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Robotic Surgery Programs

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Key takeaways

- Investments into surgical robots climb as health systems look to expand capacity, remain competitive, and recruit new physicians.
- Robotic surgery benefits remain controversial due to longer operating times and lower margins, yet convincing skeptical surgeons of its benefits over laparoscopic techniques is critical for program growth.
- Robotic surgery programs require buy-in from multiple stakeholders, including a physician champion, robotic coordinator, robotic steering committee, trained pit crew of staff, and program director.
- Standardization and increasing utilization are critical to achieving a strong return on a robot investment—making data tracking, strong program leadership, and rigorous credentialing pathways necessary.
- Reassuring patients of robotic surgery safety is imperative through consumer-friendly messaging, community engagement events, and center of excellence branding.

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TABLE OF CONTENTS

What they are

Robotic surgery programs are centers or services dedicated to surgeries performed with the assistance of a robotic system. These programs focus on soft tissue surgeries for areas of the body between the pelvis and neck, including urology, gynecology, general surgery, head and neck, and cardiothoracic specialties. As robot-assisted surgeries have become more widely adopted across different specialties, the number of health systems investing in one or more surgical robots has grown substantially. From 2016 through 2019, the number of hospitals operating five or more da Vinci systems at a single campus grew more than 400%. And, as of December 31, 2020, there were 3,720 da Vinci systems installed in the U.S.

Health systems invest in surgical robots for different reasons. Often, larger health systems invest to increase bed capacity since robotic surgeries have a lower length of stay. Many smaller, community organizations invest to differentiate themselves in their market and attract new physicians.

Main suppliers

There are several suppliers in the surgical robotics market including Intuitive Surgical, Inc., Stryker, Accuray, Smith & Nephew, and Mazor Robotics.[1] However, with a 77% market share, Intuitive Surgical, the manufacturer of the da Vinci surgical system, has a lead on the global robotic surgery market.[2] Other industry leaders, such as Medtronic and Johnson & Johnson, are bolstering their robotic surgery investments and are poised to compete with Intuitive. By 2025, the global robotic surgery market size is projected to exceed $24 billion.

$24B

Estimated global market size for surgical robots by 2025

Source: "2020 Annual Report," Intuitive Surgical, https://isrg.intuitive.com/static-files/80b10bf5-c1da-4ad3-bb0e-8c595e2c712c; "2019 Annual Report," Intuitive Surgical, https://isrg.gcs-web.com/static-files/31b5c428-1d95-4c01-9c85-a7293bac5e05; "Surgical Robots Market Size by Component, by Application, by Enduser, Industry Analysis Report, Regional Outlook, Application Potential, Competitive Market Share & Forecast, 2019 – 2025," Global Market Insights, https://www.gminsights.com/industryanalysis/surgical-robots-market; "Intuitive Surgical has 77% of the robotic surgery market, but competition is growing," Becker's Spine Review, https://www.beckersspine.com/orthopedic-a-spine-device-a-implant-news/item/48902-intuitive-surgical-has-77-of-the-robotic-surgery-market-but-competition-is-growing-7-observations-for-spine-orthopedics.html; "Top 10 Robotic Surgery Companies in the United States," iData Research, https://idataresearch.com/top-robotic-surgery-companies-in-the-united-states/; Advisory Board research and analysis.

1. Acquired by Medtronic in December 2018.
2. As a result of Intuitive Surgical's large market share, the health systems we interviewed supported da Vinci platforms in their robotic surgery programs. Therefore, this program guide is centered around the use of da Vinci platforms.

Site of care

Most surgeries performed robotically take place in the hospital setting and are billed as inpatient procedures. Some procedures, such as gallbladder surgeries and hernia repairs, can result in a patient stay of under 24 hours and may be billed as outpatient procedures. Many health systems are interested in moving surgical robots to ambulatory surgery centers (ASCs), but few have done so thus far because of the lower reimbursement and high costs of robotic surgery. Those that have successfully placed a surgical robot in an ASC often take a macro-level perspective on the financial benefit. By shifting low-margin procedures to outpatient sites, they can open inpatient capacity for high-margin, more complex procedures, such as thoracic, colorectal, and cardiovascular surgeries.

Volume forecast

Robotic surgery volume forecasts vary by specialty and adoption status. As early adopters, urology and gynecology are expected to see sustained robotic surgery growth since eligible procedures have already shifted to robotic platforms. General surgery, on the other hand, only started shifting procedures to robotic platforms in the past five years and is now experiencing substantial adoption and growth. In 2019, the use of da Vinci for general surgery procedures in the U.S. grew 30%.

Read the related resource on the right, “Robotic eligible procedure map,” for more details on the inpatient and outpatient adoption status of robotic-eligible procedures and their associated national volume estimates. This resource also defines all of Intuitive Surgical’s robotic eligible procedures and connects them to the Advisory Board’s service line definitions and associated MS-DRG codes.

