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Approaches to Robot-Assisted Surgery Among Leading Health Systems

TheAcademy

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Introduction & Objectives

To better understand health systems’ current needs and purchasing trends for robot-assisted surgery (RAS), also called robotic-assisted surgery or robotic surgery, The Academy has conducted a high-level market assessment capturing Leading Health System (LHS) approaches and strategies underlying RAS decision-making and solutions.

The Academy conducted qualitative interviews and fielded quantitative surveys with 18 senior executives across 15 unique LHS. Participating health systems span a range of regions, sizes, and statuses as either academic medical centers (AMC) or non-AMCs.

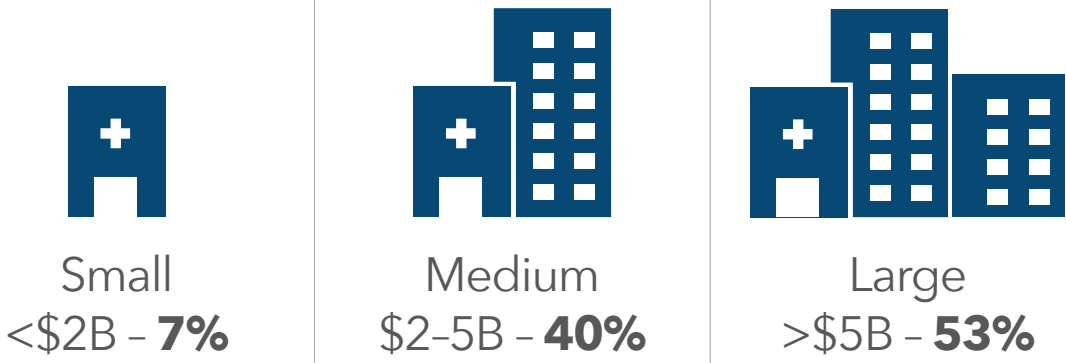
Profile of Participating Health Systems

Participating Health Systems Representative of Market



Note: Total Operating Revenue (TOR): Defined as all revenue derived from both patient care and health plan (if applicable).

Health System Size (TOR)



Participants by Region

7% Northeast	7% Southwest
20% Southeast	27% West
40% Midwest	

Participants by Academic Status

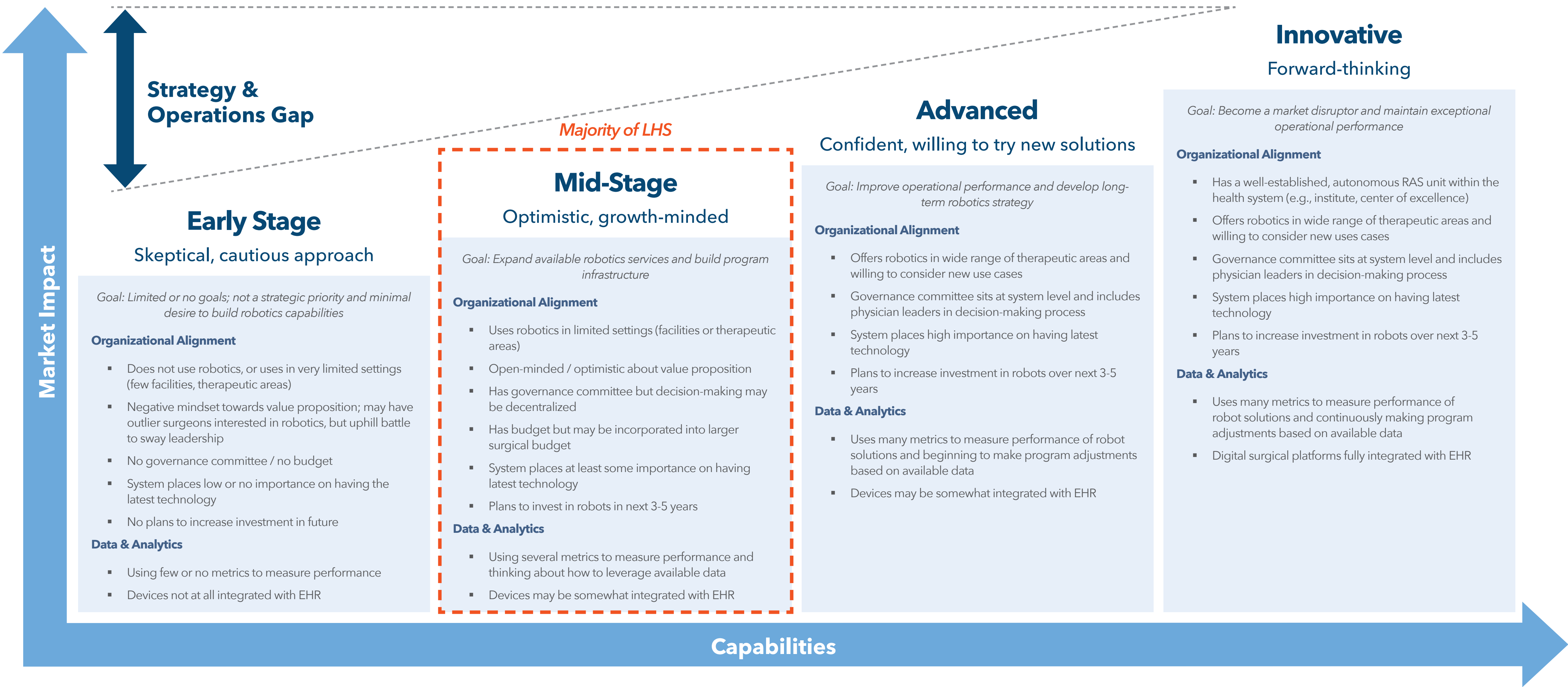
33% AMC	67% Non-AMC
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Participant Titles

