The first 5 years: Building a minimally invasive valve program

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Growth of structural heart and minimally invasive valve case volume over time.

Central Message

In this article, we review lessons learned while building a new MIVS and structural heart program, and steps to overcome common hurdles.

See Commentaries on pages 1966 and 1968.

▶ Video clip is available online.

Successful minimally invasive mitral and aortic valve surgery has been reported since the mid- to late 1990s.¹⁻³ Minimally invasive approaches generally include partial upper sternotomy, direct vision right minithoracotomy, endoscopic-assisted right minithoracotomy, and robotic-assisted right thoracoscopy. Despite durable long-term results, previously reported reduced length of stay (LOS), earlier return to work, and cost-effectiveness, many surgeons remain reluctant to adopt minimally invasive valve surgery (MIVS) into their practice.⁴⁻⁷ Reasons might include lack of dedicated minimal-access training, time required to obtain these skills, lack of administrative support, or other logistic barriers. Recognizing these obstacles and that every institution is unique, we sought to review the first 5 years of our MIVS experience to share lessons learned, and steps to overcome common potential hurdles. We have included a video (Video 1) outlining the impetus for our article.

TEAM DYNAMICS AND LEADERSHIP

A successful team should consist of high-performing individuals who each understand their roles and work as a cohesive unit. Achieving this goal within a MIVS program requires substantial collaborative effort for success. The team of dedicated professionals includes a lead cardiac surgeon, a surgical assistant, cardiologists, perfusionists, anesthesiologists, operating room (OR) technicians, and nurses.⁸

Cardiac surgeons leading a MIVS program should be able to recognize excellence in others, and recruit those

whose strengths complement each other. Surgeons should also determine what their long-term goals are before building a MIVS program, and recognize the sacrifices required to champion their MIVS program, which might include other aspects of their cardiothoracic surgical practice. Is their plan to use a direct-access right minithoracotomy for most future valve operations? Or is this the first step in eventually performing thoracoscopic or robotically-assisted operations? Although surgeons

VIDEO 1. The senior author describes a summary of the impetus and results of starting a minimally invasive valve program. Video available at: [https://www.jtcvs.org/article/S0022-5223\(18\)32791-0/fulltext](https://www.jtcvs.org/article/S0022-5223(18)32791-0/fulltext).

with experience in MIVS are recognized team leaders, every effort must be made to broaden the base for leadership. This cultivates a sense of accountability, in which all members are committed to the MIVS program.

Having a surgical assistant who is well trained to assist in MIVS is key.⁸ In addition to speed, dexterity, and coordination, the assistant must be knowledgeable of procedural details and surgeon preferences, enabling them to provide effective assistance by anticipating the surgeon's needs and orchestrating movements in synchrony.

Cardiologists should be actively involved in designing the MIVS program, and patient selection. Ultimately, cardiologists will not only be a source of patient referrals but also the team's strongest advocate. At our center, cardiologists are also involved in the immediate postoperative care and management of patients. We believe this helps provide balance of perspective with a multidisciplinary heart team approach toward patient care. As case volume increases, opening a multidisciplinary valve clinic led by cardiac surgeons and cardiologists might supplement the MIVS program, and streamline patient care.

Perfusionists should be well versed with various perfusion strategies, and equipment unique to minimally invasive cardiac surgery.⁸ This includes all aspects of peripheral cannulation, kinetic or vacuum-assisted venous drainage, managing complications of cardiopulmonary bypass (CPB), and alternative myocardial protection strategies. The surgical procedure, patient variables, and surgeon experience will determine the method of cannulation and cardioplegic arrest in MIVS.⁹

Anesthesiologists should have significant experience with double-lumen intubation, transjugular lines for retrograde cardioplegia delivery, intracardiac pressure monitoring, and pulmonary artery venting, as well as transesophageal echocardiography (TEE) for assessment of pre- and postoperative cardiac function, cannulation, cardioplegia delivery, and venting.¹⁰ If the program does not have an anesthesiologist with expertise in TEE, a dedicated cardiologist should be available to fill this critical role.¹¹

Surgical technicians and OR nurses must understand the procedural details involved in MIVS. Similar to the surgical assistant, nurses should be familiar with the long-shafted instruments and steps of the operation to anticipate the needs of the surgeon. Availability of a head camera or thoracoscope is essential for the assistant and OR staff to follow along throughout the operation.⁸ All personnel should recognize the low threshold for conversion to full sternotomy and be ready to reposition the patient and open new instrument sets to proceed quickly and safely.

