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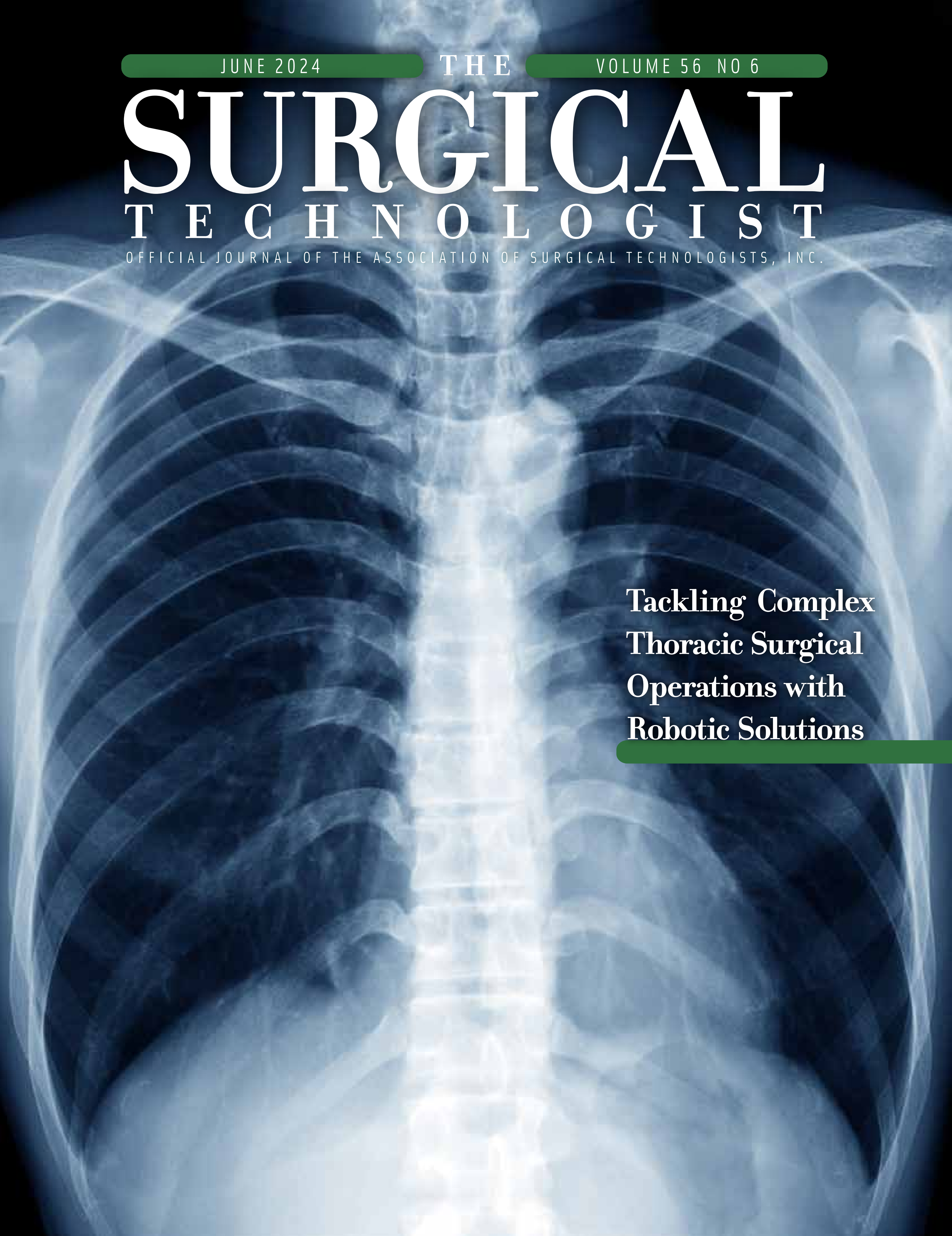

Tackling Complex Thoracic Surgical Operations with Robotic Solutions

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AST Association of Surgical Technologists

AST Association of Surgical Technologists

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Association of Surgical Technologists

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In This Issue

In Every Issue

National Time Out Day – A Testament to Unwavering Surgical Protection

NICOLE VAN VONDEREN CST, FAST, AST BOARD OF DIRECTORS

BOARD MESSAGE

Every second counts in the fast-paced environment of the operating room (OR). Precision, focus, and teamwork are paramount to ensure successful surgical outcomes. However, amidst the urgency, patient safety remains the top priority. National Time Out Day, observed annually in June, serves as a poignant reminder of the critical role of communication and protocol adherence in safeguarding patients during surgical procedures.

National Time Out Day is dedicated to promoting the Universal Protocol for Preventing Wrong Site, Wrong Procedure, and Wrong Person Surgery.™ This protocol, established by the Joint Commission, outlines a series of pre-surgical safety checks to reduce the risk of errors and ensure patient well-being. Central to this protocol is the "time out" – a brief pause before the start of a procedure during which the surgical team verifies essential details, including patient identity, procedure type, surgical site, and any pertinent allergies or medical conditions.

Surgical technologists play a pivotal role in facilitating National Time Out procedures. As integral surgical team members, they collaborate closely with surgeons, nurses, and anesthesiologists to uphold safety standards and mitigate potential risks. Before commencing surgery, surgical technologists assist in conducting time outs by confirming patient information, ensuring the availability of necessary equipment and supplies, and addressing any concerns or discrepancies. Their vigilance and attention to detail contribute significantly to preventing adverse events and upholding the highest standards of patient care.

National Time Out Day is more than a procedural mandate – it's a shared commitment to safety that's woven into the fabric of surgical practice. This annual observance underscores the importance of clear communication, teamwork, and adherence to established protocols, fostering a sense of unity and shared responsibility for patient welfare among healthcare professionals. Through ongoing education and training initiatives, surgical technologists are empowered to actively participate in promoting this safety culture within their institutions, ensuring every surgical procedure is conducted with the utmost diligence and precision.

The implementation of National Time Out protocols has led to tangible improvements in patient outcomes and safety metrics, a testament to the dedication and hard work of healthcare professionals. By systematically verifying key details before surgery, they prevent errors such as wrong-site surgery, medication errors, and other adverse events, significantly enhancing patient well-being. The emphasis on teamwork and communication fosters a collaborative environment where concerns are proactively addressed, further improving patient care quality. This is a source of pride and accomplishment for all involved.

National Time Out Day stands as a testament to the unwavering commitment of healthcare professionals to prioritize patient safety above all else. In surgical technology, this observance underscores the critical role of meticulous planning, clear communication, and teamwork in safeguarding patients during surgical procedures. By embracing the principles of the Universal Protocol and actively participating in time-outs, surgical technologists contribute to a culture of safety that ensures every patient receives the highest standard of care.

As we commemorate National Time Out Day, let us reaffirm our dedication to excellence in surgical practice and the unwavering protection of those entrusted to our care.

SPEAK UP!
TO PROMOTE SAFE PRACTICES

National Time Out Day is June 12

National Time Out Day encourages everyone to speak up for safe practices in the operating room. The Joint Commission, the World Health Organization and the Council on Surgical and Perioperative Safety (CSPS) all promote the efforts to increase awareness for all surgical team members to make it a habit to practice safe surgical protocols each and every time patients undergo surgery.

AT A GLANCE

AST News

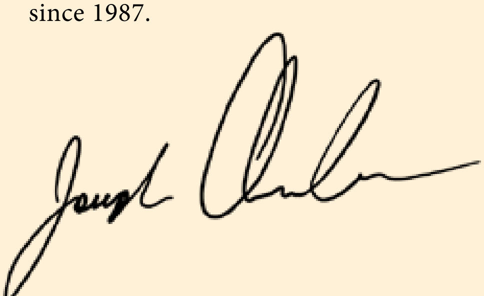
AST ANNOUNCES NEW CEO

Hello to the AST membership,

It is my pleasure to announce that Jodi Licalzi has been hired as the new CEO and Executive Director of the Association of Surgical Technologists. Mrs. Licalzi currently serves as AST's Marketing and Communications Director; she has served within the AST organization since 2011. Her vast experience in marketing and communications covers over 24 years. During her time with AST, Mrs. Licalzi also has served as a staff liaison to numerous national committees including the Foundation for Surgical Technology, the AST Reorganizational Committee, the AST Advocacy Committee, and the AST Medical Missions and Outreach Committee, as well as a staff advisor to the AST Board of Directors.

The AST Search Committee (comprised of President Joseph Charleman, CST, CSFA, FAST, DBA; Vice President Peggy Varnado, CST, CSFA, FAST; Secretary Jessica Elliott, CST, RN, FAST; Treasurer Dustin Cain, CST, FAST; Director Sherridan Poffenroth, CST, FAST; and Director Alison Wilson, CST, FAST) managed the national executive search to place the association's next CEO. With over 70 applicants, the search committee narrowed the field through three rounds of interviews and review. The final interviews were conducted by the AST Executive Search Committee, the AST Board of Directors, and the AST Staff who confirmed Mrs. Licalzi's selection as the new CEO.

Mrs. Licalzi will officially take the helm June 3, 2024, following the retirement of longtime AST CEO and Executive Director Bill Teutsch, CAE, FASAHP. Mr. Teutsch has served the organization in his current role since 1987.



AST President Joseph Charleman
CST, CSFA, FAST, DBA

SAVE THE DATE – UPCOMING EVENTS

2025 AST Educators Conference – New Orleans
February 21-22, 2025
InterContinental New Orleans
444 St Charles Ave, New Orleans, LA 70130
Join us for the 2025 Educators Conference in New Orleans! Situated in the charming French Quarter, it's a quick walk to Bourbon Street and a short jaunt to the Garden District. Event date: February 21-22, 2025, with leadership event February 20. Registration will open in the fall.