System Chief Medical Officer
Chief Operating Officer, Clinical Program Services
Chief of General Surgery
Department Chairman, Orthopedics
VP, Orthopedics Service Line
VP, Clinical Integration
VP, Clinical Services
VP, Facility Executive
Associate VP, Orthopedics & Sports Medicine
Executive Director, Musculoskeletal Program
Senior Medical Director, Musculoskeletal Program
Senior Director, Patient Experience
Director, Orthopedics Service Line
General Surgeon

Key Findings

LHS are most commonly at mid-stage maturity for RAS, exhibiting limited scale and utilization but with a growth-oriented mindset.



Majority of LHS Use Robotics for Orthopedic Surgeries



of LHS surveyed report using robot devices or solutions for orthopedic surgeries

Majority of LHS Use Robotics for Orthopedic Surgery

Nearly all (88%) of LHS surveyed report using robot devices or solutions for orthopedic surgery. Within robot-assisted orthopedics, knee procedures are most common (67%), followed by hip (56%), spine (44%), and shoulder (11%). One LHS shared their reflection that spine represents the most significant gap in their surgical orthopedics offerings.

Most Common Areas of Orthopedic RAS



Knee (67%)



Hip (56%)



Spine (44%)



Shoulder (11%)

“As the robots get more advanced, surgery will increasingly head in the direction of robotics.”

– Department Chair, Orthopedics

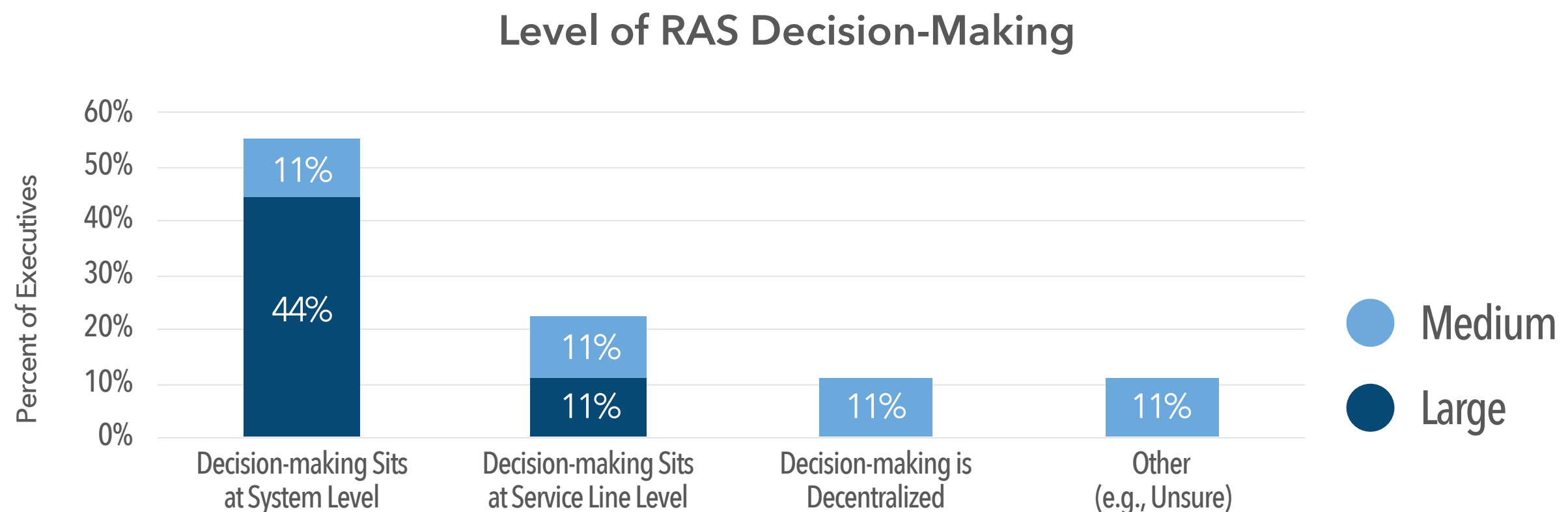
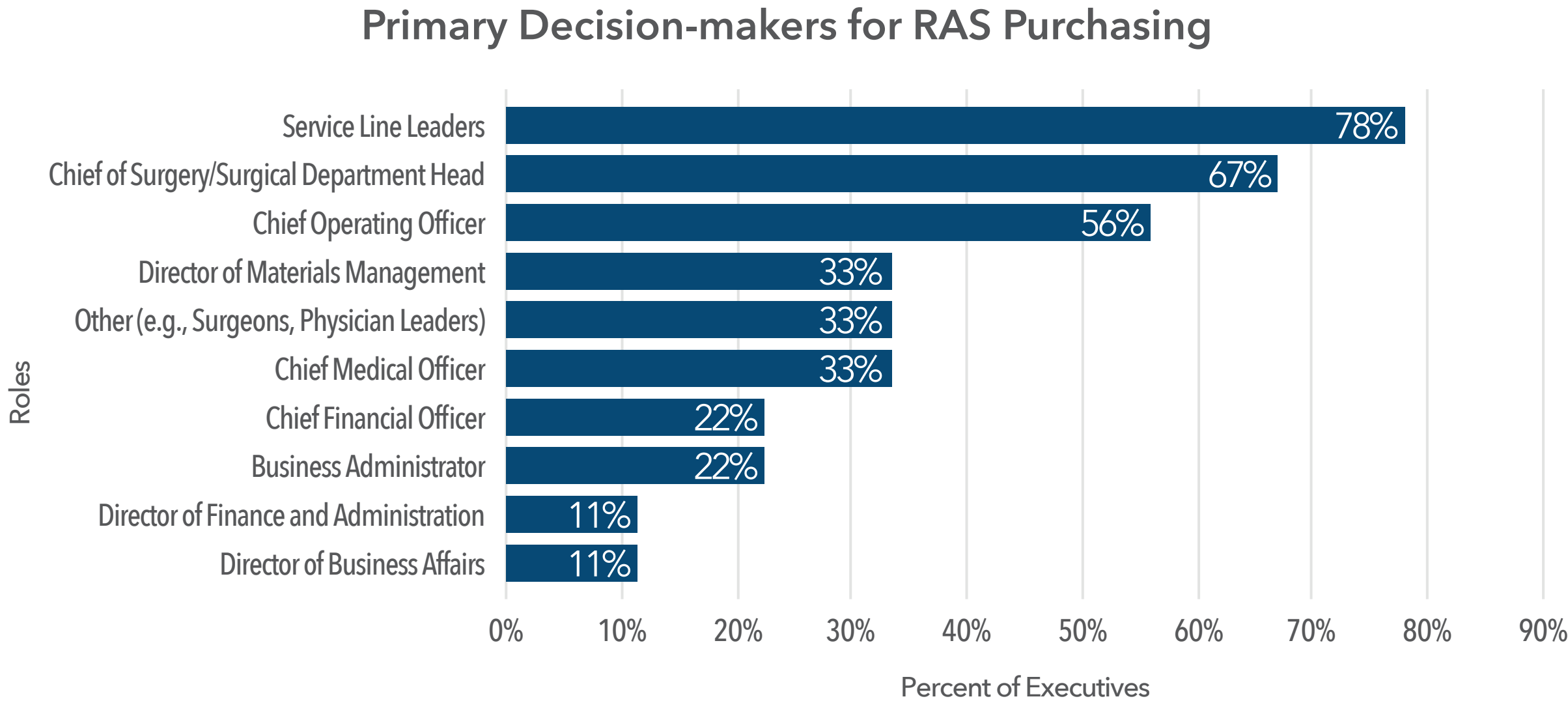
“We have 13 or 14 robots across our ten hospitals. The physicians have been very driven to use this technology.”