In the early phases of program implementation, the same team should train together, establish well defined roles, communication, and team dynamics. When an elite team is formed and operative experience gained, attention may be turned to training new members.

ADMINISTRATIVE SUPPORT

Hospital administrative and financial support are paramount for success of any MIVS program. During meetings between leaders of the clinical and administrative teams, a business plan should be presented in familiar language to the target audience. The plan should include a detailed description of the MIVS program, and institution-specific cost-benefit analysis.¹² Anticipate the question of cost, and emphasize that MIVS programs are a long-term investment that exchange significant upfront costs for long-term benefits.⁸ Multiple studies have shown decreased hospital costs^{1,2,13} and resource utilization^{4,7,14,15} associated with MIVS. The prospect of concurrently increasing hospital revenue and patient satisfaction is essential in securing administrative buy-in.

Detailed risk management discussions should also take place. New MIVS programs will encounter an inherent learning curve¹⁶ and associated risks before full proficiency. The team should outline detailed means for reduction of anticipated risks. Plans should include appropriate proctoring and mentorship during early operative experience, either from local established MIVS programs,¹⁷ or other mentors with extensive MIVS experience. Assurance that unique aspects to beginning a MIVS program will be conveyed to patients during the informed consent process is critical. A clear plan to navigate this period and shorten the learning curve will ease risk management concerns and demonstrate the team's commitment to patient safety and success of the program.

MARKETING

Patients

Convey that the patient experience is important to the entire MIVS team. Objective measures including faster functional recovery and return to work, reduced LOS, and reduced bleeding/transfusion requirements^{3,4} should be explained. Improved cosmesis should not be an indication for MIVS, but is a welcomed added benefit. Avoid marketing as a means of self-promotion; rather, aim to educate patients, and offer information to allow informed decision-making. A well informed patient, able to enjoy life after a minimally invasive operation, can be your best advocate in the community.

There are various means by which information can be presented, and we recommend multiple approaches, using educational conferences, print, and digital media. Social media can offer inexpensive methods for further outreach, and should include direct links to an MIVS program Web site offering further details, illustrations, and explanations for those interested in learning more. Use of social media might also provide exposure to negative comments or reviews, which should be viewed as an opportunity for engagement and polite discourse with whomever shares

these views. Advertisements in print media, including newspapers, magazines, and brochures, are key to reach those who do not primarily use digital news outlets or social media.

Health Care Professionals

It is also critical to make referring cardiologists, other physicians, and health care personnel aware of your MIVS program. Information may be disseminated at conferences, grand rounds presentations, interdepartmental meetings, and direct communication with referring physicians. Engage nursing leadership within the intensive care units and wards routinely caring for cardiac surgery patients to raise awareness of the program, and engender support from these critical staff. Marketing the MIVS program will require repetition to make meaningful inroads in the referral patterns of colleagues. Gratitude for patient referrals to your MIVS program should be communicated to local cardiology colleagues, fostering these critical professional relationships, because continued volume is required for MIVS program sustainment.¹⁶ Successful outcomes should be conveyed similarly at conferences, meetings, and presentations to hospital staff.

Equipment

Exposure and ease of access to the target anatomy are the keystones for a successful minimally invasive operation. Starting from the skin incision and chest entry, a soft tissue retractor is critical especially for female and obese patients. A low profile intercostal retractor system, with multiple blade sizes, and preferably an attachment for a suture belt, is also necessary. Depending on cardioplegia strategy, it might be necessary to add large-bore angiocatheters, endoballoons, or percutaneous retrograde infusion catheters to the surgeon's preference card. For aortic occlusion, a device that does not interfere with visualization is essential; options include flexible or detachable cross-clamps, or endoaortic balloon occlusion. For minimally invasive valve cases, exposure and visualization is maximized by use of specific atrial retraction devices designed for MIVS.