Percentage of general surgery procedures performed robotically[1]

Data from a cohort study of 73 U.S. hospitals

n = 169,404 procedures

Related resource

Robotic eligible procedure map

Read now

1. According to a 2019 cohort study of 73 hospitals analyzing clinical registry data from Michigan Surgical Quality Collaborative of all inpatient and outpatient general surgical episodes.

Source: “Trends in the Adoption of Robotic Surgery for Common Surgical Procedures,” JAMA Network, https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2758472; “Q4 2020 Unaudited Preliminary Revenue Procedures and Other Metrics,” Intuitive Surgical, https://isrg.intuitive.com/static-files/a095ba78-a45a-464f-8841-ddeea8fdac05; Advisory Board research and analysis.

What distinguishes them

One of the largest barriers providers face in implementing robotic surgery programs is the high up-front and recurring costs. These high costs make it challenging for programs to justify the cost of a robot investment since realizing a strong financial return is not black and white.

Common costs of a robotic surgery program

Up-front costs

- Cost of robot acquisition: $2M
- Surgeon training: $6K per surgeon
- OR renovation: varies by institution

Recurring costs

- Annual maintenance fee: $100K—170K
- Supply costs: $2K—2.5K per procedure
- Additional OR time: varies by procedure
- Annual marketing: $25K on average
- Additional FTEs, such as robotic coordinator, first assists, and director: average annual salary of $50K—$110K per individual

Further complicating the financial benefit of robotic surgery programs are the reimbursement rates. The reimbursement rates for robotic surgery are the same as laparoscopic and fail to offset the additional costs of these procedures. There are coding modifiers, such as the HCPCS modifier S2900 for CPT codes and a letter "C" in the secondary code's sixth character position for ICD-10 codes, to indicate robotic surgery, but these are mostly for tracking purposes since payers reimburse for the primary laparoscopic procedure performed. Some high-acuity procedures, such as thoracic, colorectal, and cardiovascular surgeries, see higher contribution margins than urology and gynecology, provided variable costs, especially length of stay, are kept low. However, outpatient procedures, which have even lower reimbursement rates, often fail to generate positive ROI.

Average robotic procedure contribution margin as a percent of total case reimbursement[1]

Data from Temple University Hospital, FY15

n = 696

38%
Inpatient

-88%
Outpatient

1. Contribution margin, defined as total revenue minus all variable costs, as a percentage of total surgical reimbursement. Includes all patients who underwent any robotically assisted surgical procedure at Temple University Hospital (TUH) in fiscal year 2015

Source: "Financial impact of adapting robotics to a thoracic practice in an academic institution," Journal of Thoracic Disease, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7061187/; "Robotic Assisted Surgery," Florida Blue, https://www.floridablue.com/sites/floridablue.com/files/docs/Robotic%20Assisted%20Surgery%2010-030%202020.pdf; "Program Manager (4330U) – CITRIS," MPA, https://jobs.magazine.org/jobs/14546389/program-manager-4330u-citris; "Robotic Surgery Coordinator Salaries," Glassdoor, https://www.glassdoor.com/Salaries/robotic-surgery-coordinator-salary-SRCH_KO0,27.htm; "Coding ICD-10-PCS Medical and Surgical-Related Sections," Journal of AHIMA, http://bok.ahima.org/doc?oid=107364#.YGyE2OhKg2x; "What is the cost of robotic surgery as compared to other traditional surgery," Cedars Sinai, https://www.marinahospital.com/faq/cost-of-robotic-surgery-as-compared-to-other-traditional-surgery; "Robot-Assisted Surgery Compared with Open Surgery and Laparoscopic Surgery: Clinical Effectiveness and Economic Analyses [Internet]," NCBI, https://www.ncbi.nlm.nih.gov/books/NBK168933/table/T16/; Advisory Board research and analysis.

Some robotic surgery program leaders speculate the main reason why reimbursement rates have not increased to reflect the higher costs of robotic procedures is because their benefits over laparoscopic techniques remains controversial. The advantages of robotic surgery—shorter length of stay, lower rates of complications, less pain, better ergonomic positioning for surgeons, and less blood loss—are significantly better than open procedures. However, more research is needed to clarify how robotic surgery is superior to laparoscopic techniques since the advantages are similar.

As a result, driving adoption among laparoscopic surgeons disinterested in robotic surgery can be challenging. Surgeons often cite the steep learning curve, uncertain financial benefits, longer OR time, and similar clinical outcomes to laparoscopic surgery as reasons why they are hesitant to adopt robotic surgery. However, to maximize utilization of the robot, programs must expand robotic surgery to more procedures and specialties to grow volumes. Therefore, convincing surgeons from other specialties to adopt robotic surgery is an important part of program growth.

