse of the P2 segment^[19,21]. This approach enables young surgeons to gain practical experience through co-surgery with experienced professionals, allowing for skill development and contributing to the success and advancement of our MIMVS program.

Patient safety

Ensuring patient safety is of paramount importance when implementing a new program like MIMVS^[19,21]. At our hospital, patient safety is not only a priority but also embedded in our core values and reflected in our hospital's slogan. During the initial MIMVS cases, we had the supervision of experienced proctors from Germany and direct monitoring by the hospital director, demonstrating our unwavering commitment to a patient-centred culture.

Furthermore, during the initial stages, we carefully selected patients without significant medical comorbidities such as renal

failure, liver failure, or neurological disease. Additionally, we excluded those with thoracic abnormalities, peripheral vascular abnormalities, cardiac malposition, and obesity from undergoing MIMVS procedures. As our experience and expertise grew, we expanded the application of MIMVS to include patients with one or more of these factors^[28].

Additionally, the main surgeons at our hospital have received extensive training as fellows in esteemed institutions in France, Germany, or the United States, or have obtained fellowships through reputable professional associations such as Asian Society for Cardiovascular and Thoracic Surgery. This ensures that the safety of our patients is absolutely guaranteed. Additionally, we prioritize optimizing surgical procedures by closely monitoring and managing key factors such as CPB and cross-clamp time. We recognize the significance of comprehensive preoperative and postoperative care, which includes implementing an enhanced recovery after surgery program specifically designed for the early recovery of patients undergoing MIMVS surgery. This program covers all MIMVS cases and involves seamless coordination among our entire team, including the training and support of young surgeons, to maintain strict control over CPB and cross-clamp times, ultimately enhancing patient safety and outcomes.

Quality management

The close monitoring of treatment quality is of utmost importance throughout the implementation and maintenance of the MIMVS program^[21]. To ensure the delivery of exceptional care, we have established an independent quality management department dedicated to monitoring the treatment quality provided by our clinical departments. This department operates autonomously, fostering a sense of trust and confidence in the outcomes we achieve. Our centre develops and refines MIMVS procedures that undergo rigorous scrutiny by the hospital's scientific committee and are subsequently disseminated hospital-wide. Based on these approved procedures, the quality control department diligently monitors surgeons, operating room staff, post-cardiac resuscitation teams, and clinical departments to ensure strict adherence to the established protocols. Monthly data reports are shared with surgeons and non-surgical practitioners, highlighting mandatory compliance rates exceeding

99%. In cases of non-compliance, employees receive reminders and additional training, with the possibility of reassignment or transfer if training efforts do not yield satisfactory results. This comprehensive approach to quality control underscores our unwavering commitment to upholding the highest standards of care and continually improving the MIMVS program.

Following the discharge of our patients, we maintain a strong and proactive connection by conducting regular follow-up visits at our outpatient clinic or collaborating with cardiologists at our hospital or local hospital. This diligent approach allows us to closely monitor patient outcomes and evaluate the quality of healthcare provided. By actively engaging with our patients post-operatively, we not only gather essential information to assess our performance and healthcare quality but also contribute to our scientific research efforts. These valuable interactions enable us to address any concerns or issues that may arise after surgery, ensuring the well-being and satisfaction of our patients.

By diligently monitoring patient outcomes and leveraging the use of electronic medical records, we have the ability to conduct research and reassess the effectiveness of our practices, continuously striving for improvement and benchmarking against global standards. Our commitment to excellence extends beyond our hospital walls as we actively contribute to international reports, sharing our insights and experiences with the broader medical community^[8,13,29]. Additionally, to foster collaboration and enhance scientific publication, we ensure that our MIMVS data are regularly updated with the data from the mini-mitral international registry, promoting the sharing of valuable information and facilitating international cooperation in the field^[30,31]. Through these efforts, we contribute to the advancement of medical knowledge, ultimately benefiting patients around the world.