Long, single-shafted instruments are essential, and there are several brands that specialize in MIVS (Geister [Tuttlingen, Germany], Estech [AtriCure, Mason, Ohio], Delacroix-Chevalier [Paris, France], etc), that surgeons should familiarize themselves with before purchasing. Alternatively, hybrid sets might be composed of particular instruments from different manufacturers if necessary. Keep in mind that not all manufacturers offer extra-long instruments for morbidly obese patients with deep chests. For suturing during MIVS cases, a knot pusher, finger extension, or COR-KNOT device (LSI Solutions, Victor, New York) are each reasonable on the basis of surgeon preference. Finally, it is imperative to have a thoracoscopic insufflation device to test valve repairs.

Training

Before building a MIVS program, it is critical that surgeons are already facile with complex valve repair and replacement techniques, because the time to learn these is not while simultaneously mastering alternative cannulation, access, and visualization. A surgeon should first possess mastery of mitral repair techniques via conventional sternotomy, confirmed by attentively tracking their patient's outcomes, with this benchmark necessary to gauge any future success.

Training in MIVS should ideally begin during cardiothoracic fellowship for those still in training.^{18,19} However, additional training for those who have already completed cardiothoracic fellowship, or want to fine-tune their skills, should be considered before building a new MIVS program.

Dedicated Fellowship

The most formalized option for MIVS-specific training is a dedicated fellowship at a high-volume center, generally 1 to 2 years in duration, for those interested in this course of action. The University of Texas, Houston offers a 1-year nonaccredited structural heart fellowship in minimally invasive and transcatheter techniques for recent graduates. There are also a handful of other excellent programs across the country. These programs offer substantial operative volume, and connections for future mentorship when ready to build one's own MIVS program. However, undertaking additional fellowship training is not feasible for all surgeons, because this entails a long absence from their already-established practice or faculty appointment.

MIVS Courses

Courses for MIVS are supported by a number of organizations, including the International Society for Minimally Invasive Cardiothoracic Surgery, Society of Thoracic Surgeons (STS), American Association of Thoracic Surgery, European Association for Cardiothoracic Surgery, and others. These offer exposure and proctoring for surgeons to better familiarize themselves with MIVS-specific techniques and instruments. Courses should also include relevant information regarding workup, and management of intraoperative and postoperative complications. One's home institution might be able to offset travel costs, because training is an essential investment for MIVS program success.

Training for the Entire Team

For a surgeon to lead a MIVS team, requisite training for other team members is also vital.²⁰ Traveling to a well established MIVS program with the entire team allows shadowing opportunities for all involved, and for

anesthesiologists, perfusionists, and OR staff to build relationships that facilitate future mentorship within their roles when the time comes for a new program's first cases.

Team training should also take place at one's home institution before operating. While still performing operations via conventional sternotomy, surgeons might start using single-shafted instruments and knot pushers. Implementing peripheral cannulation platforms provides repetition and familiarization for surgeons, anesthesiologists/echocardiographers, perfusionists, and technicians, alike. Anesthesiologists might be asked to place additional internal jugular lines for retrograde cardioplegia delivery, pressure monitoring, or venting. When the time to perform a program's first cases is approaching, it is also valuable to review equipment, setup, and procedures that need to be in place to allow safe conversion from a minimally invasive approach to sternotomy in case of emergency or prolonged procedural times.

Simulation

The previously mentioned training arrangements require significant time and logistic coordination, but simulation can also supplement live training. As it relates to MIVS, robust platforms already exist for simulating of CPB conduct and complication management.²¹ These models allow for simultaneous training of surgeons, anesthesiologists, and perfusionists, facilitating technical mastery and troubleshooting of peripheral CPB, while also allowing the opportunity to hone team dynamics and expectations for communication. Alternatively, simulation of chest port placement, or conduct of robotic-assisted operations on a porcine heart within a model human chest can offer dedicated practice for surgeons.²² When one establishes the best use of simulation at their institution, this might also serve a role within a training pathway for the next staff to join the MIVS team.

PATIENT SELECTION

Patient safety is the ultimate goal when operating. Start with carefully selected patients on the basis of several factors. Consider those with isolated valve disease, avoiding the need for multiple procedures, because early CPB and cross-clamp times will likely be longer than via conventional sternotomy. Careful history and examination, as well as appropriate echocardiography, computed tomography (CT) imaging, cardiac catheterization, and pulmonary function testing when indicated, will help to best inform decision-making.²³

A history of previous right-sided thoracic operations, tube thoracostomy, or trauma might make safe exposure and visualization difficult. In women, it is important to plan the incision relative to the breast parenchyma, and this can generally be positioned lateral to the breast, in the inframammary fold, or even in the periareolar area. In

women with previous breast augmentation, implants might prevent safe placement of the left atrial retractor in mitral operations, or impede an anterior right minithoracotomy in aortic cases. Although there are reports of successful implant removal and reinsertion before and after MIVS,²⁴ we recommend avoiding these patients as part of one's earliest cohort.