– Associate VP, Orthopedics & Sports Medicine

“I think spine is the biggest opportunity to expand robot-assisted surgery based on quality, opportunities, margins, and frequency of procedures per day. Spine is the biggest gap in our program as of now.”

– Executive Director, Musculoskeletal Program

Service Line Leaders Are Key Decision-Makers for RAS Purchasing



Service Line Leaders Are Primary Purchasing Decision-Makers

LHS report that service line leaders are the most frequent decision-makers on purchasing decisions related to surgical robots (78%), followed by Surgery Department Heads (67%), and COOs (56%). Relative to C-suite executives, service line leaders have more direct communication with surgeons and may be better positioned to evaluate the feasibility, as well as potential costs and benefits, of integrating robotics into their surgical program.

RAS Decision-making Typically Centralized

The majority (77%) of LHS have a structure in place to govern their RAS decisions, and 55% report that this governing body sits at the system level. Only 11% of LHS report that decision-making is decentralized. Large LHS are more likely to have a governance committee at the system level, potentially due to the need for greater coordination of robot purchases and decisions across a larger enterprise. Smaller health systems are more likely to place governing bodies at the facility or hospital level, indicating that they may not yet have scaled their programs to an enterprise level.

“We have one overarching steering committee that governs sub-committees. The committee has representatives from finance, clinical effectiveness, surgeons, and operational leaders and decides on where technology should be deployed and how to improve the robotics process. It meets monthly at the moment but we plan to make it bimonthly.”

– Chief Medical Officer

Academic Training Heavily Influences Physician Engagement in Robotics

Use of Robotics in Physician Training Is Key Indicator of Future Robotics Engagement

LHS report that physicians’ training experience has a significant influence on their participation in robot-assisted surgery. Surgeons that participated in academic training and residency programs or had mentors that promoted use of robots are more likely to take a long-term interest in performing RAS.

Though the influence of training programs appears most prominently through generational differences across surgeons, this is not always the case. One executive mentioned that several of their health systems’ more seasoned surgeons are enthusiastic proponents of RAS, and shared an example of a conventionally-trained surgeon leaving his practice for a period of time to train in robotics, and returning to his practice with the newly developed skillset.

“We have incredibly skilled physicians that use robots in orthopedics and others that have authored papers challenging the efficacy of robots for total joint replacements. Preferences seem to be influenced most by surgeons’ training programs.”

- AVP, Orthopedics & Sports Medicine

“Engagement depends on the age of the physician. The younger surgeons are getting this as part of their training. They are more likely to be exposed to robots and have the manual dexterity to manipulate the control box console.”