On the contrary, some organizations are faced with a surplus of surgeons interested in robotic surgery. As a result, they must prioritize access for a select group of surgeons. Often these surgeons have high utilization rates and procedure margins, and low instrumentation costs and operating times. Prioritizing access for select surgeons can foster a competitive environment among surgical teams. Being transparent and sharing benchmarked robotic surgery data with all surgeons helps them understand the prioritization process, and surgeons will often try to improve their own outcomes after seeing what other surgeons have done.

In the future, adoption of robotic techniques will likely continue to grow as older surgeons retire and the younger workforce, trained in robotic surgery during residency, begin to fill their positions. Ironically, since the younger workforce will be more comfortable with robotic surgery out of residency, they may need laparoscopic training in the future.

Keys to a successful program

01

ELEMENT

Program structure and infrastructure

02

ELEMENT

Leadership and governance

03

ELEMENT

Care coordination and quality

04

ELEMENT

Marketing and communication

01 Program structure and infrastructure

Set a goal for your robotic surgery program that aligns with the goals of the overall organization. Hospitals invest in surgical robots for several reasons. At a basic level, most organizations decide to invest in a surgical robot to provide their surgeons access to the most innovative clinical technologies and their patients with access to the highest quality care. Secondary goals of a surgical robot investment often vary by organization size. Larger organizations or those operating at capacity may leverage a robotic investment to expand inpatient capacity since robotic surgeries have a lower length of stay. Smaller, community organizations often invest to remain competitive, reassure their community of their commitment to their health, or to attract new physicians. Overall, it is imperative that the goal of the robotic surgery program aligns with your system's goals. This helps organizations achieve buy-in with executives up-front since the financial benefit of these programs is often not black and white.

Treat robotic surgery as a service line or program to achieve standardization. It is best practice to treat robotic surgery as a program, enterprise service, or service line rather than another surgical modality. To standardize services across the program, have all robotic services report up to one umbrella program, as opposed to reporting up through separate service lines. Having clear leadership and defined organization allows for better standardization, which is key in reducing unnecessary costs, such as excess instrumentation use or longer OR times, and reducing surgical variance by surgeon and procedure.

Source: Advisory Board research and analysis

Determine the types of surgeries you want to support. This should largely depend on surgeon availability and preference, but preexisting system strengths and market competition are also important factors to weigh. In a market saturated with robotic surgery programs, offering higher acuity services rather than baseline services may help differentiate a program provided there are staff and resources to support it. For example, Capital Health System, a two-hospital system in New Jersey, was faced with high patient outmigration to neighboring robotic programs. They decided to offer more advanced robotic surgeries, such as complex pancreatic procedures, not offered in nearby counties. As a result, they saw a 600% increase in robotic surgery case volumes performed in one quarter with their Xi da Vinci system.

Comparison of services supported at robotic surgery programs

	Baseline	Intermediate	Advanced
Urology	X	X	X
Gynecology	X	X	X
General surgery		X	X
Colorectal			X
Cardiology			X
ENT			X
Thoracic			X

Select the appropriate site of care for your robotic platform. It's best practice to house your surgical robot in a dedicated operating room to minimize turnover times. Select an operating room with sufficient space that is easily accessible to your robotically trained staff. In a multi-hospital system with a large robotic surgery program, consider prioritizing services at specific sites of care. For example, prioritize higher complexity cases for tertiary sites and lower complexity procedures for community sites.

- **Consider ambulatory surgery center placement.** As procedures continue to shift outpatient—in some cases specifically to ASCs—organizations are starting to consider new site-of-care strategies for robots. The few health systems that have successfully placed a surgical robot in an ASC are large organizations with capacity constraints that take a macro-level perspective on the financial benefit of this investment. They focus on shifting high-volume, low-margin procedures, such as gallbladder surgeries and hernia repairs, to outpatient sites. This allows organizations to increase inpatient capacity for higher margin, higher complexity procedures, like thoracic and colorectal surgeries. Additionally, these organizations often place older models already in their fleet, such as the da Vinci Si platform, in an ASC under lease-based agreements as opposed to buying a new model for these sites outright. Consider a robotic ASC investment as a top-of-site strategy if your organization faces capacity constraints, performs high volumes of outpatient procedures, and has an available OR to house a surgical robot.

Select the optimal robot model. There are multiple surgical robots currently available or soon to be released. The ideal model for your program depends on the services you plan to offer, where the robot will be kept, and the costs you are able to manage.

- A **single port model**, such as the da Vinci's Si and SP models or Medtronic's Hugo robotic-assisted surgery (RAS) system,[1] is designed for deep and narrow access to tissue in the body through a single, small incision. It is thus ideal for some transoral and urologic procedures. Typically, these models are less expensive than multiport models.

- A **multiport model**, such as the da Vinci X and Xi models or Johnson & Johnson's Ottava,[1] can provide more flexibility and support more procedures with multiple robotic arms.[2] These models can be used for colorectal surgery, general surgery, bariatric surgery, gynecology, and urology.