2025 AST Surgical Technology Conference – Orlando
June 5-7, 2025
Hilton Orlando Buena Vista Palace
1900 E. Buena Vista Drive, Lake Buena Vista, FL 32830

CONTINUING EDUCATION RESOURCES

Earning CE

The vast majority of all CE credits processed by AST for CSTs for CSFAs are earned through one or more of the ways listed below. ***None of these are subject to a processing fee.***

- AST Distance CE (journal tests or CE packages)
- Hospital Inservices
- Live lectures at AST state assemblies, national conference and others, such as ACS Congress
- College Courses
- Healthcare Manufacturer's Live Events. AST now accepts CE credits that are offered at lives events that have been planned and are sponsored and advertised by healthcare manufacturers - referred to as commercial interest organizations (CIO).

However, in order for the CE credits to be accepted by AST, the live program must be approved by AST and the program must be relevant to the practice of surgical technology or surgical first assisting. Live events are stand-alone events, such as forums or hands-on workshops that are the sole responsibility of the CIO to plan and market as well as offer the CE credits, and are held at the location of the CIO's choice.

Qualifying CE Credits Checklist

- Are all CE your credits earned while an AST member?
- Are all CE credits earned within your current certification cycle established by the NBSTSA?
- Are all your CE credits relevant to the medical-surgical practice of surgical technology and surgical assisting?
- Have you submitted a CE Reporting Form? CE credits will be returned without a CE Reporting Form.
- Did you list each educational activity on the CE Reporting Form?
- Did you submit proper documentation for each education activity listed on the CE Reporting Form? Keep originals of documentation and submit copies.
- Is any applicable fee enclosed?

3 Ways to Submit Your CE Credits

- Mail to: AST, 6 West Dry Creek Circle, Ste 200, Littleton, CO 80120-8031
- Email scanned CE credits in PDF format to AST Member Services. Do not mail credits that were previously emailed.

APPLY FOR A MEDICAL MISSION SCHOLARSHIP

Did you serve on a medical mission during the first couple months of this year, prior to the global pandemic? If so, you may be eligible to apply for a medical mission scholarship.

Eligibility

To be eligible for a mission scholarship you must:

- Be an active AST member with currency.
- Complete and submit the Mission Medical Application and the Medical Mission Verification Form by December 31 of the year of your mission.
- Provide a description of your membership history—join date and any AST involvement.
- Upload official documentation of the mission program you have described.
- Upload official receipts documenting the costs incurred by the individual and all costs must be shown in dollars. All assistance is determined after the medical mission trip has occurred and the appropriate documentation has been provided. Upload supporting documents below.
- Upload two letters of recommendation, along with an article describing your experience for The Surgical Technologist journal and related photos.
- Write an article describing your experience for The Surgical Technologist and provide related photos before you will be reimbursed.

MILESTONES

Happy Anniversary!

Congratulations to the following state assemblies as they celebrate anniversaries this month! AST appreciates your hard work, dedication and all your years of service for making our state assemblies the backbone of this organization.

- Colorado/Wyoming – 23 years
- Nevada – 21 years

2024 AVERAGE HOURLY PAY RATE
OF AST MEMBERS BY STATE

Figures are derived from salary ranges reported on membership applications and renewal notices. Salaries include both entry-level and experienced members, and certified and noncertified members.

DISCLAIMER: AST provides salary data for informational purposes only, and disclaims any attempt to directly or indirectly suggest what salary schedule should be established for surgical technologists. The association must be careful to avoid any violation of the antitrust laws in the collection or dissemination of salary information. The concerted use of salary information in a profession in order to restrain competition or to fix prices is illegal.

ADVOCATE FOR YOURSELF.

AST
Association of Surgical Technologists

You advocate for your patients – no question. Now it's time to advocate for the critical role you play as a key member of the surgical team and how important your role is to patient safety.

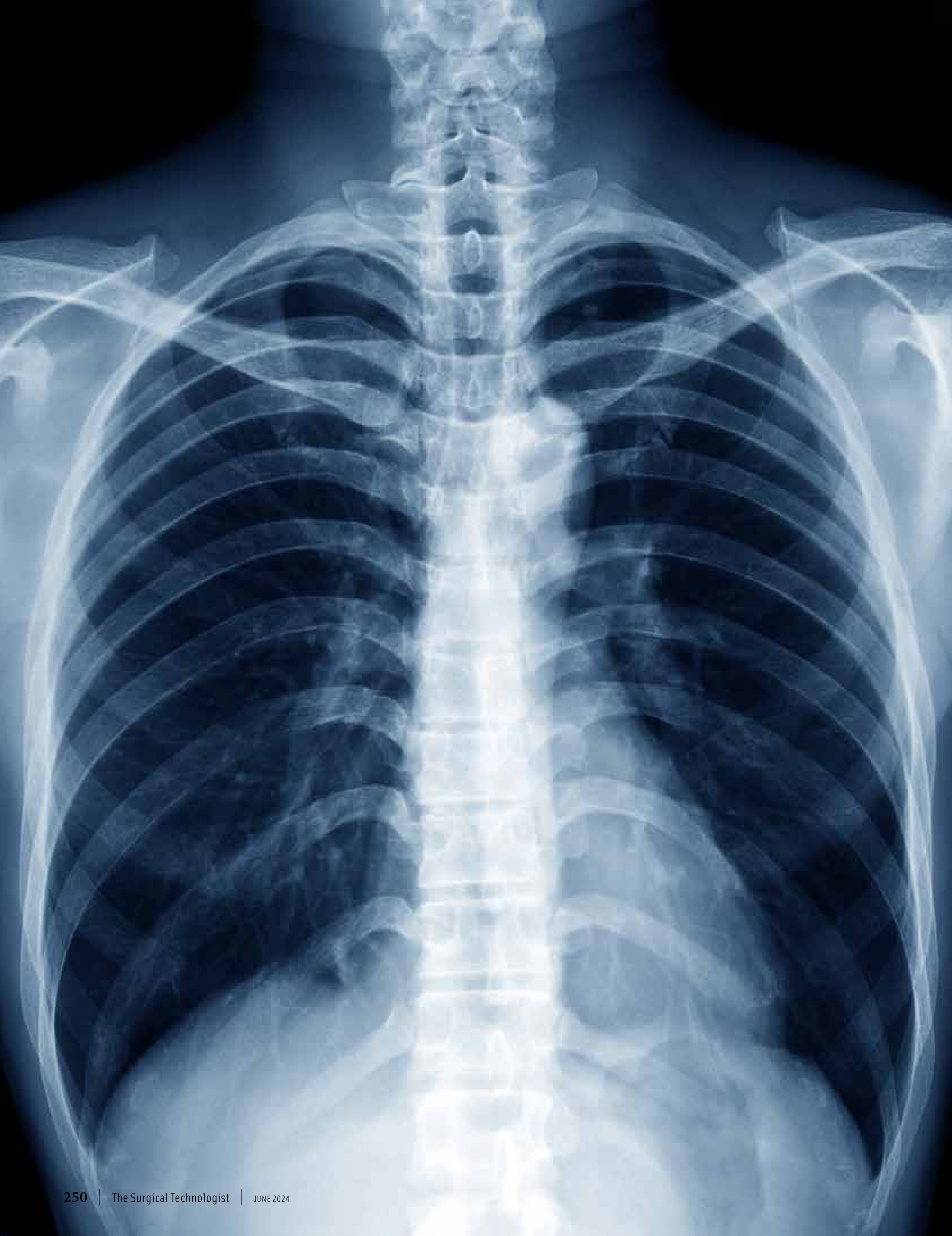
AST developed a toolkit specifically for surgical technologists to use when you're explaining just how crucial is it that certified surgical technologists earn education from an accredited program thus making them eligible to sit for the national certifying exam and earn the distinguished CST credential. Scan the QR code to access documents, AST position statements and other resources you need to keep advocating for the profession.

The Workforce Shortage: A Message from AST

CSTs Many Lifesaving Roles

AST Encourages Healthcare Facility Leaders to Support Local, Accredited Surgical Technology Educational Programs

Recommendations for CSTs, Program Directors, and State Assemblies when Addressing On-the-Job Training with a Healthcare Facility



Tackling complex thoracic surgical operations with robotic solutions: a narrative review

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Contributions: (I) Conception and design: ZM Abdelsattar; (II) Administrative support: RK Freeman; (III) Provision of study materials or patients: AM Odeh, ZM Abdelsattar; (IV) Collection and assembly of data: AM Odeh, K Wyant, ZM Abdelsattar; (V) Data analysis and interpretation: AM Odeh, ZM Abdelsattar; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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Background and Objective: The adoption of robotic surgery for general thoracic surgery has rapidly progressed over the last two decades from its application in basic operations to complex pathologies. As such, the purpose of this narrative review is to highlight the collective experience of tackling complex thoracic surgical operations with minimally invasive robotic solutions.

Methods: Electronic searches of PubMed were conducted for each subtopic, using specific keywords and inclusion criteria. Once identified, the articles were screened through the abstract, introduction, results and conclusion for relevancy, and included based on a standard narrative review inclusion criteria.

Key Content and Findings: The role of the robotic approach has increased in thoracic outlet syndrome, chest wall resection, tracheobronchomalacia, airway and sleeve lung surgery, lobectomy after neoadjuvant therapy, complex segmentectomy, giant paraesophageal hernia repair, esophagectomy and esophageal enucleation, mediastinal masses and thymectomy and lung transplantation. Robotic surgery has several advantages when compared to video-assisted and open thoracoscopic surgery. These include better pain control and aesthetic outcome, improved handling of complex anatomy, enhanced access to lymph nodes, and faster recovery rates. Although it is associated with longer operative time, robotic surgery has comparable morbidity rates.