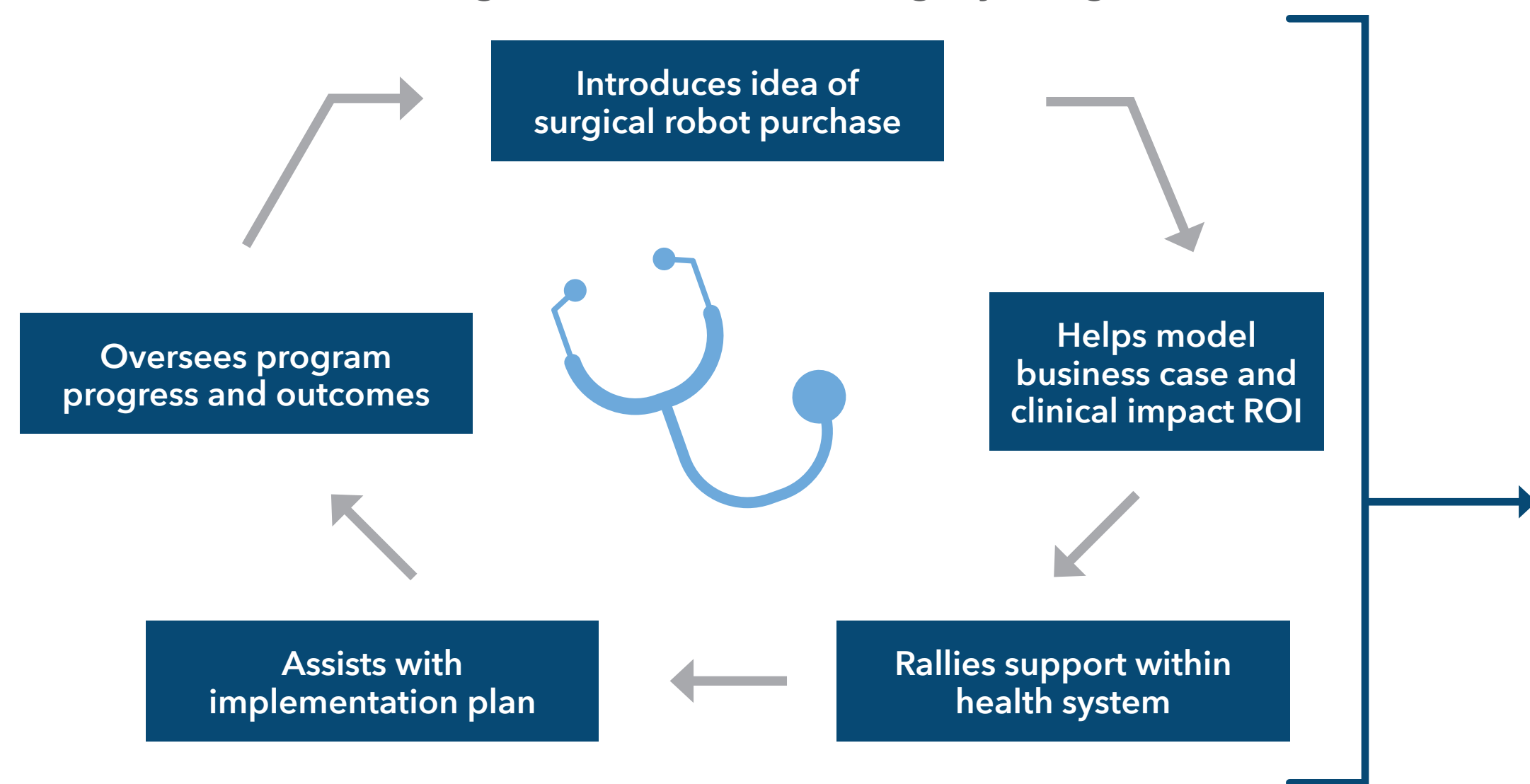
- Senior Director, Patient Experience

“All the orthopedic surgeons we recruit are using robots in their training. Not having the technology could be a hindrance to recruitment.”

- VP, Clinical Services

Physician Champions Serve Critical Role in Starting Robotics Programs

Life Cycle of Physician Champion's Role in Establishing Robot-Assisted Surgery Program



“Clinicians are the ones that bring forward interest in the device. You have to have a champion - someone to help you lay out the program, the clinical implications, the financial analysis and ROI - all the things you need for funding. They also help recruit like-minded physicians to initiate the program. They have to have that vision.”