We routinely obtain a CT scan of the chest to better delineate relevant anatomy. Frailty does not necessarily exclude candidacy for minimally invasive procedures because these patients might benefit from avoiding median sternotomy and its associated postoperative limitations. Significant pectus excavatum should raise suspicion for leftward cardiac displacement, making appropriate exposure and visualization suboptimal. Significant kyphoscoliosis might limit appropriate positioning, while also distorting relevant cardiopulmonary anatomy. When considering peripheral cannulation, a careful assessment of femoral pulses, any inguinal or femoral hernia, significant pannus, or active cutaneous infection, is needed to ensure safe femoral cannulation. [Table 1](#) lists pertinent clinical considerations when evaluating patients for MIVS.

Detailed transthoracic echocardiography, and if necessary TEE, assessment is critical to diagnose the precise mechanism of valve pathology.²⁵ Ideal situations for initial experience in minimally invasive mitral surgery include planned repair of focal P2 prolapse, or straightforward replacement. During the early period, consider avoiding those with moderate or severe aortic insufficiency, because this might make myocardial protection and left ventricular decompression challenging. Because bypass and cross-clamp times will likely be longer with early minimally invasive experience, avoid patients with left ventricular ejection fraction <30% to 35%, or any concern for the requirement of left ventricular assist device support postoperatively in the early learning period. Patients with moderate or severe pulmonary hypertension are known to have an underestimated STS risk score,²⁶ and should be avoided early in a MIVS program's experience. Consideration might be given for right heart catheterization and/or additional pulmonary function testing on a case-by-case basis. Additionally, if TEE shows an enlarged coronary sinus, evaluation for a left-sided Superior Vena Cava should also take place. [Table 2](#) lists relevant preoperative imaging findings for MIVS planning.

CT scan of the chest aids in planning the appropriate intercostal space for incision, detailed delineation of thoracic anatomy, and additional assessment of any aortic calcification or mitral annular calcification (MAC). Significant aortic atheroma might preclude safe placement of either a cross-clamp or use of the endoaortic occlusion balloon. Mid-ascending aortic size >4 cm might also limit complete aortic occlusion when using the endoaortic balloon.²³ MAC significantly increases the risk of

TABLE 1. Important clinical findings when evaluating potential MIVS patients

Findings	Consideration(s)
Morbid obesity	Difficult exposure. Increased distance from incision to valve annulus. Pannus with or without any cutaneous groin infection contraindicating ipsilateral femoral cannulation
Particularly muscular chest wall	Difficult exposure. Increased distance to valve annulus
Breast implants	Might require adjustments to planned incisions. Consider implant removal and reinsertion for adequate thoracic access
Pectus excavatum	Compromised exposure. Leftward cardiac displacement
Kyphoscoliosis	Difficult or inadequate patient positioning. Compromised exposure
COPD or other chronic pulmonary dysfunction	Might not tolerate single lung ventilation. Risk for postoperative respiratory failure
Chronic renal dysfunction	Postoperative renal failure
Chronic hepatic dysfunction	Postoperative hepatic failure
Previous right thoracotomy, chest tube, or trauma	Pleural adhesions limit exposure. Risk of pulmonary or major vascular injury
Femoral pulses	Absence suggests inadequate peripheral cannulation access. Low threshold for CT evaluation
Hernia	Any unrepaired femoral or inguinal hernia might contraindicate ipsilateral femoral cannulation

COPD, Chronic obstructive pulmonary disease; CT, computed tomography.

atrioventricular dehiscence requiring complex repair techniques, and maneuvers for decalcification or annular suture placement can be difficult through minimally invasive incisions with single-shafted instrumentation. In these cases, a transcatheter aortic valve replacement (TAVR) in MAC can be considered.²⁷ Additional CT angiography of the abdomen and pelvis should also be routine when planning for peripheral cannulation.²⁸ Significant atheromatous disease might again preclude safe peripheral cannulation and retrograde perfusion, because of increased risk of stroke. Iliofemoral calcification, aneurysm, or dissection should

be ruled out to ensure safe vascular access for peripheral cannulation.