1. These robot models are currently still in development and are not yet being sold.
2. Medtronic's Hugo RAS system is modular, and additional robotic arms may be used to support surgeries where more than one arm is required.

Source: "Medtronic's Surgical Robot Approaches Key Milestones," Medical Device and Diagnostic Industry, site:advisory.com general surgery market trends 2020/; "Johnson & Johnson's new robotic surgical system to rival Intuitive Surgical's da Vinci," Medical Device Network, https://www.medicaldevice-network.com/features/ottava-robotic-johnson/; Advisory Board research and analysis.

Determine whether to buy or lease a surgical robot. Buying a surgical robot outright is about $2 million, which is still the most common method of robot acquisition. However, operating lease models have become more popular, especially in the wake of the pandemic, as hospitals look for financial reprieve. Usage-based models are ideal for longer or infrequent cases, whereas owning or leasing per month is more appropriate for shorter, high-volume cases. Leasing is a practical option when capital expenses may be tied up in other investments, such as construction on a new site, or when a previously leased model needs to be upgraded.

34%

Portion of all da Vinci systems shipped in 2020 under operating lease agreements

15%

Portion of all installed da Vinci systems under operating lease agreements at the end of 2020

Create a dedicated robotic staff "pit crew." A trained "pit crew" helps to optimize turnover and should undergo a credentialing process for robotic surgery, similar to the surgeon credentialing process. This team should include surgical technicians, nurses, first assists, a robotic coordinator, educators, surgeons, and a program director. For academic medical centers, residents often serve as first assists during training.

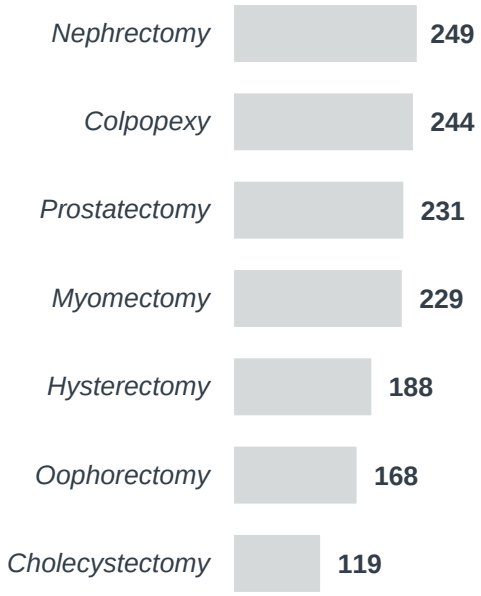
The role of a robotics coordinator is the glue to a robotic surgery program. This person helps train and credential staff, optimizes scheduling, works closely with the vendor representative, drives program growth and standardization, assesses new service opportunities, monitors program performance, and serves as a communication liaison between administrative and clinical staff. Often this role is best served by someone with previous clinical experience. For example, the robotic coordinator at St. Elizabeth's Healthcare, a four-hospital, two-surgery center system with seven Xi robots in Kentucky, was a first assist who became the system-wide coordinator. This person still spends 20% of their time as a first assist, which helps them intimately understand the day-to-day challenges of the program and build trust with the physician and clinical workforce. Ultimately, this person acts as a critical communication channel between administrators and clinicians.

Source: "Q4 2020 Financial Data Tables," Intuitive Surgical, https://isrg.intuitive.com/static-files/35a6a5bb-5246-4cf1-8288-1bdb076640bd; Advisory Board research and analysis.

Optimize robotic surgery scheduling to increase utilization. In a dedicated OR, organize robotic surgery schedules into specialty or procedure block times. Prioritize the shortest case times first to minimize scheduling delays, and schedule like cases back-to-back to prevent longer turnovers. Send out email blasts to staff if a time slot becomes available to prevent underutilization.

If faced with high demand, consider offering extended hours of operation or prioritizing access for certain specialties or surgeons. If surgeon prioritization is necessary, select for high-utilization surgeons based on volumes, operating times, and outcomes, with the knowledge that this is likely to produce a competitive environment among surgeons. In these conversations, be transparent and up-front about the data used to make this decision.

Average robotic procedure lengths in minutes[1]



Grow your program by evaluating new service opportunities or additional robotic platforms.

- **Evaluate new service opportunities.** After the initial phases of program development, organizations often look to grow their program and increase utilization of the robot. This requires careful planning to identify the highest opportunity services and to overcome resulting barriers.
  - **Select services to target for volume growth.** Identify clinically appropriate surgeries that would benefit from adoption on the robot, such as those with a high portion of open cases, long lengths of stay, high contribution margins, or interested surgeons. Program growth is contingent on expanding the utilization of the robot across more procedures and specialties, but before pursuing a new specialty, it is critical to get surgeons on board. If faced with uninterested surgeons, see page 22 of this guide for how to communicate the benefits of robotic surgery to skeptical surgeons.