- VP, Clinical Integration

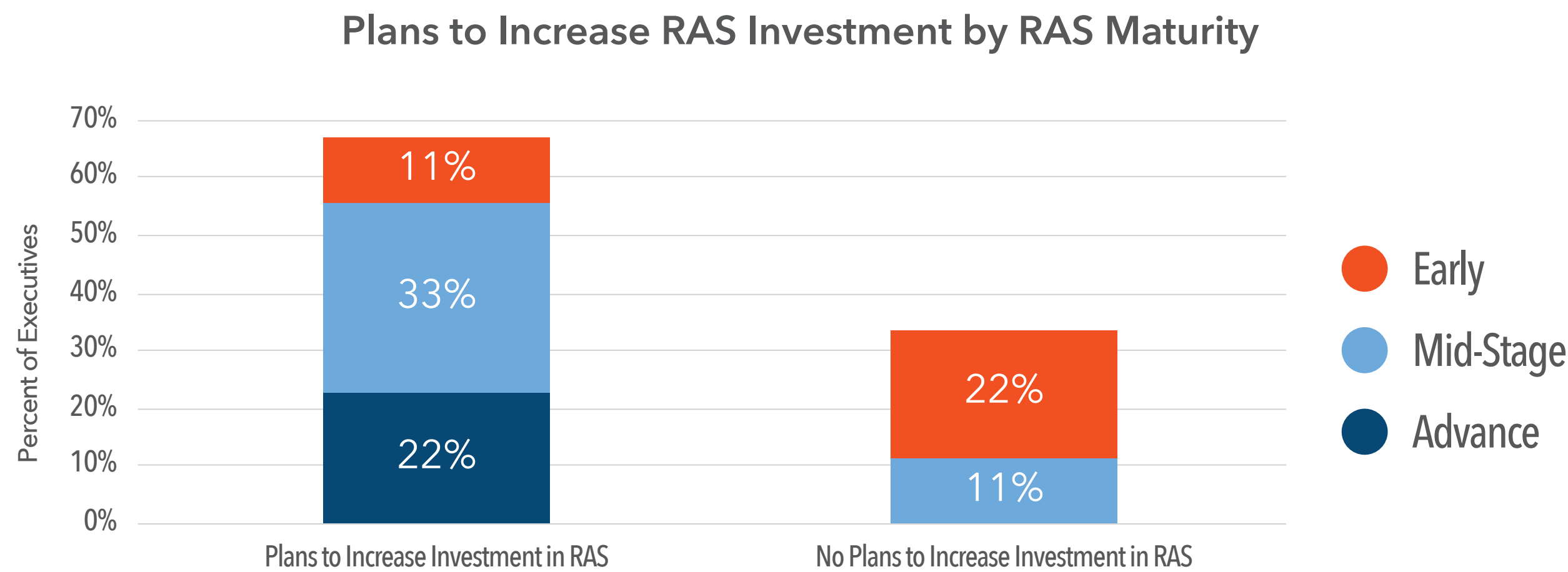
LHS Typically Rely on Physician Champions to Initiate Program Efforts

LHS of all sizes, regions, and academic status report the critical importance of the “physician champion” to their RAS programs. Health systems have reported that many of their RAS programs started with one or two interested physicians willing to oversee the process from idea initiation to implementation and oversight. The physician champion may remain actively engaged in oversight and operations once the program is up and running, or may transition some of these responsibilities to a dedicated service line leader once the program becomes more established.

Life Cycle of Physician Champion's Role

1. Introduces idea: Enthusiastic surgeon proposes idea for robotics purchase to health system, influenced by training or other robotics exposure
2. Models impact: Surgeon helps model inputs (e.g., cost, staffing, facility needs) and project potential outputs (e.g., clinical outcomes, patient volume) to evaluate ROI
3. Rallies support: Surgeon recruits like-minded physicians to establish a team and helps align program model to executive strategy, enlists support of service line leader
4. Outlines implementation: Surgeon works collaboratively with decision-makers (e.g., service line leaders, other executives) to outline a roll-out plan for the service offering
5. Oversees program: Surgeon establishes process for monitoring program operations and evaluating success through performance metrics and continues to participate in program oversight or yields this responsibility to service line leader

Two-Thirds of LHS Plan to Increase Investment in RAS in Near Term



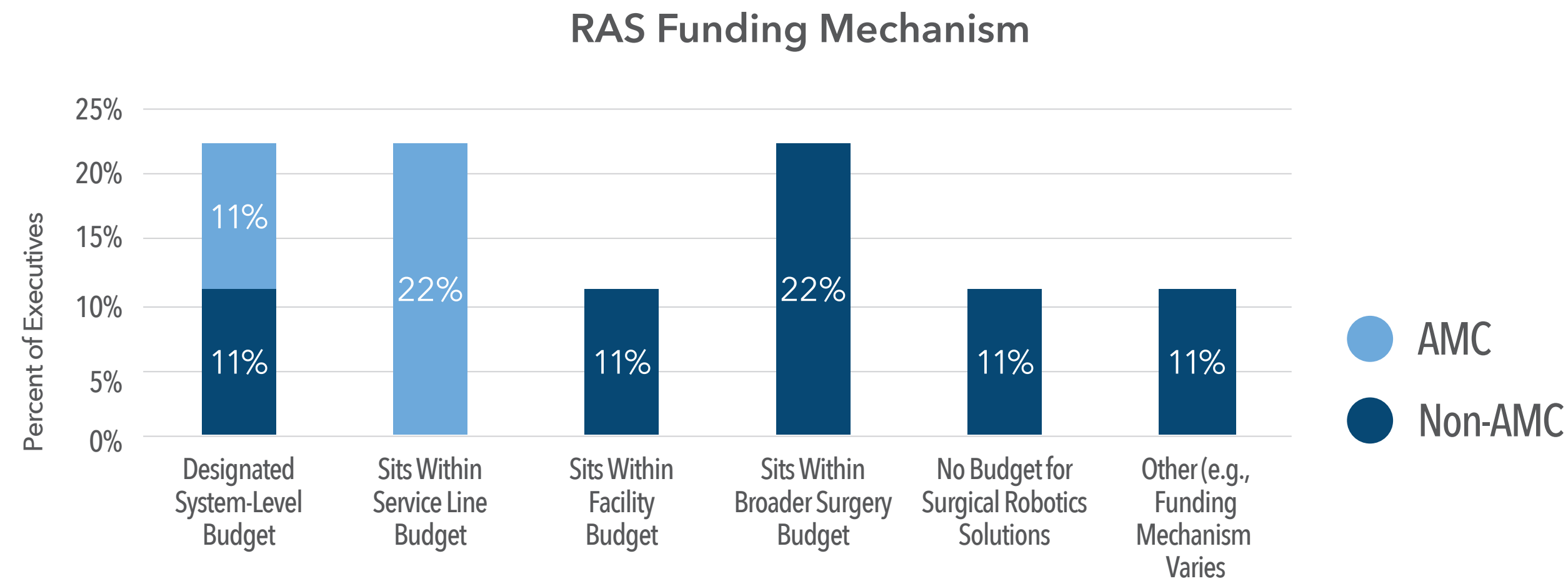
Most LHS Plan to Increase Robotics Investments

Two-thirds (66%) of LHS report plans to increase investment in RAS solutions in the next 3-5 years. Health systems that prioritize RAS funding at the system-level or have a dedicated carve-out within their service line budget are more likely to report plans to increase investment.