Conclusions: The robotic approach to complex thoracic problems is safe, effective, and associated with improved patient outcomes. To encourage wider adoption of robotic technology, increased training and expanded research efforts are essential, alongside improved worldwide access to this technology.

Keywords: Robotic surgery; thoracic surgery; surgical outcomes; narrative review

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Introduction

In the field of thoracic surgery, improving the quality of life with innovative and progressive techniques has long been the hallmark of therapy. With patients presenting a complex and diverse range of pathologies, the advancement of surgical techniques and equipment has become increasingly essential. Although video-assisted thoracoscopic surgery (VATS) has gained worldwide acceptance, robotic thoracic surgery has gained further momentum due to the platform's capacity to address many, if not all, limitations associated with traditional VATS approaches (1). Notable improvements include unparalleled three-dimensional (3D) views with steady magnification, wristed instruments providing enhanced maneuverability across several degrees of freedom, which prove extremely useful in addressing issues within the 3D anatomy of the chest, lung, esophagus and mediastinum. Not to mention, the benefits on surgeon longevity, and reduced surgeon fatigue (2-4). In theory, robotic surgery would also reduce postoperative pain, and in turn shorten hospital stays. It would also have similar, if not better, short and long-term outcomes.

In this narrative review, we discuss the application and progression of thoracic robotic approaches to a variety of complex thoracic surgical conditions. These selected conditions have traditionally been mostly performed with an open approach and/or a VATS approach had been limited. These include first rib resection for thoracic outlet syndrome (TOS), chest wall resection, sleeve lung resection, airway resection, tracheobronchomalacia, lobectomy after neoadjuvant therapy, complex segmentectomy, giant hiatal hernia repair, esophagectomy, esophageal enucleation, mediastinal mass resection, and lung transplantation.

Although prior studies have demonstrated and established the role for the robotic approach in many of these complex operations and disease presentations, it has done so in isolated silos for each topic (1,5-12). It is prudent to review the application of the robotic approach across multiple operations within a single discipline with a collective eye, as there are many areas of overlap, and technical considerations that can be shared or improved upon.

In this context, we compiled a comprehensive update on the current status of robotic surgery in each of the mentioned fields. This narrative review is meant to illustrate the role of the robotic approach to these issues, ultimately surgeons have the judgement to decide on whether to proceed with the approach they see fit for each individual patient based on indication, patient factors, and surgeon's experience. We present this article in accordance with the Narrative Review reporting checklist (available at https://jtd.amegroups.com/article/view/10.21037/jtd-23-1570/rc).

Methods

Search strategy

A list of subtopics pertaining to complex thoracic surgery and robotic approaches included first rib resection for TOS, chest wall resection, sleeve lung resection, airway resection, tracheobronchomalacia, lobectomy after neoadjuvant therapy, complex segmentectomy, giant hiatal hernia repair, esophagectomy, esophageal enucleation, mediastinal mass resection, and lung transplantation. These conditions were selected based on our experience. Databases searched included PubMed. Following retrieval of all relevant literature, a search in the reference list for each article was done. Anything that fit the inclusion criteria found in the reference list was added and screened.

Specific keywords, most common being "robotic surgery" were incorporated with each subtopic. The "advanced" feature was utilized with every search, along with "AND" and "NOT" terms. Specific outcomes of interest included "operative time", "length of hospital stay", "complications", "lymph node harvest", and "30-day and 90-day mortality". If found, these would be reported. The search strategy for all subtopics combined can be found in *Table 1*.

Inclusion criteria

Each study reviewed was screened through its abstract, introduction, results, and conclusion for relevancy, and only those specific to each subtopic were chosen. Articles retrieved were only included if they adhered to the following inclusion criteria:

(I) Separate findings for robotic surgery: literature that did not report exclusive findings of robotic surgery, or incorporated them as a whole with other types of surgeries were excluded.
(II) English formatted studies: literature that was not English in language, or contained results in a foreign language was excluded.
(III) Study type: there was no emphasis on type of study, but clinical trials, case reports and meta-analysis were favored.

The author A.M.O. conducted the screening procedure, cross-checking each article with the decided inclusion criteria. All literature was then reviewed and accepted for use by author Z.M.A.

A total of 1,058 publications were found and screened, of which 235 were excluded after inclusion criteria was applied. The remaining 823 publications were then screened for relevancy and appropriateness for each subtopic. Publications with data referenced in one study were excluded, to minimize duplicity and reference citation. After the screening procedure, 109 publications remained. There was 1 YouTube video referenced, and another news article, both for the subtopic "Lung transplant".

Robotic first rib resection for TOS

In the field of TOS, robotic surgery has emerged as a useful

Table 1 Search strategy for each subtopic

Items	Specification
Dates of search	08/03/2023 – 11/16/2023
Databases and other sources searched	PubMed
Search terms used	(Thoracic outlet syndrome) AND (Robotic surgery)
	(Robotic surgery) AND (Chest wall resection)
	(Robotic surgery) AND (Sleeve Lung Resection)
	(Robotic Surgery) AND (Tracheal resection)
	(Robotic surgery) AND (Tracheobronchomalacia)
	(((Robotic surgery) AND (Lobectomy)) AND (Neoadjuvant)) AND (Lung)
	(Robotic surgery) AND (Complex Segmentectomy)
	(Robotic surgery) AND (Large paraesophageal hernia repair)
	(Robotic surgery) AND (Esophagectomy)
	(Robotic surgery) AND (Esophageal enucleation)
	(Robotic surgery) AND (Mediastinal mass resection)
	(Robotic surgery) AND (Thymectomy)
	(((Robotic surgery) AND (Lung transplantation)) NOT (Resection)) NOT (Thoracoscopic)
Timeframe	2000–2023
Inclusion and exclusion criteria	Inclusion criteria: any study type; English formatted studies; separate findings for robotic surgery
	Exclusion criteria: no mention of robotic surgery findings
Selection process	The selection process was conducted independently by all authors, with no consensus obtained externally

approach, accommodating neurogenic thoracic outlet syndrome (nTOS) and venous thoracic outlet syndrome (vTOS). For TOS, different types of open approaches have been described, each with limitations depending on the neurogenic, arterial, or venous pathology. These approaches are the transaxillary, supraclavicular or infraclavicular approach. These open approaches are all limited by not providing complete exposure of the entirety of the first rib. This results in increased risk of injury to the neurovascular bundle or incomplete rib resection. The visualization and exposure of the first rib from the intrathoracic robotic approach is unparalleled.

This concept was initially introduced in 2005 by Martinez *et al.*, who explored the use of computer-aided instruments for endoscopic transaxillary first rib resection (13). Building on this, in 2012 Gharagozloo *et al.* was among the first to advocate for the robotic thoracoscopic approach, replacing traditional two-dimensional visualization with the superior 3D visualization of the entirety of the first rib (14). This enhancement allows for superior visualization of the surrounding anatomy, notably the ribs and neurovascular bundle, optimizing the surgical outcomes for patients with TOS and minimizing injury (15-18).

Gharagozloo *et al.* reported a series of 162 patients, 79 patients suffering from nTOS and 83 patients with vTOS (19). The authors reported excellent results with 90% of the nTOS experiencing immediate relief, and subsequently, 97% achieved complete symptom relief. Similarly, for vTOS, all remained asymptomatic with full functionality 2 years post-surgery, along with patent subclavian veins. The average operative time was 88 min for nTOS and 128 min for vTOS procedures. Notably, both procedures had no reported neurovascular complications, and patients had a median hospitalization stay of 3 days

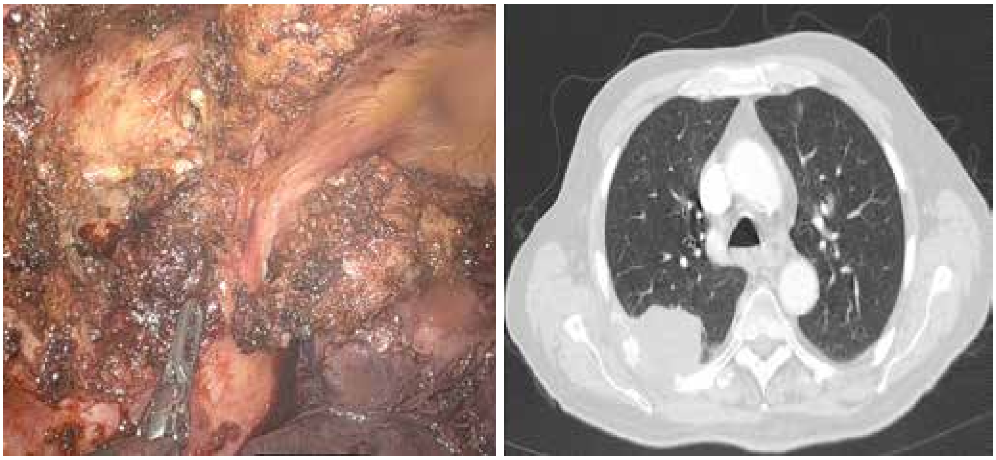

Figure 1 T3 lung adenocarcinoma with *en-bloc* resection of chest wall via entirely robotic approach.

for nTOS and 4 days for vTOS procedures. Similarly, Gkikas *et al.* discussed the safety of robotic first rib resection, comparing it with traditional techniques such as supraclavicular first rib resection, both intraoperatively and postoperatively (20). The study revealed that patients undergoing the robotic approach reported better pain control as measured by the visual analogue scale and morphine equivalents. In addition, several studies have reported less complications with the robotic approach (21-23). However, it is worth noting that robotic surgery does entail certain drawbacks, including higher upfront costs and longer operative times early in the learning curve of the surgeon, although the data on this is limited (15,24).