Assessment for coronary artery disease might involve coronary CT angiography in young patients without risk factors for coronary atherosclerosis. Otherwise, in men older than 40 years or postmenopausal women, American College of Cardiology/American Heart Association guideline-directed coronary catheterization should be performed.²⁵ Patients at our center typically undergo left heart catheterization via the right groin, and we have not encountered difficulty using the contralateral left femoral vessels for peripheral cannulation and CPB.

TABLE 2. Relevant preoperative echocardiographic and CT scan findings for MIVS patients

Location	Finding
Echocardiography	
Mitral valve	Specific etiology of mitral dysfunction, presence and degree of MAC, evidence of rheumatic disease, risk factors for postoperative systolic anterior motion
Aortic valve	Specific etiology and degree of stenosis or insufficiency. Bicuspid aortic valve
Left and right ventricles	Ejection fraction $\leq 30\%$ to 35%
Tricuspid valve	Degree of any insufficiency or stenosis
Aorta	Atheromatous burden, chronic dissection, or thrombus
Pulmonary artery	Any evidence of pulmonary hypertension
Coronary sinus	Any enlargement, which might be associated with persistent left SVC
CT scan	
Thoracic anatomy	Any pectus excavatum, kyphoscoliosis, rib fractures, right hemidiaphragm elevation, or breast implants
Mitral valve	Degree of MAC
Ascending aorta	Significant atheromatous burden precluding safe clamp placement or endoaortic balloon occlusion. Size >4 cm associated with incomplete endoaortic balloon occlusion
Great vessels	Aberrant anatomy including persistent left SVC, aberrant right subclavian artery, or patent ductus arteriosus
Descending aorta	Significant atheroma, or AAA with mural thrombus, associated with increased risk of stroke during retrograde perfusion
Iliofemoral	Presence of significant plaque, aneurysm, tortuosity, or dissection limiting safe arterial canula access
Venous anatomy	Presence of an IVC filter, which might be a relative contraindication
	Presence of persistent left-sided SVC

MAC, Mitral annular calcification; SVC, Superior Vena Cava; CT, Computed tomography; AAA, Abdominal Aortic Aneurysm; IVC, Inferior Vena Cava.

FIGURE 1. Procedural volumes versus time during the growth of our minimally invasive valve program. Total includes additional cases not captured in the other listed categories (eg, acute dissection, etc). Structural heart includes all open and transcatheter valve cases as well as atrial septal defect repairs. CABG, Coronary artery bypass grafting; MVR, mitral valve repair; AVR, aortic valve replacement; TAVR, transcatheter aortic valve replacement.

PATIENT SAFETY

If possible, we recommend proctoring for approximately the first 2 to 4 MIVS cases. Proctors should have substantial MIVS experience, and might include previous mentors from fellowship, or experts from other established MIVS programs.^{8,11,17} Alternatively, various societies (International Society for Minimally Invasive Cardiothoracic Surgery, STS, American Association of Thoracic Surgery, European Association for Cardio-Thoracic Surgery, as previously stated) might assist with aligning a new program and an available experienced proctor. The proctor should help improve safety during early experience, with additional goals of maximizing efficiency and identifying nuanced areas for improvement. With increased experience, expect to encounter areas for improvement in incision planning, cannulation techniques, TEE proficiency, CPB conduct, and aortic occlusion, instrumentation, and visualization. During this time, a mentor remains valuable to provide feedback, discuss difficult decision-making, operative variables, and case experience.

At all times patient safety should be emphasized. Beginning with the informed consent process, patients should be clearly made aware of the MIVS team's experience, outcomes, and any ongoing proctoring. Possible conversion to sternotomy to safely complete the operation, and any relevant alternatives should be clearly explained. We also recommend discussing among the MIVS team what end points for maximum CPB or cross-clamp times will be allowed before conversion to

sternotomy to complete the operation in a safe and timely manner. These should be determined preoperatively, and known among the MIVS team to ensure adherence. It is not conversion to a conventional exposure and safely completing the operation, but carrying on inefficiently with poor exposure, and prolonged CPB and clamp times that represents failure. We have been fortunate to not encounter prolonged procedural times requiring conversion, but have needed to convert twice of more than 200 cases, once for bleeding and once because of complications related to left atrial retraction causing compression of an adjacent TAVR valve, requiring replacement. Previously published experiences have shown similarly low conversion rates of approximately 1% to 5%.^{29,30} Additional reports, including data from our institution, have shown safety of minimally invasive aortic valve replacement over time compared with conventional sternotomy, with lower rates of 30-day mortality and postoperative atrial fibrillation, as well as reduced LOS.³¹