Previous Academy research found that LHS expect to continue centralizing their supply chain.¹ This may indicate a trend toward system-wide robotics purchasing strategies - where individual facilities have less autonomy to make robotics investments and system-wide governance committees drive purchasing and implementation decisions for the whole enterprise.

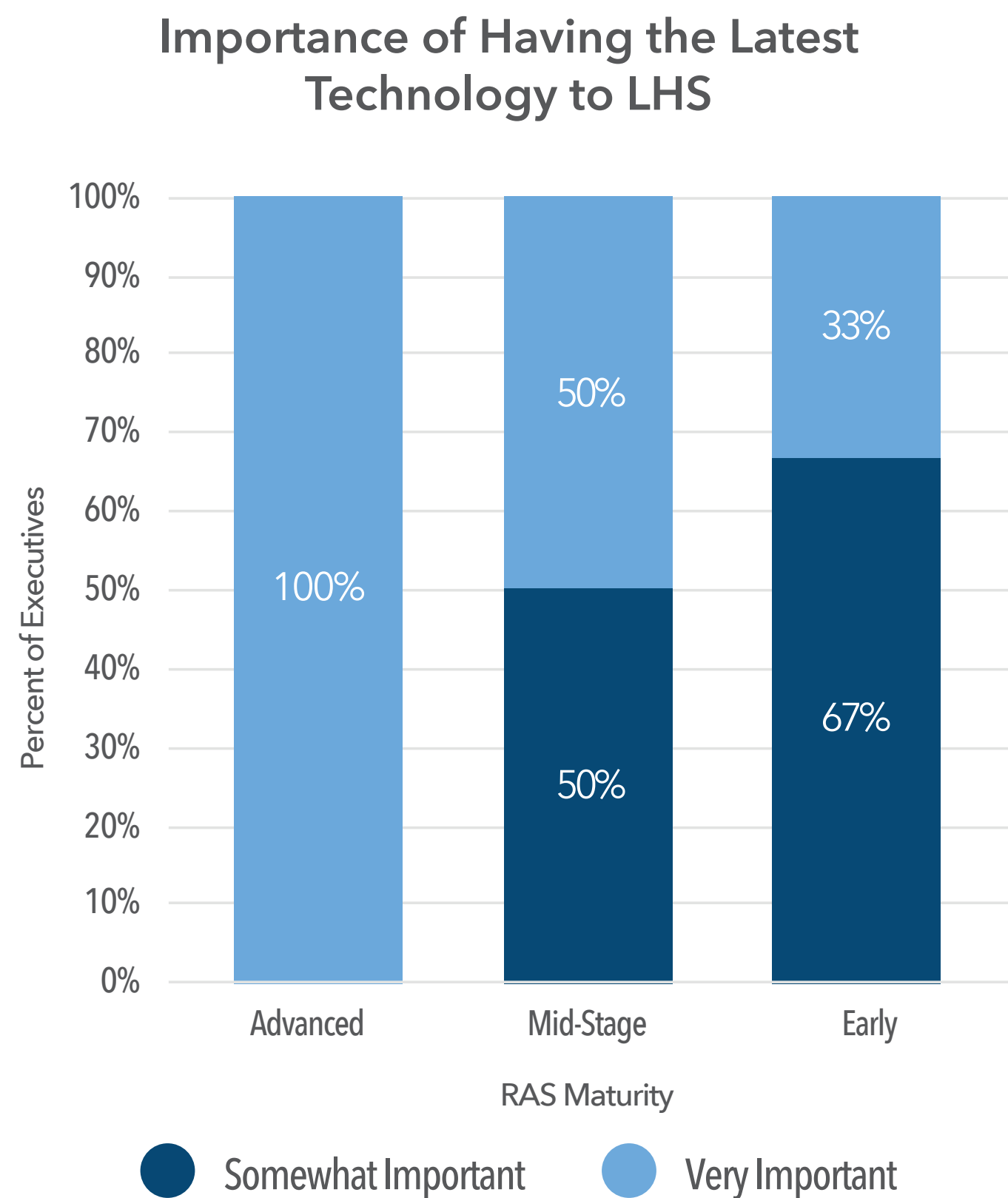
Funding Mechanisms for Robot-Assisted Surgery Vary Widely

Across LHS, there is no standard funding mechanism for robotics. AMCs tend to have either designated system-level budgets (11%) or funding that sits within the service line budget (22%). In contrast, non-AMCs' funding mechanisms typically sit within the broader surgery budget (22%), facility budget (11%), or have no budget for surgical robots solutions (11%). AMCs may be more likely to have dedicated robotics funding due to higher cultural acceptance of new and experimental technologies.



¹ The Academy. Single-Use Device Reprocessing Among LHS: Informing JJMDC's Strategic Approach. 2019.