In a broader context, the evolution of robotic techniques in TOS management inspires confidence in surgical outcomes using this approach. Although this approach has not been employed for arterial TOS per se, it is only a matter of time before we see it extended to that group of patients as well.

Robotic chest wall resection

The concepts of robotic first rib resection can be employed for other rib resections and further expanded to also apply for chest wall resections robotically. The robotic approach has also been shown useful for chest wall resection, enabling more minimally invasive procedures that come with fewer postoperative morbidities. In the largest case series of robotic chest wall resection for neoplasia, Verm *et al.* explored the application of robotic surgery from a single institution and enriched the series with data from 96 patients from the National Cancer Database (NCDB) (25). The case series includes benign primary chest wall tumors and locally advanced lung cancer invading the chest wall. The authors reported excellent outcomes for all patients, with emphasis on the usefulness of robotic surgery in resecting tumors located in difficult anatomic regions, an example being those deep to the scapula or in the apex of the chest. In this report, there were no open conversions, with a median hospitalization stay of 3 days, along with no 30-day readmissions or 90-day mortality. The robotic approach was also used sporadically in the U.S. with 96 patients in the NCDB from 2012–2017. From the NCDB there was a 19% conversion rate, median hospitalization stay of 7 days, along with a 4% 30-day mortality which is similar to open chest wall resection mortality rates nationally. Verm *et al.* conclude the feasibility, safety and excellent outcomes of implementing robotic surgery for chest wall resections.

Figure 1 demonstrates a recent example from our own experience of a locally advanced lung cancer invading the posterior chest wall just underneath the scapula. This was resected *en-bloc* with right upper lobectomy after neoadjuvant chemoradiation. The patient did well apart from a prolonged air leak and was discharged home on day 7. A step-by-step video for our technique is published elsewhere (26). The advantages of this approach cannot be overstated for complex presentations such as this one. He had negative margins and is currently without evidence of disease.

Many isolated case reports have shown the feasibility for treating other benign chest wall tumors, such as fibrous dysplasia of the second rib, as reported by Liu *et al.* They indicated an operative time of 135 min and a hospital stay of 2 days without complications (27). Other examples include a robotic resection of rib—invasive paraganglioma in the posterior mediastinum, a solitary fibrous tumor, and a second rib osteochondroma (28-30). In all reports, the robotic approach reflected a safe and beneficial alternative to the standard or VATS approaches.

Another important application of this approach is to Pancoast tumors. Mariolo *et al.* reported the resection of an anterior Pancoast tumor using a hybrid robotic and transmanubrial approach in a 59 year old morbidly obese patient (31). The advantages of the robotic approach are highlighted particularly overcoming the patient's body habitus and a resultant faster recovery with better functional and aesthetic outcomes.

Robotic surgery for tracheobronchomalacia

One other complex disease where the advantages of the robotic approach cannot be overstated is tracheobronchomalacia (32-36). Initially implemented through a bilateral tracheobronchoplasty, the robotic approach demonstrated improved feasibility when handling high-risk tracheobronchomalacia patients (37). Further investigation by Lazzaro *et al.* involved 42 patients who underwent robotic tracheobronchoplasty (38). The majority of patients exhibited significant improvements in postoperative pulmonary function tests when compared to their preoperative measurements. For example, forced expiratory volume in the first second increased from a median of 74% before surgery to 82% after, forced vital capacity improved from a median of 69% to 80%, and peak expiratory flow enhanced from a median of 62% to 75%. A similar study compared 6 cases of robotic tracheobronchoplasty with 16 cases of open tracheobronchoplasty (39). Patients who underwent robotic tracheobronchoplasty experienced shorter hospital stays (3 days compared to 7 days), fewer complications (17% *vs.* 69%), and all reported improvements in their condition.

The application of the robotic approach to tracheobronchoplasty is not only beneficial for patients, but also to surgeons. The dissection involved in isolating the airway, identifying and protecting the recurrent nerves, and the complete lymph node dissection affords the surgeon and trainees with improved understanding of anatomy, which then in turn facilitates complex resections of the trachea, carina, mainstem bronchi, and extensive lymphadenectomy, as discussed below.

Robotic airway and sleeve lung resection

As thoracic surgeons continue to push the envelope by maximizing minimally invasive approaches and parenchymal sparing operations, sleeve lung resections are increasing, becoming a more suitable option than pneumonectomy for anatomically suitable lung cancer cases, as highlighted in Abdelsattar *et al.* (40). Significant advancements in sleeve lung resection have been facilitated by robotic surgery, evident from the innovative robotic bronchoplasty on a human cadaver in 2006 (41). The authors discussed their exploration of robotic techniques for upper sleeve lobectomy. Following the success, it was then performed on a human patient, documented by Schmid *et al.* (42). Building on this, Gonzalez-Rivas *et al.* reported the carinal resection and construction using uniportal robotic thoracic surgery (43). The pillars of success afforded by robotics in carinal surgery include precise movements, secure anastomosis, safe margins, and avoiding extensive lateral dissection. Gonzalez-Rivas *et al.* updated their report recently, with 30 new cases without intraoperative complications and low postoperative morbidity (44). They emphasized the need to master the learning curves associated with such advance techniques and tools. The risks are also highlighted by opponents to this approach (45).

In one large study on sleeve resection, Geraci *et al.* conducted a retrospective analysis of 1,951 robotic procedures (46). These were further categorized into 755 lobectomies, 306 robotic segmentectomies, including 23 elective sleeve resections. These encompassed 18 sleeve lobectomies, 2 main stem bronchus resections (1 left and 1 right) without pulmonary resection, 2 right bronchus intermedius resections without pulmonary resection, 2 pulmonary artery sleeve and/or angioplasty, and 1 case involved pneumonectomy. The median operative duration was 205 min, with one instance requiring conversion to open thoracotomy due to concerns regarding anastomotic tension. The average hospital stay was 3 days, with minimal postoperative complications. Notably, there were no mortalities recorded within both the 30-day and 90-day periods.

Similarly, Jiao *et al.* examined the utilization of robotic bronchial sleeve lobectomy for central lung tumors. In their study of 67 patients, they examined the use of robotic bronchial sleeve lobectomy for central lung tumors (47). The study revealed an average surgery time of 167 min, with an additional 21 min for bronchial anastomosis, and a hospital stay of 7 days. While there were no reported deaths, 14 postoperative complications occurred, with the most common being atelectasis requiring bronchoscopy. Similarly, Li *et al.* reported similar results from 3 patients who underwent robotic sleeve resection (48). The average surgery time was 155 min, and the hospital stay was 7 days. Although one patient experienced postoperative atelectasis, there were no other complications or deaths, and all patients remained recurrence-free during the follow-up period. Their study does mention several drawbacks related to robotics, including the challenge of tactile sensation, a comparatively higher number of incisions (4–5 incisions) compared to other minimally invasive techniques, and the associated increased cost. Likewise, a 2016 study supported these findings in 21 cases of patients who underwent robotic sleeve resection, further classified as single (bronchial) or double (bronchial and vascular) (49). The average surgery time aligned closely at 158 min, although one case required a switch to open thoracotomy. There was a postoperative complication rate of 19%, with subcutaneous emphysema (14%) being the most common. There was mortality secondary to bronchopleural fistula. Building upon this original work, Pan *et al.* presented one of the initial reports on the application of robotic approach in extended sleeve lobectomies for lung cancer patients receiving neoadjuvant therapy (50). They emphasized the advantages of the robotic platform over VATS in these patients, reiterating the benefits.

The role of robotic thoracic surgery is further highlighted in tracheobronchial and airway surgery. In their study, Li *et al.* explored the application of robotic surgery in tracheal/airway surgery for a group of 5 patients, all under non-intubated spontaneous ventilation (51). In contrast to the previously discussed surgeries, these cases exhibited notably longer operative durations, spanning from 305 to 595 min, accompanied by extended hospital stays lasting between 4 to 14 days. Notably, no postoperative complications were reported, and patients underwent satisfactory short-term follow-up (1 month). Although innovative, the non-intubated nature of their description introduces several challenges some of which may be viewed as unnecessary. These include physiologic and anesthesiologic concerns, such as hypoxia, hypercapnia, and uncontrolled cough. Not to mention, the risk of life-threatening bleeding from a thoracic operation in the absence of a secure airway (52). As we discuss the role of emerging technologies, and adopt minimally invasive robotic approaches to complex operations, it is important not only to demonstrate feasibility, but also safety and reliability (53).

As highlighted earlier in this paper, when compared to conventional techniques, including VATS, the utilization of robotic surgery for tracheal/airway resection offers enhanced maneuverability and improved visualization, attributed to its 3D capabilities. However, it does involve a lengthier operative time due to the necessity for recurrent suture reloading in case of suture interruption.

Lobectomy after neoadjuvant therapy

The recent advancements in chemoimmunotherapy have changed the paradigm for how locally advanced lung cancer is treated (54). Neoadjuvant therapy is associated with hilar fibrosis which is thought to make the operation more difficult. The robotic approach has repeatedly been shown to be associated with less conversion to open when compared to VATS (55). For example, in Nivolumab With or Without Ipilimumab in Treating Patients With Previously Untreated Stage I-IIIA Non-Small Cell Lung Cancer (NEOSTAR) phase II randomized trial, Sepesi *et al.* reported 44 patients with stage I to IIIA non-small cell lung cancer (NSCLC), 37 of which underwent resection on-trial (56). Of these 37 resections, 19% were VATS and 8% was robotic, with only 17% (2 patients) of these minimally invasive techniques requiring conversions to open thoracotomy, both being VATS. Surgeons also graded the complexity of operation following neoadjuvant therapy, with "1" being easiest and "4" being very complex. The majority, being 40%, reported surgeries being a grade of 3 or 4, reflecting a more complex procedure compared to a typical lobectomy for stage I disease.