Heart valve centre

Establishing a heart valve centre is a critical strategy for our MIMVS program. This goal aligns with our vision and allows us to build an exceptional MIMVS team. A heart valve centre requires centres of excellence for MIMVS, comprising multidisciplinary teams with expertise in imaging, clinical assessment, and surgery. A sufficient patient volume and a well-defined training program are essential components^[22,32]. Furthermore, our commitment to becoming a heart valve centre is strengthened by our criteria for mitral valve repair. If we can achieve a durable repair with no residual mitral regurgitation exceeding 95% and maintain an expected mortality rate below 1%, we will extend this option to asymptomatic patients with severe mitral regurgitation, no left ventricular dilatation, and preserved ejection fraction^[5]. This drive to become a heart valve centre not only provides our surgeons with a patient volume on which to operate, ensuring their expertise remains relevant, but also offers valuable learning opportunities for young surgeons to complete their learning curve. Additionally, attaining heart valve centre status enhances the prestige of our hospital and contributes to cost reduction by increasing patient numbers and optimizing resource utilization. Establishing a heart valve centre is vital for our hospital as it empowers team-based learning, driving continuous improvement for our entire team.

From the outset of implementing MIMVS, our goal has been to establish ourselves as a heart valve centre of excellence. Pursuing

excellence does not imply overestimating our capabilities, but rather serves as a driving force for continuous improvement in surgical skills, procedural quality, and overall patient care. It is imperative that this mindset of excellence permeates throughout our entire team, acknowledging and appreciating the daily efforts of each individual. To nurture this mindset, we encourage team members to seek opportunities for advanced studies at renowned institutions worldwide, diligently practice in simulated clinical settings, and actively participate in surgeries alongside distinguished surgeons. Moreover, this commitment to excellence extends to our hospital management, as we implement motivating salary and bonus policies that incentivize staff members to pursue knowledge acquisition at leading international centres specializing in cardiology and MIMVS. By nurturing an excellence mindset, we are confident in our ability to consistently deliver exceptional care and drive advancements in the field.

Besides our pursuit of excellence, our hospital established the Heart Centre in 2012, prior to implementing the MIMVS program. Serving as a central hub, the Heart Center facilitates collaboration among multidisciplinary heart teams, enabling seamless communication between surgical and non-surgical professionals involved in the treatment of complex cases. This collaborative approach serves as the foundation for the development of specialized teams within the Heart Center, including the Heart Valve Team, Transcatheter Aortic Valve Replacement Team, Aortic Team, and Hypertrophic Obstructive Cardiomyopathy Team. Additionally, we have established a dedicated outpatient clinic specializing in heart valves, ensuring coordinated care for heart valve patients and monitoring the outcomes of valve repair and treatment effectiveness. Furthermore, we have implemented collaborative programs with other medical specialties such as neurology, nephrology, and physiotherapy to provide comprehensive post-MIMVS care for our patients. Additionally, data monitoring and connection with mini-mitral international registry, as outlined in the training section, form an integral part of our heart valve centre development strategy. The above-mentioned solution has played a crucial role in establishing our heart valve centre, serving as the cornerstone of our country's comprehensive regionalization strategy. Its successful implementation has led to a consistent and dependable flow of patients, enabling the effective execution of our MIMVS program.

Conclusion

The adoption of MIMVS represents an undeniable trend in mitral valve procedures. However, the success of the program hinges not only on teamwork but also on comprehensive hospital support and a clearly defined training strategy. It is crucial to implement targeted marketing initiatives that highlight the true value of the heart valve centre, ensuring the ongoing success of MIMVS and maintaining a steady stream of patients. These strategies must be diligently implemented, consistently maintained, and continuously improved to secure the triumph of the MIMVS program.

While sharing our centre's implementation experience cannot ensure success for all MIMVS programs in other centres, customizing the approach by selecting the right features and access points is vital for successful implementation. Each centre may face unique challenges, and adapting the strategy to address specific needs will enhance the effectiveness of the MIMVS program.

Ethical approval

Ethics approval was not required for this review.

Consent

Not required.

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Author contribution

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The author(s) declare no conflict of interest in preparing this article.

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Availability of data and materials

All the materials are available and owned by the authors and/or no permissions are required.

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