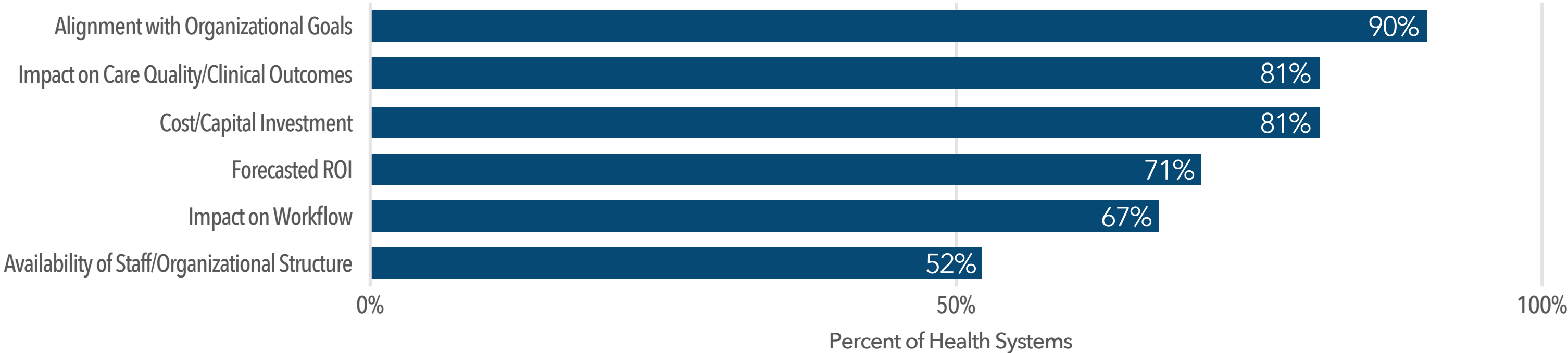
More Mature Health Systems Focused on Having the Latest Technology



"If you don't invest in the technology, you are behind the times."

- VP, Clinical Integration

Key Criteria for Innovation-related Decision-making across LHS¹



Nearly All LHS Place Some Importance on Having Latest Technology

All advanced LHS report that having the latest technology is very important (100%) to their health system. Comparatively, mid-stage LHS report that this is very important (50%) or somewhat important (50%). Fewer early-stage LHS (33%) report that having the latest technology is very important, while the remaining early-stage LHS (67%) report that it is somewhat important. The higher relative importance placed on new technologies by more mature health systems may be reflective of broader organizational priorities around integrating new treatment paradigms and offering new technologies to patients. This may also be a function of more advanced LHS being in a better position to dedicate capital to new robotics solutions.

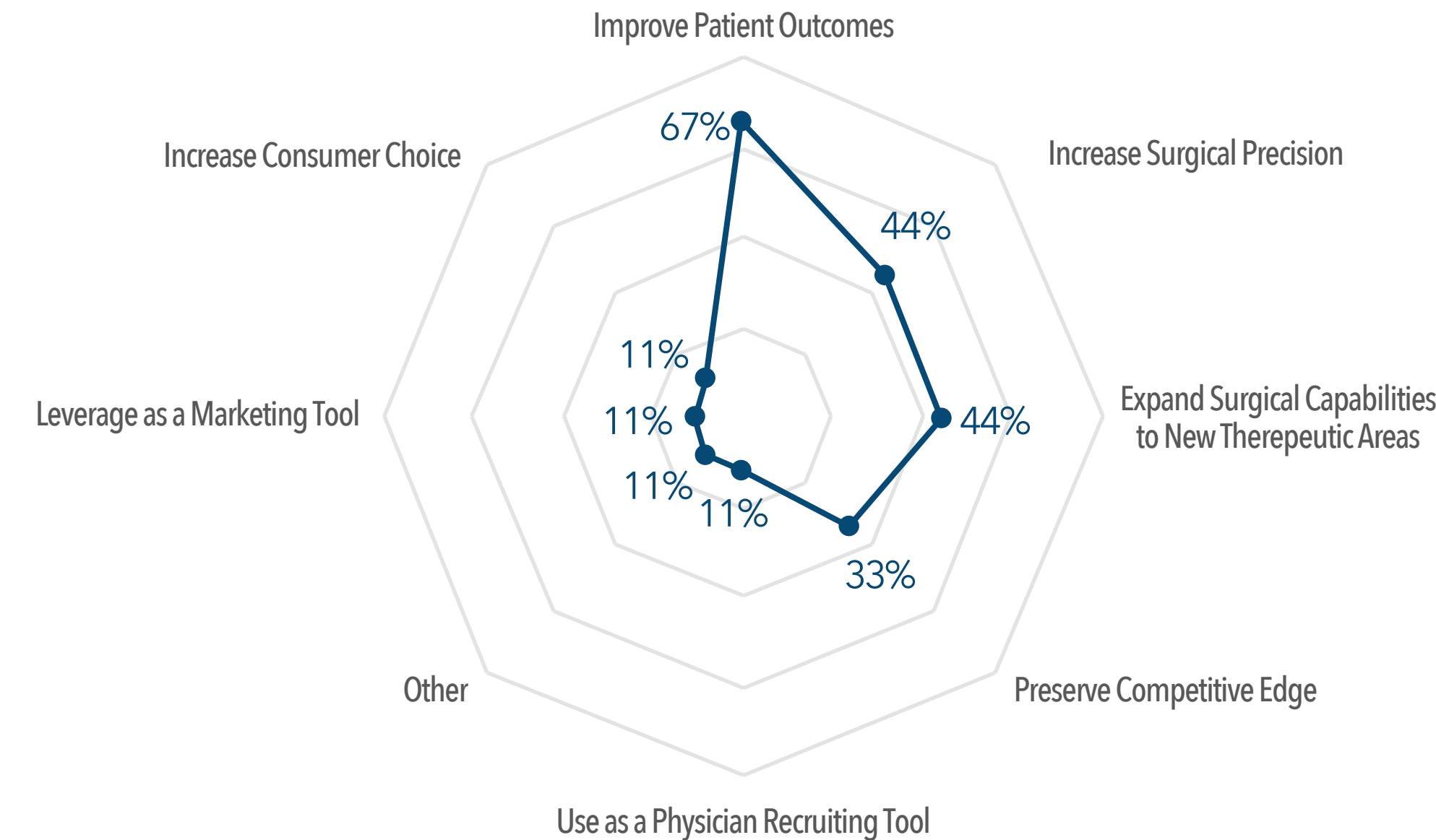
New Technologies and Innovations Evaluated Against LHS' Strategic Goals