Consider making MIVS-specific modifications to your preoperative time-out to ensure all personnel are apprised of nuances in each case, and all critical equipment for minimally-invasive and conventional-exposure surgery is available. A conservative operating schedule of 1 MIVS case per day should be sufficient while members of the team adapt to their role.

OPERATIVE VOLUME

Case volume is also critical for a successful MIVS program. Surgeons should be aware of their mitral and

FIGURE 2. Cardiopulmonary bypass (CPB) and aortic cross-clamp duration versus time. *miniMVR*, Isolated mitral valve repair; *CC*, aortic cross-clamp; *miniAVR*, isolated aortic valve replacement.

aortic case volumes before starting a MIVS program. When beginning, a learning curve is likely to persist, even after the proctored interval. For instance, a large single-institution experience reported that approximately 75 to 125 minimally invasive mitral operations were required to obtain sufficient mastery.¹⁶ As MIVS experience increases, this can further facilitate developing key relationships with cardiologists. We have found that with continued growth and operative success, cardiology colleagues often advocate for our MIVS program. For instance, if a patient is evaluated and not a candidate for transcatheter intervention (eg, TAVR, MitraClip [Abbott, Abbott Park, Illinois]), cardiologists might not believe that they lose any ground in the eyes of the patient after referring to a minimally invasive surgeon as opposed to implicitly referring for conventional sternotomy.

This camaraderie begets additional referrals, and we have experienced substantial growth in MIVS and overall structural heart case numbers since starting our MIVS program. For illustration, Figure 1 shows the senior author's procedural volumes during the first 5 years of our minimally invasive valve program. We have witnessed a steady growth in aortic and mitral valve referrers since the birth of our program and our practice has transitioned to nearly all structural heart cases. Growth in structural heart volume has also resulted in improved operative efficiency. Figure 2 shows the senior author's progressive reduction in CPB and cross-clamp times. While attentively tracking patient outcomes to ensure success (see Monitoring Outcomes section), continued experience and improved efficiency together allow surgeons to expand their patient selection beyond those with isolated valve disease, to further increase MIVS case numbers.

MONITORING OUTCOMES

Closely monitoring outcomes is critical, and we recommend using a comprehensive database. For surgeons, knowing the minutiae about each case accelerates learning, whereas patients, administrators, and referring physicians will also be keenly interested in relevant data. Pay close attention to procedural, CPB, and cross-clamp times, as well as LOS, pain control, and conventional complications. Despite concerns from some surgeons that minithoracotomy might be as painful as sternotomy, this has not been our experience. Our preferred methods to minimize pain after minithoracotomy rely on minimization of rib-spreading, injection of liposomal bupivacaine for multilevel posterior intercostal nerve block, and use of nonopioid adjuncts for pain control including gabapentin, ketorolac, and intravenous acetaminophen.

Attempts to capture patient satisfaction, function, and return to work are also worthwhile. After hospital discharge, close follow-up to ensure durable technical success and relevant patient-centered milestones are achieved requires diligence, and close communication with referring cardiologists. Auditing outcomes allows directed interventions for early improvement, and reporting your successes.

CONCLUSIONS

Persistence is key to building a MIVS program. Assembling and training a core team is foundational to success. Presenting a plan to hospital administrators with sound cost-benefit analysis and long-term vision are key to secure necessary support. Dedicated fellowships, MIVS courses, scholarships, and simulation all serve to maximize

readiness. Close relationships with referring physicians, and an effective marketing strategy, are key to making the MIVS program known. When ready to operate, patient safety is critical and all measures to maximize this should be taken. Preparation will pay dividends; and a thriving MIVS program can substantially augment structural heart case volume, with paralleled improvements in operative times. Close attention to outcomes will shed light on areas for improvement, and allow one to report the program's successes, for continued mastery and growth.

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