1. Robotic procedure lengths are averages across a cohort of over 182 facilities from Optum's Surgical Profitability Compass database. Individual institutions may vary in the length of robotic procedures across these categories.

Source: Optum's Surgical Profitability Compass cohort database. Advisory Board research and analysis.

  - **Evaluate the growth potential of selected services.** Assess population demographics and incremental volume growth potential for any new services. Identify market competition that might impede net volume growth following new surgeon credentialing. A surgeon who is not employed and performs surgeries at other sites in a saturated market may limit growth.

  - **Overcome barriers to implementation.** Asses the additional costs of new instruments and OR time for selected services. Then, mitigate scheduling and access challenges by minimizing operating and turnover times to make space for a new service offering. Identify which OR has the capacity to best support this new offering while maintaining a top-of-site strategy. For example, prioritize high-margin procedures for inpatient sites and low-margin procedures for community or outpatient sites.

  - Lastly, consider partnering with robotically trained providers in your community to increase robot utilization. For example, Wood County Hospital, a 100-bed acute care hospital in northwest Ohio, collaborated with their employed and partner surgeons to explore the feasibility and utilization of a da Vinci Xi robot. After gaining consensus to move forward, the hospital rapidly increased robotic utilization, expanded the number of procedures offered, penetrated new markets, and developed and strengthened referral relationships.

- **Evaluate adding another robot to your fleet.** Organizations faced with high utilization and access constraints often consider investing in a new robot. Normally, this investment discussion is started by the physician champion at the robotic steering committee meeting and later presented to system planning and financial leaders. Leverage robotic data dashboards to identify current utilization patterns by robot, total days all robots are used, high-utilization specialties and surgeons, and frequency of scheduling challenges. Evaluate which service lines you want to grow, which site of care to prioritize, and which model to select based on the frameworks on pages 9, 10, and 12 of this guide. Lastly, weigh the additional costs involved for a new robot, such as supply costs, acquisition expense, increased OR time, and new staff, such as first assist and surgical technicians, before investing in another surgical robot.

02 Leadership and governance

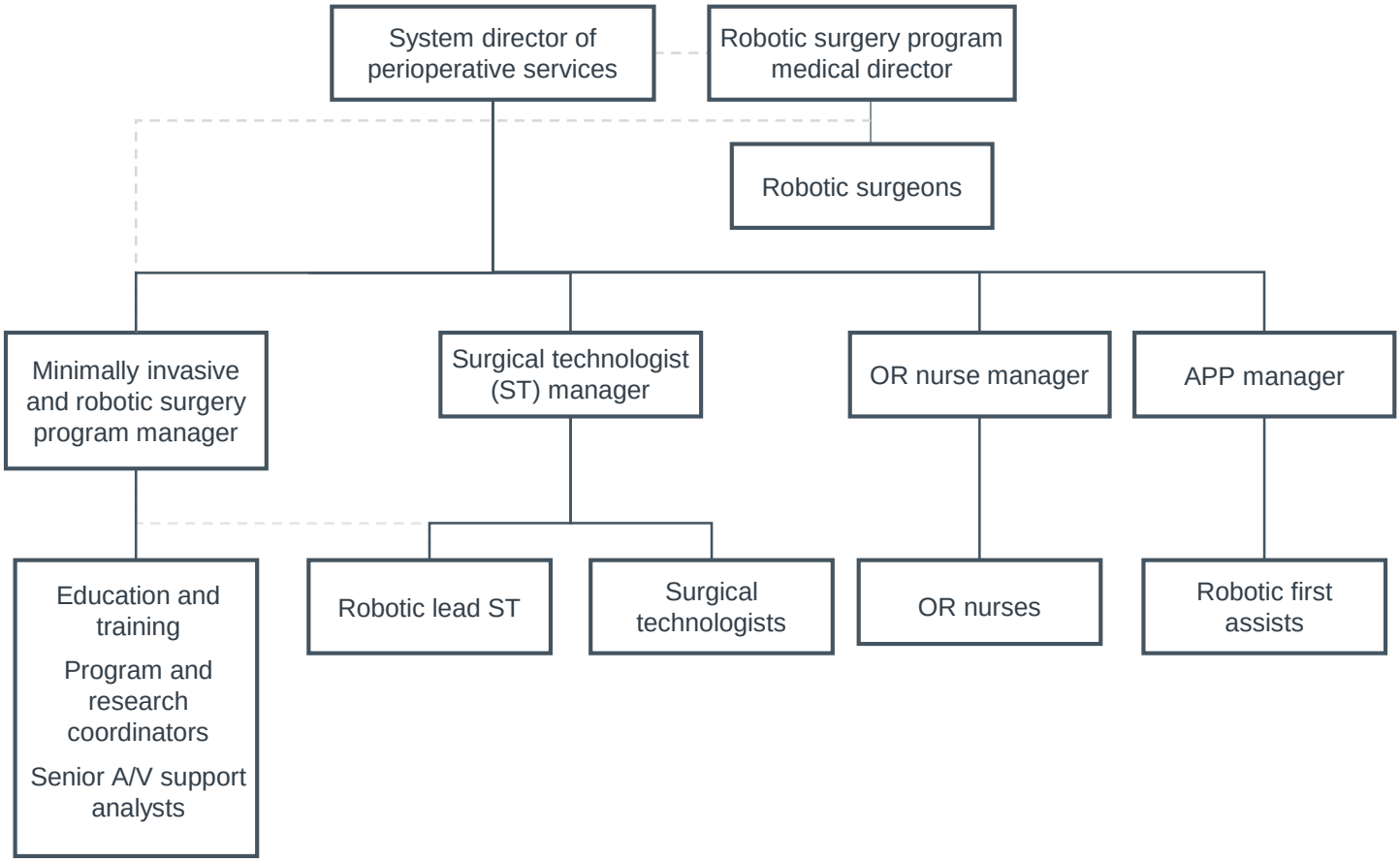
Select a physician champion to spearhead program development and growth. Having a physician leader is imperative to starting a robotic surgery program since they often approach hospital executives with the idea of a robotic surgery program and make the business case for investment. The physician champion also plays a crucial role in program growth by getting their colleagues on board with robotic surgery, training surgeons and non-surgical staff, and leading the robotic steering committee. Additionally, they identify areas for improvement, such as opportunities to decrease instrumentation utilization, standardize trays, minimize surgical variance, and decrease operating times. For example, Dr. Cataldo Doria, a robotic surgery program director, acted as the physician champion for Capital Health System, a two-hospital system in New Jersey. Under his leadership, they added one Xi robot, a simulator, a dual console, and a trumpf bed; performed over 550 cases in 2019; and became a center of excellence in robotic surgery. This is largely because he was able to get health system leaders on board with new program investments for growth.