Similar data was reported in Feldman *et al.* study, which reported 124 patients undergoing anatomic lung resection for NSCLC, 107 of which underwent neoadjuvant therapy (57). Of those 124 patients, 17 were minimally invasive, further divided into 9 VATS and 8 robotic. Two of the 9 VATS were converted non-emergently to open, while all 8 were begun and completed as robotic. It is interesting to note those with >30% short axis nodal reduction were associated with greater need for advanced operative maneuvers than those with <30% node reduction.

With all that being said, the use of robotics for lobectomies following neoadjuvant therapy, including both chemoradiation and immunotherapy, has progressed immensely.

Similarly, a 2023 study compared 46 NSCLC patients who underwent neoadjuvant immunochemotherapy followed by surgery, dividing them into 15 robotic and 31 VATS cases (58). The robotic group exhibited no

30-day mortality along with reduced ICU stay. In line with earlier findings, robotic surgery demonstrated better access lymph node yield, on average assessing one more N1 lymph node than VATS. Both robotic surgery and VATS yielded similar surgical outcomes, with no significant differences in postoperative complications.

In this subset of technically challenging lobectomy after neoadjuvant therapy, it is easy to appreciate the benefits of the robotic approach, although more head-to-head comparisons are needed (59,60).

Robotic complex segmentectomies

Recent trials have demonstrated the role of sub-lobar resections, particularly segmentectomy in the management of early-stage lung cancer (61,62). Anatomic segmentectomies are technically more challenging than lobectomies, and complex segmentectomy (also known as atypical segmentectomy) are more difficult than simple (typical) segmentectomy. The robotic approach facilitates performing complex segmentectomies especially those that have multiple intersegmental planes, due to the platform's increased dexterity and advanced imaging capability including the seamless integration of FireFly technology to visualize the intersegmental plane.

In one study from MD Anderson Cancer Center, Zhou *et al.* attributed the increased frequency of anatomic segmentectomy to the increase in their overall robotic operations, and demonstrated that the proportion of complex segmentectomies had increased concurrently. At their institution, the VATS approach was largely utilized for simple segments, and more complex segments were performed robotically (63). The robotic approach was associated with longer operative times but had less estimated blood loss, shorter hospitalization, and required no conversion to VATS or thoracotomy (63). Several other studies have found similar results (64).

As is the case with complex operations, there is a learning curve to mastery. Zhang *et al.* analyzed the learning curve of complex robotic segments (65). In their report, they found that technical competency ensuring safe and comparable outcomes can be achieved after the 40^{th} operation. As experience increases, operative time and intraoperative blood loss decrease.

In terms of cost, some studies have shown the robotic approach to be more expensive while others have shown it to be cost effective (11,66-70). In one study from the University of Alabama at Birmingham, Nasir *et al.* demonstrated that the robotic approach is associated with lower direct costs but higher indirect costs, and although it is more costly overall, it remained profitable for the hospital (67). Another study from Italy, showed similar results (66). The majority of the cost burden appears related to upfront purchasing cost, maintenance, depreciation, and robotic disposables. The profitability is largely from the reduction of hospital stays and personnel cost which in turn results in robotic segmentectomy being cost-effective. All in all, the advantages of the robotic approach in allowing these technically complexity resections with minimal morbidity cannot be overstated.

Robotic giant paraesophageal hernia (PEH) repair

Traditionally performed laparoscopically, the robotic approach offers a safe and effective approach to a complicated surgery associated with historical reports on morbidity and mortality. One of the earliest instances of robotic surgery implementation was depicted in a 2005 study by Braumann *et al.* (71). This study explored the feasibility and effectiveness of implementing robotic techniques on four patients with type 2 and type 3 hiatal hernias. A 2020 literature review by Tartaglia *et al.* contrasted and compared the advantages of robotic surgery with the challenges associated with standard treatment for symptomatic PEH, specifically laparoscopic surgery (72). Notable benefits of robotic surgery included improved control over equipment and hand movements, enhanced visualization, and greater dexterity.

Figure 2 shows an example of a giant PEH repaired robotically without mesh. The patient's symptoms resolved after surgery, and he was discharged home on postoperative day 1.

Galvani *et al.* assessed the safety and feasibility of robotic PEH repair, prospectively examining 61 patients (73). The mean operative time was 186 min. Patients had an average hospital stay of 2.6 days. The study compared their findings with a laparoscopic systematic review study, reflecting comparable results, with higher postoperative complications seen in robotic surgery, possibly attributed to the difficult learning curve associated with such a complex procedure (74).

Giant PEH repairs can be challenging. Sarkaria *et al.* studied 24 patients undergoing robotic surgery for giant PEH, exploring the surgical outcomes (75). The average operative time was 334 min, which decreased by 98 min (275 min) following the 12th procedure. There were no

Figure 2 Large type 4 paraesophageal hernia approached via robotic repair.

conversions into open or laparoscopic, with an average length of stay of 4 days. There were 9 patients suffering from postoperative complications, often multiple complications in the same patient. Of these 9, 4 had major complications, which include pulmonary embolus, septic thrombophlebitis, diarrhea, acute lung injury and C. difficile colitis. Similarly, a study conducted by Seetharamaiah *et al.* conveyed comparable results (12). The report included 19 patients undergoing robotic surgery. The mean operative time was 185 min with 4.3 days average hospital stay. There was 1 conversion case to open repair for partial gastric resection. There were 2 postoperative complications, which included dysphagia requiring dilatation and 1 pleural injury. Finally, Morelli *et al.* reported 6 patients undergoing giant hiatal hernia repair using robotic surgery (76). The mean operative time was 182 min, with a mean hospitalization stay of 6 days. There were no postoperative complications or symptoms.

All in all, similar to other complex surgical techniques, robotic surgery for giant PEH provides enhanced visualization, control, and dexterity. While studies indicate that robotic surgery may not necessarily outperform laparoscopic approaches in terms of surgical outcomes, it still offers notable technical improvements (77). However, it still proves to be disadvantageous when it comes to costs. This was displayed by Kulshrestha's *et al.*, in which the authors reported robotic surgery having comparable clinical outcomes, but a higher index cost when compared to laparoscopic surgery (78). In another study, Kulshrestha *et al.* described the existence of a 2-fold variation between diaphragmatic hernia repair costs between various hospitals (79). This highlights the need for a holistic approach that includes clinical outcome and cost-effectiveness when it comes to choosing a treatment modality. A study comparing the cost-effectiveness of robotic and laparoscopic approaches for PEH found laparoscopic surgery to be a more feasible option (80). When compared, and after excluding capital and maintenance costs, robotic surgery exhibited a slightly higher cost and comparable quality-adjusted life years, indicating a need for further evaluation.

Esophagectomy and esophageal enucleation

The robotic approach has also been employed for benign and malignant diseases of the esophagus. After the initial case report by Elli *et al.* on using a robotic approach for esophageal enucleation to leiomyomas, multiple other studies concur that the robotic approach provides a safe, feasible, and effective alternative to the VATS or open approach (81-84).

For esophagectomy, the robotic approach has also been increasingly used, and it is applicable for all types including Ivor-Lewis, McKeown and transhiatal esophagectomy. In a meta-analysis, Zheng *et al.* analyzed 14 studies, encompassing 2,887 patients with 1,435 robotic (RAMIE) and 1,452 VATS/laparoscopic (MIE) (85). Although the operative time was higher with RAMIE (mean difference of 46 min), the incidence of complications such as pneumonia and vocal cord palsy was lower for RAMIE versus MIE. This can be attributed to the enhanced 3D visualization provided by robotic techniques, coupled with improved dexterity. However, there was a trend for increased occurrence of anastomotic leaks in RAMIE patients (odds ratio =1.11; 95% confidence interval: 0.75–1.62). The reasons for this trend may be due to increased operative time and/or overzealous proximal dissection. There were no differences in 30- and 90-day mortality rates.

Another meta-analysis conducted in 2023 delved into the comparative surgical outcomes between RAMIE and MIE (86). This comprehensive study encompassed 2,932 patients, further stratified into 1,418 RAMIE and 1,514 MIE patients. No statistically significant differences emerged between the two groups concerning operative time, length of hospital stay, and 30- and 90-day mortality rates. However, congruent with the earlier investigation, RAMIE

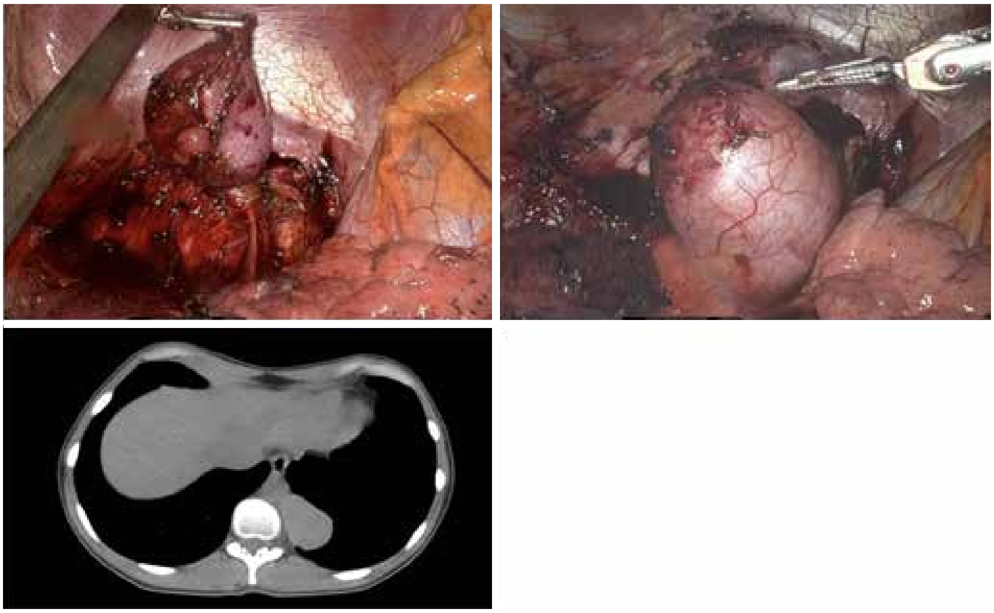

Figure 3 Posterior mediastinal mass resected via left sided robotic approach.

exhibited a lower incidence of postoperative complications, including pneumonia. For long term outcomes, although no significant difference existed with regards to overall survival between both groups, the 3-year disease-free survival was significantly higher in RAMIE patients, at 78% compared to 71% seen with MIE (odds ratio =1.42; 95% confidence interval: 1.11–1.83). RAMIE also demonstrated greater lymph node harvesting ability, specifically for total, abdominal, and those along the left recurrent laryngeal nerve, when compared to MIE patients.