> “The CEO reacted really positively to the vision of a robotic surgery program I pitched. Now we are working towards becoming an institution for robotic surgery as part of our competitive advantage.
>
> **Dr. Cataldo Doria, Director, Robotic Center of Excellence**
> Capital Health System

Organize your robotic surgery program under perioperative services with a program director. Having a director with oversight over all robotic services is critical to organization-wide standardization. The ability to optimize robotic surgery operations and outcomes to a gold standard helps robotic surgery programs minimize unnecessary costs and reduce surgical variation.

Most robotic surgery program directors report to the system lead of perioperative services. For larger programs or directors without a clinical background, a dyad structure may be appropriate. The Ohio State University Wexner Medical Center, a 900-bed academic medical center with one Si and six Xi da Vinci robots, has a dyad structure over their program. Their medical director oversees 60 robotic surgeons, and all other staff report through the program manager. The robotic surgery program reports up to the system director of perioperative services.

Example robotic surgery program organization structure



Establish a robotic steering committee that meets regularly. A robotic steering committee is instrumental in driving program growth. They often meet every two months or quarterly, depending on program size. The staff on the committee varies but often includes a program director, surgeon specialty representatives, robotic coordinator, physician champion, manufacturer representative, and a hospital OR leader. The committee evaluates robotic surgery data from dashboards such as volume by surgeon and specialty, instrumentation usage, cost per case, and OR turnover time. They also identify areas to reduce variance and instrumentation, as well as complications. The committee creates reports on program progress and outcomes for hospital leadership and communicates program strategy to the surgical staff.

Carilion Clinic, a seven-hospital system in Virginia with multiple da Vinci systems across different sites, established a system-wide robotic steering committee that meets quarterly to prevent siloed robotic surgery programs. The committee includes nursing OR leaders from each site, the system director of perioperative services, a financial administrator, surgical representatives from each specialty, the Intuitive Surgical (vendor) representative, and two co-chairs as medical leaders. As a result, they can monitor robotic utilization, identify areas for standardization, and find opportunities to minimize unnecessary costs across the system.

03 Care coordination and quality

Create credentialing pathways for robotic surgery privileges. Establish separate pathways for surgeons with and without prior robotic experience to gain privileges with input from the robotic steering and hospital credentialing committees. Then, establish continuous monitoring protocols for surgeons with privileges to ensure they remain proficient.

Example robotic surgeon credentialing pathways

New credentialing pathway

Surgeon with prior robotic experience: Surgeon provides proof of prior credentialing or several months of case volumes from a prior institution. Similarly, a residency- or fellowship-trained surgeon provides a letter from their residency or fellowship director documenting proficiency and several months of case volumes on the console.

Surgeon new to robotic surgery: Surgeon submits a request to the hospital credentialing committee. Once approved, they undergo Intuitive Surgical's training with written tests and hands-on exposure to earn a certificate. Then, they spend about 20 hours on a simulator, and a proctor observes them for about three cases. Lastly, the robotic steering and credentialing committees assesses the surgeon's performance before granting privileges.

Continuous program monitoring

Newly credentialed surgeon: The robotic steering and credentialing committees review a newly credentialed surgeon's first three to five cases to monitor progress.

All surgeons with privileges: Must meet a minimum case volume per two years (often 10 to 20 cases, depending on robot availability). If a surgeon does not meet the minimum case volume, they must practice on a simulator and with a proctor to regain privileges.

These committees assess surgeon performance across six domains: depth perception, bimanual dexterity, efficiency, force sensitivity, autonomy, and robotic control.

Source: "Best Practices for Robotic Surgery Programs," Journal of the Society of Laparoscopic & Robotic Surgeons, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5508805/; Advisory Board research and analysis.

Create pathways to train non-surgeon staff. Exposing non-surgeon staff in your program to robotic surgery is also important. Ensuring all staff are trained on how the nuances of robotic surgery may alter their roles helps maximize patient safety, improves turnover times, ensures staff coverage, and makes cases run smoothly. For example, Legacy Health, a six-hospital system in Oregon with 10 Xi da Vinci systems, ensures all registered nurses and surgical technicians go through an intensive onboarding and training process before they can assist in robotic procedures. Following an Intuitive Surgical online education module, their robotic educators walk staff through three weeks of hands-on service line orientation with two to three cases per day to ensure staff gain exposure to all specialties and instruments. As a result, all staff can support the system's robotic service available 24/7 across specialties.

Track robotic surgery program data regularly. Track the quality, operational, and financial metrics of your robotic surgery program in a data dashboard to monitor performance and identify opportunity areas. The dashboards can be built either in-house or in partnership with Intuitive Surgical. Set regular cadences, such as every two months or quarterly, to evaluate the performance of your robotic surgery program against the goals of the program.

By closely analyzing robotic surgery performance data, programs can identify pain points, find opportunities to reduce OR time and instrumentation costs, improve surgeon and procedure outcomes, and highlight when a new robot or instrument may be needed. For example, Ohio State University Wexner Medical Center regularly monitors their data dashboard to identify when they may need to invest in a new robotic platform. They analyze surgical volumes by robot serial number, the number of days spent using the robots in their fleet, the hours each robot is used, and any scheduling issues to see if robot utilization is saturated. An example robotic surgery scorecard used to track performance progress is shown on the following page.

Example robotic surgery program data scorecard with tracked metrics[1]

Programmatic reporting:

Robotic volumes

- Total, also broken down monthly, by case type and surgeon
- By location
- By service line, hourly usage, and count
- On each robot via serial number

Percent of days all robots used

Block schedule utilization by month

Financial reporting:

Inpatient versus outpatient by fiscal year, service line and procedure

Profitability analysis:

- By location and patient type
- By surgical division

Summary analysis

- Total financials by fiscal year
- Per case financials by fiscal year, including cost per procedure

Breakeven analysis

- Charges, payments, costs, and contribution margin

Operational reporting:

Instrumentation usage

Instrumentation exchanges

Education reporting:

Volume of training by course type and participants

Curriculum completion by trainees and service line

Operative time percentages

Quality reporting:

Estimated blood loss

Returns to OR within 24 hours

Mortalities during visit and within 30 days

Conversions from robotic to open

Readmissions within 30 days

Average length of stay by service line, surgeon, and procedure

Case length by procedure and surgeon

1. Sample scorecard metrics were modeled off of the metrics tracked at Ohio State University Wexner Medical Center and Penn State Hershey Robotics Programs.

Source: "Best Practices for Robotic Surgery Programs," Journal of the Society of Laparoscopic & Robotic Surgeons, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5508805/; Advisory Board research and analysis.

Share data from robotic cases with surgeons. Build out surgeon-specific reports, including case volumes by procedure, cost per case, instrumentation use, and complication rates. Provide benchmark data from their colleagues to spur surgeons to improve their outcomes. Often, surgeons will seek to improve their own outcomes and cost per case after seeing what similarly trained surgeons have done. For example, Cedars-Sinai Medical Center, an 886-bed academic medical center in Los Angeles, shared robotic surgery data costs and OR time with their surgeons. They highlighted data from surgeons' five highest volume cases and the cost of the equipment they used, such as implants and staplers, coupled with the cost data of what their colleagues used. As a result, they saved $4 million in direct costs over 12 months with their surgeons reducing variation.