The most notable advantages for RAMIE over standard MIE that have been consistently reported are the increased lymph node yields with RAMIE, likely attributed to superior reach and visualization capabilities (87,88). This may be one reason for the improved survival for RAMIE.

Robotic surgery for mediastinal mass resection and thymectomy

The enhanced maneuverability and improved visualization offered by robotic surgery facilitates advancements in treating various pathologies located within the mediastinum, including thymomas, substernal goiter, pericardial cysts, and neurogenic masses such as schwannomas (89,90). Robotic approaches to mediastinal masses can be via a lateral transthoracic approach or a subxiphoid approach, and uniportal or multiportal. *Figure 3* shows an example from our experience of a posterior mediastinal bronchogenic cyst resected via a robotic left transthoracic approach. The patient did well and was discharged home on day 1.

The choice of whether to pursue a subxiphoid or lateral thoracic robotic approach depends on surgeon preference largely. In a study of 116 patients, Hong *et al.* had 52 patients who underwent subxiphoid robotic surgery for anterior mediastinal tumors, while 64 patients underwent a lateral thoracic approach (91). There was no statistical significance between both groups with regards to operative time, postoperative complications; however, the subxiphoid process offers more advantages with regards to total postoperative drainage, drainage time, and postoperative hospital stay. The number of cases needed to reach a plateau in terms of learning curve and technical skill employing the subxiphoid approach was 10–20 cases. All in all, the subxiphoid approach seems to be a feasible alternative that may be associated with reduced postoperative patient pain.

Other studies demonstrate the effectiveness of a three-port and bi-portal robotic approach (92,93). Recently, more advancements have been made regarding a single-port robotic approach to mediastinal masses and pathologies. Park *et al.* retrospectively reviewed 14 single-port robotic surgery cases, 4 of which were thymomas and 3 were pericardial cysts (94). The median operative time was 105 min, with a median hospitalization stay of 4 days. There were no conventional multiport or open surgery conversions. In another study of theirs, Park *et al.* report 17 robotic surgeries done using single-port, 8 of which were thymomas and 6 were cystic lesions (95). Of these 17, 11 were subxiphoid and 6 were transthoracic (subcostal and intercostal). The median operative time was 120 min, with a median hospitalization stay of 3 days. There were no postoperative complications nor were there any conversions to multiport or open surgery.

Similarly, multiple case studies report comparable findings regarding the use of a single-port robotic platform. Ishikawa *et al.* report the implementation of transthoracic single port robotic surgery on a 50-year-old male with a mediastinal tumor, while Shidei *et al.* report its use in a 39-year-old male with anterior mediastinal mass caused by multiple endocrine neoplasia type 1 (96,97). In both reports, a single-port robotic platform proved to be a safe alternative that offers enhanced maneuverability and dexterity when handling mediastinal tumors, allowing for good clinical and cosmetic outcomes.

Lastly, a noteworthy contribution comes from a meta-analysis and systematic review conducted in 2021, focusing on the examination of complications arising from robotic-assisted thymectomies. In this comprehensive study, Xu *et al.* examined 21 distinct studies, collectively including a cohort of 930 patients (98). This patient pool was stratified based on the side of surgical entry, left and right. Their finding indicated that a left-sided approach held distinct advantages in terms of reduced complication rates when juxtaposed against the right-sided counterpart. The cumulative incidence of complications was 12%; specifically, procedures performed on the left side exhibited an overall complication rate of 7%, while procedures executed on the right side demonstrated a significantly higher complication rate of 17%. Among the range of complications ensuing from robotic-assisted thymectomies, notable occurrences included pleural effusion, air leaks, thoracic duct fistulas, atrial fibrillation, and instances requiring open conversion.

Robotic surgery for lung transplant

There are a few studies examining the use of minimally invasive video-assisted techniques for lung transplantation (99,100); In a case series consisting of 8 patients, Emerson *et al.* reported the use of robotic lung transplantation on patients with obstructive and restrictive pathologies (101). Initially done as a right sided lung transplant for a 69-year-old patient with chronic obstructive pulmonary disease (COPD), robotic transplantation proved safe. The patient had an uneventful postoperative course, and although a mild primary graft dysfunction at 24 hours and atrial fibrillation occurred, both were resolved and treated. The remaining 7 cases reflected a successful implementation of robotic transplantation, with one case requiring an open conversion, and two cases requiring traditional open pulmonary artery anastomoses. Emerson *et al.* also reported warm ischemic times trending down significantly, from 111 min initially to around 60 min in most recent cases. All in all, patients experienced no major intraoperative complications, and are all alive at the time this was reported. Although reflecting a successful outcome, they emphasize the amount of time taken to plan and execute a robotic transplant, starting from discussions with the patient to application of technique. However, there is promise and potential to the teachability of this technique to residents and trainees.

Another case report exists on a robotic lung transplantation performed on a patient with COPD (102). After providing a detailed explanation of the procedure, Jiao *et al.* concluded that a robotic approach with four ports provides significant benefits in managing complex procedures such as lung transplantation (102). They emphasized the role of enhanced maneuverability and dexterity. The study highlighted the efficacy of using a robot to handle anastomoses, including those involving the bronchus, pulmonary artery, and left atrium, comparing its ease and importance with the more cumbersome traditional open procedure. There have been several groups in the US and Spain that have also adopted robotic lung transplantation featured in lay media (103,104).

Although very limited, these offer insights into the potential for robotic surgery to bring greater benefits and advancements to the field of lung transplantation. Further research in this area could potentially lead to more widespread adoption and refinement of robotic techniques.

Summary and limitations

To summarize, robotic surgery provides a multitude of benefits when compared to VATS or open approaches across many types of operations. In each section of this narrative review, we highlight the strengths and advantages pertaining to that complex presentation. In addition to the aforementioned advantages of better visualization, enhanced maneuverability, and reduced surgeon fatigue, robotic surgery allows the surgeon to “mimic an open approach”, and provide the surgeon with the rare ability to be inside the chest without opening it (105-107).

In addition, robotic surgery also offers better pain control, faster recovery rates with improved cosmesis. In most procedures, it proved to have comparable short-term outcomes with its VATS counterpart. For specific procedures, such as lobectomy following neoadjuvant therapy, and esophagectomy, robotic surgery allows for better lymph node harvest and handling of complex anatomy and nodal regression.

On the other hand, the robotic platform does have some important disadvantages. Across the majority of these complex operations, cost was a major concern, limitation and potential obstacle for increased adoption. Although some reports demonstrated a net profit at the hospital level, the upfront cost and other hidden costs need to be considered. For many applications, there is no data on cost yet. Although outcomes are comparable (or better), robotic surgery is associated with longer operative times compared to other approaches, and a real learning curve that varies between indications. Although some require a few operations to start achieving similar outcomes, a minority of operations necessitate a large number before the surgeon reaches proficiency and comparable results.

This review has various limitations. Firstly, a good percentage of literature included retrospective studies. These studies are subject to both selection and confounding bias, which could alter the results reported. Some studies have mentioned this, but others did not, meaning there was no way to document if it was accounted for. Second, several studies in the same category are authored by the same individual, as they followed up on their previous studies. This raises concerns about reporting bias, affecting the results reported. Third, our inclusion criteria may have been too general, with a need to include more specific parameters for literature retrieval. For example, there was a huge variation in the sample size between some studies, meaning a clear definition of the minimum or maximum size could have been implemented. Also, the exclusion of non-English studies could have removed literature that was prominent and beneficial for this review. However, we believe our review encompasses the latest updates on robotic surgery implementation on various complex thoracic operations, with relevant and cohesive reports. Finally, as this is a narrative review that is largely focused on innovation and the application of technological advancements to complex thoracic problems; we believe it necessary to include small case reports and case series for operations where the use of the robotic approach may have been innovative at the time, and limited data existed.

Future direction

First of all, the robotic platform used almost exclusively in this narrative review is the DaVinci platform by Intuitive (Sunnyvale, CA, USA). The newest product from this company is the Single Port (SP) system which has not yet become mainstream for thoracic operations (95,108). The SP can introduce several advantages owing to its single port design, although it would most likely require sub-xiphoid placement rather than a trans-thoracic intercostal placement. Several other companies are also introducing their own robotic platforms such as Versius by CMR Surgical (Cambridge, UK), Hugo by Medtronic (Dublin, Ireland) and Ottave by Johnson & Johnson Auris (Redwood City, CA, USA) to name a few (1).

The dramatic evolution of artificial intelligence over the past few years may even suggest a future where robots become autonomous during the entirety of the operation. Currently, as seen in Senhance surgical system (Durham, NC, USA), artificial intelligence integration moves the camera in response to surgeon's movement, provides 3D measurement and digital tagging, and anticipates what the surgeon aims to locate and adjusts accordingly (109). Other avenues of robotic surgery evolution include miniaturized platforms that allow for small robotic devices, and soft robotics that conform to curvilinear paths in space.

Conclusions

Robotic thoracic surgeons continue to push the envelope by using robotic minimally invasive techniques for the spectrum of complex thoracic pathology. The robotic approach is safe, effective, and associated with improved patient outcomes. The most consistently reported advantages are lower rates of conversion to open, and improved lymph node harvest. This review provides several insights on the ubiquitous and intuitive ability of the robotic platform to encompass even the most complex of thoracic problems. To encourage wider adoption of robotic technology, increased training and expanded research efforts are essential, along with improved worldwide access to this technology.

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Footnote

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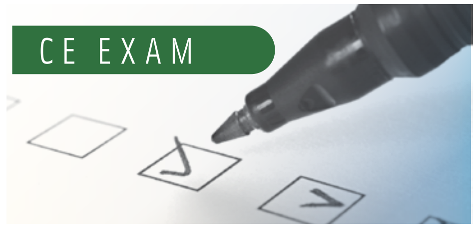

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Tackling complex thoracic surgical operations with robotic solutions

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1. Similar to other complex surgical techniques, robotic surgery for giant PEH provides enhanced:
- a. Visualization
- b. Control
- c. Dexterity
- d. All of the above

2. True or false: In conjunction with neoadjuvant therapy, the robotic approach has repeatedly been shown to be associated with less conversion to open when compared to VATS.
- a. True
- b. False

3. The robotic approach facilitates performing complex segmentectomies especially those that have multiple ______ planes.
- a. Atypical
- b. Simple
- c. Complex
- d. Intersegmental

4. The enhanced maneuverability and improved visualization offered by robotic surgery facilitates advancements in treating various pathologies located within the mediastinum, including:
- a. Substernal goiter
- b. Schwannomas
- c. Thymomas
- d. All of the above

5. For TOS, different types of open approaches have been described which include:
- a. Transaxillary
- b. Supraclavicular
- c. Both and b
- d. Neither a nor b

6. Notable improvements in robotic thoracic surgery include:
- a. 3-D views with steady magnification
- b. Wristed instruments providing enhanced maneuverability
- c. Reduced surgeon fatigue
- d. All of the above

7. Which process allows unparalleled exposure and visualization of the first rib?
- a. Open
- b. Robotic
- c. Both are the same access
- d. Robotic only allows visualization

8. For one study analyzing sleeve lung resection, there were several drawbacks related to robotics including:
- a. The challenge of tactile sensation
- b. A comparatively higher number of incisions
- c. Increased cost per procedure
- d. All of the above

9. In one study analyzing nTOS patients, the authors reported that ___ achieved complete symptom relief following the procedure.
- a. 90%
- b. 95%
- c. 97%
- d. 100%

10. The pillars of success afforded by robotics in carinal surgery include:
- a. Secure anastomosis
- b. Longer hospital duration
- c. Increased surgeon performance
- d. Increased recovery

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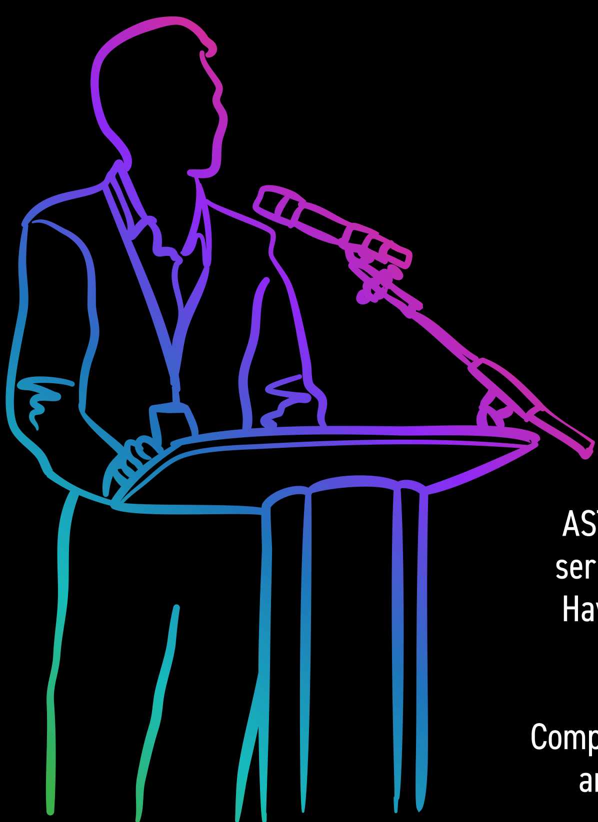

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ALABAMA STATE ASSEMBLY

Program Type: Workshop
Date: September 14, 2024
Title: CST, Waves of Wisdom
Location: Flowers Hospital, 4370 W Main St, Dothan, AL 36305
Contact: Jessica Sirmon, 4208 Idlewood Dr, Pensacola, FL 32506, 850-418-0739, hollimangirl35@gmail.com
CE Credits: 8

CALIFORNIA STATE ASSEMBLY

Program Type: Workshop
Date: July 27, 2024
Title: Northern Exposure Location: Stanford Newark Campus, 7600 Gateway Blvd, Newark, CA 94560
Contact: Jessica Ramirez, 408-910-2146, jessica22ten@yahoo.com
CE Credits: 5

Program Type: Annual Meeting/Elections
Date: October 12, 2024
Title: Certified Surgical Technologist "Leap into the Future"
Location: UCLA Santa Monica Medical Center Auditorium, 1250 16th St, Santa Monica, CA 90404
Contact: Sabrina Arreaga, 818-288-6917, ca.sastateassembly@gmail.com
CE Credits: 7

COLORADO/WYOMING STATE ASSEMBLY

Program Type: Webinar (approved only Colorado/Wyoming State Assembly members)
Date: September 7, 2024
Title: Getting Groovy
Contact: Julie Beard, 700 North Colorado Blvd, Denver, CO 80206, information@coloradoast.com
CE Credits: 3

Program Type: Annual Meeting/Elections
Date: October 26, 2024
Title: Getting into Some Spooky Business
Location: TBA
Contact: Julie Beard, 700 North Colorado Blvd, Denver, CO 80206, information@coloradoast.com
CE Credits: 5

FLORIDA STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: September 28, 2024
Title: Fall Fest 2024: Annual Business Meeting and Workshop Location: Sheraton Orlando North Hotel, 600 N Lake Destiny Dr, Maitland, FL 32751
Contact: Stephanie Hurst, 772-538-1230, flsastateassembly@gmail.com
CE Credits: 6

GEORGIA STATE ASSEMBLY

Program Type: Workshop
Date: September 14, 2024
Title: West Georgia Autumn Workshop
Location: West Georgia Technical College - Murphy Campus, 176 Murphy Campus Blvd, Waco, GA 30182
Contact: Erin Baggett, 678-226-6943, gasawebmaster@gmail.com
CE Credits: 8

MICHIGAN STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: September 28, 2024
Title: Forever Changing with MSA
Location: Fischer Hall, 613 S Main St, Frankenmuth, MI 48734
Contact: Renona Gauthier, michiganassemblyofast@gmail.com
CE Credits: 5

MONTANA STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: September 7, 2024
Title: MTSA Annual Business Meeting/ Elections and Workshop
Location: Benefis Health System, 1101 26th St South, Great Falls, MT 59405
Contact: Marsha Lyles, 406-670-8376, mnmcst@yahoo.com
CE Credits: 6

NEW MEXICO STATE ASSEMBLY

Program Type: Workshop
Date: September 28, 2024
Title: Fall Into Surgery Workshop
Location: UNMH North Campus; Domenici Center Auditorium, 1001 Stanford Drive NE, Albuquerque, NM 87131
Contact: Ruth Borah, PO Box 66496, Albuquerque, NM 87193, 848-391-3661, ruth.kerrjusinski@gmail.com
CE Credits: 5

NORTH CAROLINA STATE ASSEMBLY

Program Type: Workshop
Date: October 26, 2024
Title: NCSA Fall Workshop
Location: Novant Health New Hanover Regional Medical Center, 2131 S 17th St, Wilmington, NC 28401
Contact: Brittany Toth, 6911 McNeely Road, Waxhaw, NC 28173, 507-720-1892, ncsaast@gmail.com
CE Credits: 7

PENNSYLVANIA STATE ASSEMBLY

Program Type: Annual Meeting/Elections
Date: September 14, 2024
Title: PA State Assembly Fall Workshop with Business Meetings and Elections
Location: UPMC West Shore Campus / Fredrickson Center Room G08, 2005 Technology Pkwy,
Medical Office Building #2, Mechanicsburg, PA 17050
Contact: Christopher Kapp, 120 Railroad St, Duncannon, PA 17020, 717-856-1278, kappcj@upmc.edu
CE Credits: 5

VIRGINIA STATE ASSEMBLY

Program Type: Workshop
Date: July 13, 2024
Title: VCSA Summer Mini Workshop
Location: Fauquier Hospital, 500 Hospital Dr, Warrenton, VA 20186
Contact: JaLynda Buckingham, 540-323-2048, virginiastateassembly@gmail.com
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2024 BOD Elections
& 2025 Delegate Elections

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TBA
October 26, 2024
Annual Meeting
2024 BOD Elections
& 2025 Delegate Elections

FLORIDA
Maitland
September 28, 2024
Annual Meeting
2024 BOD Elections
& 2025 Delegate Elections

MICHIGAN
Frankenmuth
September 28, 2024
Annual Meeting
2024 BOD Elections
& 2025 Delegate Elections

MONTANA
Great Falls
September 7, 2024
Annual Meeting
2024 BOD Elections
& 2025 Delegate Election

PENNSYLVANIA
Mechanicsburg
September 14, 2024
Annual Meeting
2024 BOD Elections
& 2025 Delegate Elections

Program Approvals: Submit the *State Assembly Program Date Request Form A1* no less than 120 days prior to the date(s) of the program for AST approval. The form must be received prior to first (1st) of the current month for program publication in the next month of the AST monthly journal *The Surgical Technologist*. The *Application for State Assembly CE Program Approval A2* must be received at least thirty (30) days prior to the date(s) of the program for continuing education credit approval. An application submitted post-program will not be accepted; no program is granted approval retroactively.