> Give people their data…Tie in transparency of cost, variation from colleagues, and outcomes, and I guarantee you will see movement.
>
> **Dr. Harry Sax, Executive Vice Chair of Surgery**
> Cedars-Sinai Medical Center

Source: "Financial Viability of Robotic Surgery," Becker's Healthcare and Intuitive Robotics Content Hub, https://events.beckershospitalreview.com/intuitive-executive-education/p/1; Advisory Board research and analysis.

04 Marketing and communication

Tailor the language of marketing messages to reassure patients of the safety of robotic surgery. When discussing surgical options with their physicians, patients often hear “robotic surgery” and assume this means the surgeon is not in control or performing the operation. By tailoring communications and marketing campaigns to include “robot-assisted” or “computer-assisted” surgery, programs can reassure patients and help them understand that the surgeon is in control during every procedure.

Create a dedicated robotics webpage to win over patients shopping online. Provide patients information up-front about the robotic services you offer in your program. Clearly state the benefits of choosing robotic surgery, including less pain and blood loss, on the webpage to win over patients. Additionally, make sure there is a clear call to action for patients with lingering questions, such as an email or phone number.

Inspira Health, a three-hospital system in New Jersey with two Xi da Vinci platforms, designed a consumer-friendly webpage dedicated to their robotic service offering. They posted a video of one of their surgeons performing a robotic operation on the children’s game, Operation, to make it seem more approachable to patients. Additionally, they reassure patients of their experience in robotic surgery, explain how robotic surgery works, highlight the robotic services they offer and their benefits in detail, and provide a clear call to action to book an appointment. Their consumer-friendly website helps mitigate patients’ fears and leaves them with a clear understanding of the benefits of robotic surgery.

Demystify robotic surgery with community engagement events. Since surgical robots are novel to some patients, organizations have found that demonstrating the robot to their communities is beneficial in improving patients' understanding of the technology. Both in-person and virtual community engagement events are impactful in increasing awareness and understanding.

- **In-person event example**: Wood County Hospital, a community provider in northwest Ohio, held three community engagement events to increase community awareness of their robotic surgery program. They held events featuring their da Vinci Xi surgical robot at multiple locations including a kickoff event in their surgical waiting area, a tour of the surgery department and operating suites, and at a local college basketball game. As a result, the community is better informed about robotic surgery; understands its advantages, benefits, and limitations; and recognizes that Wood County is investing in their health and wellness. In-person outreach events are especially impactful for rural hospitals, as the close relationship between the community and health care provider is important to the hospital's success.

- **Virtual event example**: St. Elizabeth Healthcare in Kentucky held a virtual event for a local elementary school via Zoom. Their physician champion and robotic coordinator explained the benefits of robotic surgery while the robot operated on a teddy bear. St. Elizabeth's goal was to invest in making the next generation feel more accustomed to and comfortable with the idea of robotic surgery as a commonly used surgical tool.

Communicate the benefits of robotic surgery to skeptical surgeons. Expanding your program's robotic service portfolio is critical for program growth. Often, programs will face robot skeptics in specialties they want to grow. Leverage your physician champion in communicating the benefits of robotic surgery—such as better ergonomic positioning, less pain for patients, and lower length of stay—to get uninterested surgeons on board. It is ideal if a robotically trained surgeon promotes these benefits with their colleagues, since often surgeons trust their colleagues' opinions over administrative staff without clinical experience.

Consider pursuing a center of excellence (COE) designation to distinguish your program. The Surgical Review Corporation is the accrediting body for Centers of Excellence, Surgeons of Excellence, and Master Surgeons in robotic surgery. Large, well-developed organizations use these designations in marketing material to promote program safety and excellence to patients and referring providers. To earn a center of excellence accreditation, a hospital undergoes a series of site inspections during which all aspects of the program's surgical processes are closely examined and data on health outcomes are collected. This process includes physicians, nurses, and administrators who are actively involved in the accredited program. For example, in 2020, Capital Health System became a center of excellence in robotic surgery. Since they already had a high volume of cases and support from their CEO, this distinction was a strategic way to differentiate their robotic surgery program across the Philadelphia-New Jersey-New York corridor in a market saturated with other robotic competitors.

Criteria and costs required to become a center of excellence in robotic surgery

Requirements as stated by the Surgical Review Corporation

Criteria

- **Volumes**: Minimum cases are 200 annual per center, and 30 annual per surgeon or 125 lifetime cases
- **Staff**: Surgeon experience, dedication, and call coverage; a physician program director, surgical team, and support staff
- **Infrastructure**: Institutional commitment to excellence, consultative services, robotic equipment and instrumentation, clinical pathways and standard operating procedures, patient education, and continuous quality assessment

Costs

- **Application fee**: $7.5K per center and $650 per surgeon
- **Site inspection**: $2.5K USD for US, Canada, and Mexico
- **Annual fee**: $5K per center and $650 per surgeon

Source: "Programs, pricing and volumes," Surgical Review Corporation, https://www.surgicalreview.org/facilities/#tab5; Advisory Board research and analysis.

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