Contact stateassembly@ast.org or 800.637.7433, ext. 2547.

ADVOCATE FOR YOURSELF.

AST
Association of Surgical Technologists

You advocate for your patients – no question. Now it's time to advocate for the critical role you play as a key member of the surgical team and how important your role is to patient safety.

AST developed a toolkit specifically for surgical technologists to use when you're explaining just how crucial is it that certified surgical technologists earn education from an accredited program thus making them eligible to sit for the national certifying exam and earn the distinguished CST credential. Scan the QR code to access documents, AST position statements and other resources you need to keep advocating for the profession.

AST Position Statement on Accreditation, Certification, Official Title of Profession, and On-the-Job Training

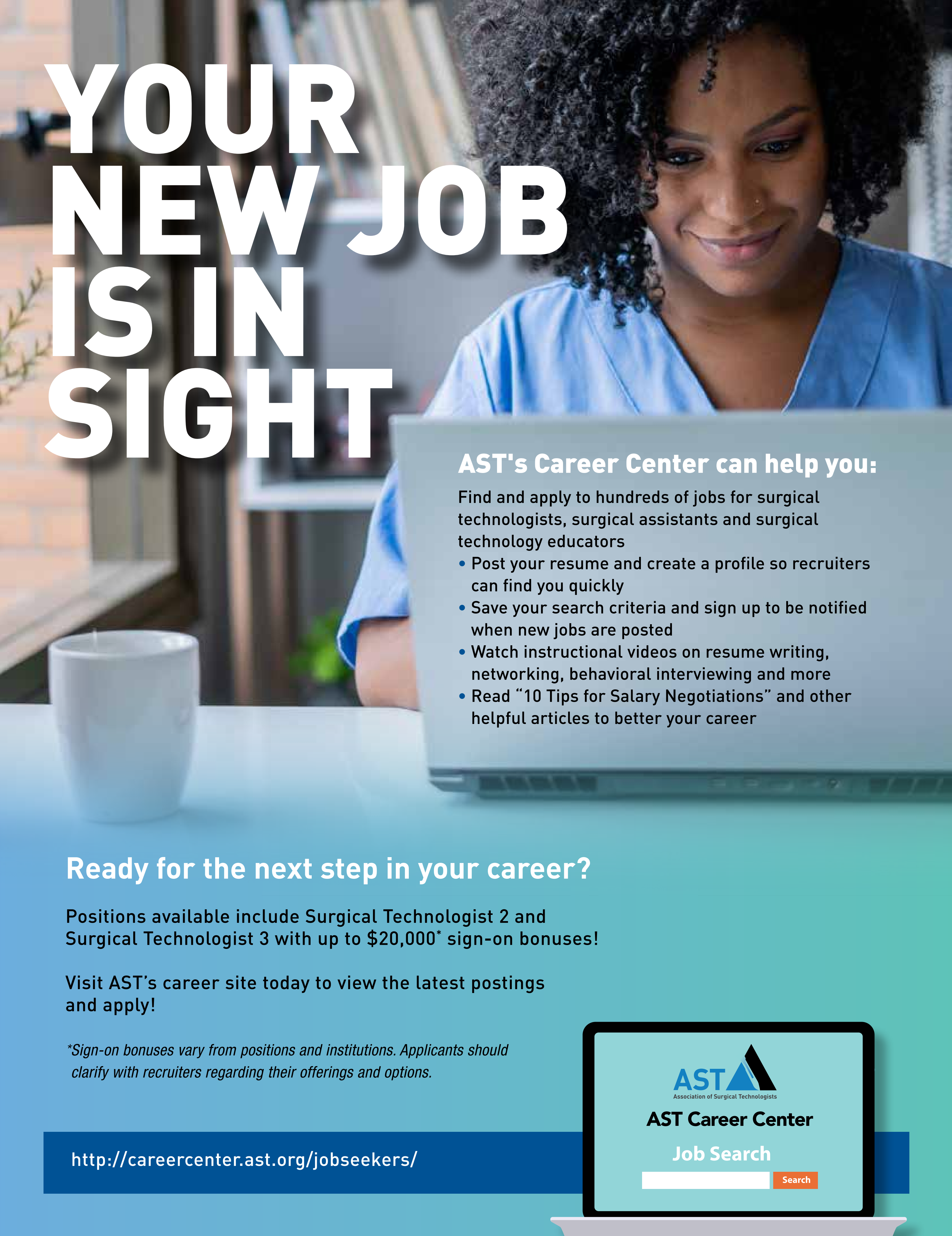
American College of Surgeons Statement on Surgical Technology Training and Certification

Council on Surgical & Perioperative Safety Statement in Support of CST

Interested in serving on a medical mission?
Check out our Medical Missions page with details and resources,
and start planning your pathway to assist those in need.

Visit www.ast.org - About Us - Medical Missions

AST
Association of Surgical Technologists



YOUR NEW JOB IS IN SIGHT
AST's Career Center can help you:
Find and apply to hundreds of jobs for surgical technologists, surgical assistants and surgical technology educators
• Post your resume and create a profile so recruiters can find you quickly
• Save your search criteria and sign up to be notified when new jobs are posted
• Watch instructional videos on resume writing, networking, behavioral interviewing and more
• Read "10 Tips for Salary Negotiations" and other helpful articles to better your career
Ready for the next step in your career?
Positions available include Surgical Technologist 2 and Surgical Technologist 3 with up to $20,000* sign-on bonuses!
Visit AST's career site today to view the latest postings and apply!
*Sign-on bonuses vary from positions and institutions. Applicants should clarify with recruiters regarding their offerings and options.
http://careercenter.ast.org/jobseekers/
AST
Association of Surgical Technologists
AST Career Center
Job Search
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CONTINUING EDUCATION

Choose any nine articles and we will be happy to send them out free of charge. Return the answer sheets provided with the appropriate processing fee—only $6 per credit (not per test) for members, $10 per credit (not per test) for nonmembers. AST automatically records the returned CE credits for AST members.

Parotidectomy with Facial Nerve Dissection — 1 CE

Radiostereometric Analysis in Orthopaedic Surgery — 1 CE

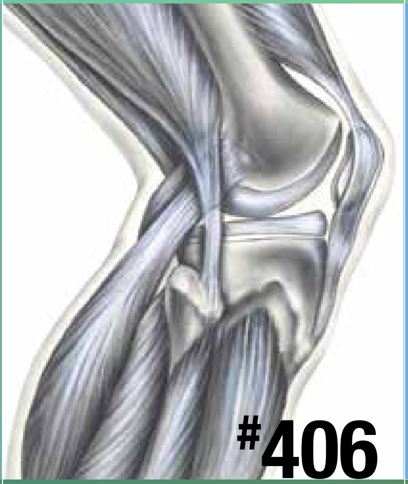
The Modern-Day Caesarean Section — 1.5 CEs

The Economic Argument for Using Safety Scalpels — 2 CEs

Emergency Department Visits and the Public Health — 2 CEs

Staged Rapid Source Control Laparotomy in Emergency General Surgery — 1 CE

Functional Endoscopic Sinus Surgery with Image-Guided Navigation — 1 CE



PJACT: Treating Articular Cartilage Defects — 1 CE

AST has even more continuing education opportunities available in print and online. We will be adding more continuing education credits on a continual basis, and the lists that are published in the Journal will be rotating on a quarterly basis so that we can provide more CE credits in a range of specialties.

Other articles, as well as archived conference and forum presentations, are easily accessible on the AST Web site, http://ceonline.ast.org. And there are three free CE opportunities for AST members to earn continuing education credits online—be sure to check them out.

To order please visit: **http://ceonline.ast.org/articles/index.htm**
or contact Member Services at **memserv@ast.org** or fax requests to 303-694-9169
or call Member Services at 800-637-7433.

Returned CE tests cost:
Members $6 per CE
Nonmembers $10 per CE, plus $400 Nonmember Fee

OPPORTUNITIES

Surgical Rib Fixation
1 CE

Butterfly Graft in Functional Rhinoplasty
1 CE

Micromotion at the Tibial Plateau in Total Knee Arthroplasty
1.5 CEs

Disc Battery Ingestion in Pediatric Patients

Partial Nephrectomy
2 CEs

Emotional Intelligence and the Surgical Technologist
2.5 CEs

Cervical Arthroplasty
1.5 CE

Treating Glioblastoma Multiforme
1 CE

ORDER FORM

❑ Member ❑ Nonmember

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Name ______________________

Address ______________________

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Next year's AST Surgical Technology Conference will be so bright, you'll need to wear shades.
Save the date and get ready to soak up the sun, fun, friends, and Florida hospitality in beautiful Orlando.
Orlando
June 5-7, 2025
AST
Association of Surgical Technologists