Across all LHS, alignment with organizational goals (90%) is the top criteria for decision-making related to innovation and innovative technologies. Given finite resources, health systems are particularly sensitive to whether innovation-related initiatives or investments align with their organization's mission, vision, and goals. Secondary innovation criteria include impact on care quality and clinical outcomes (81%) and cost or capital investment required (81%).

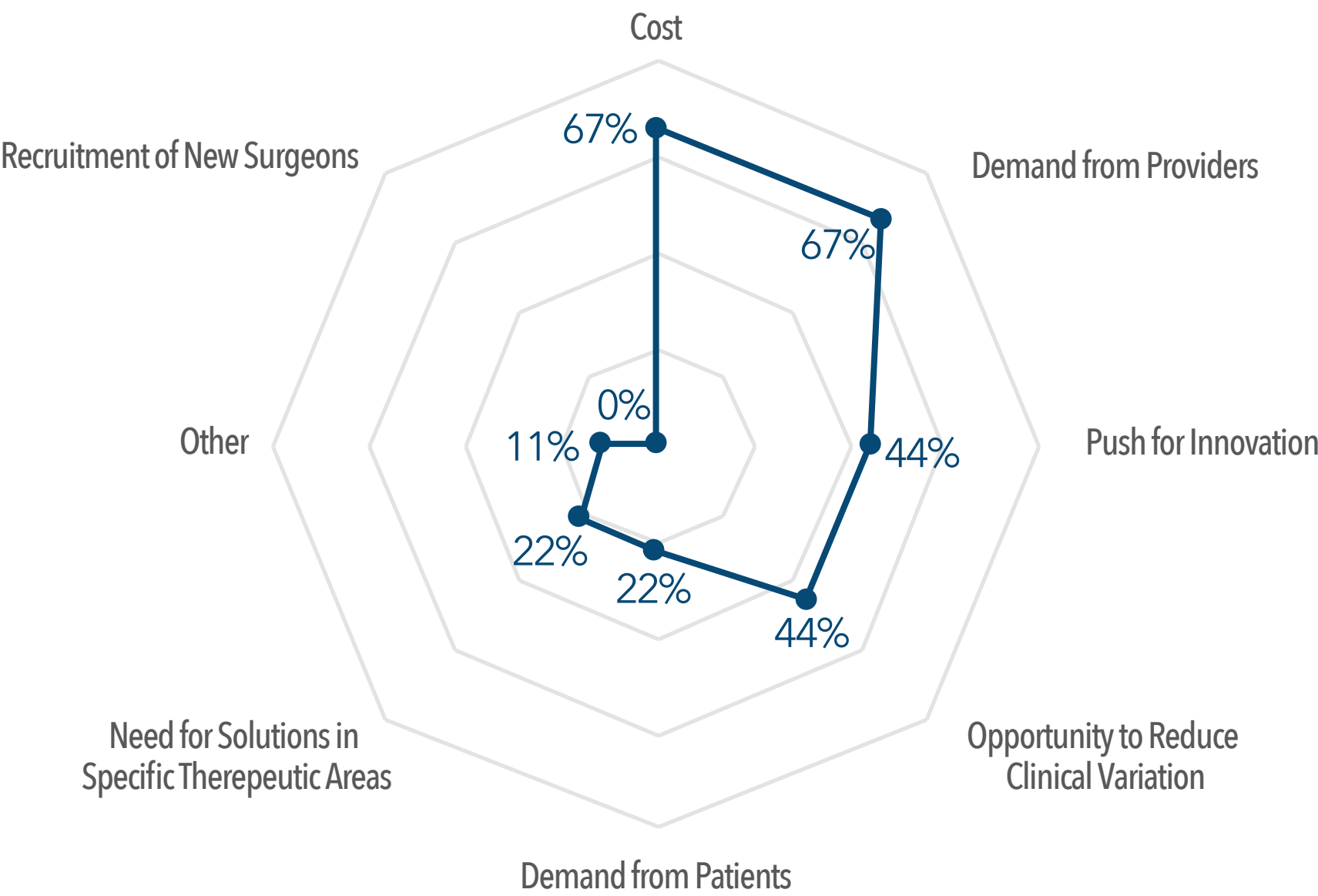
¹ The Academy and The Center for Connected Medicine. Top of Mind for Top Health Systems. 2019.

Patient Outcomes and Costs Are Top Factors Driving Purchasing Decisions

Motivating Factors for Robotics Purchasing



Key Criteria in Evaluating Purchasing Decisions



Purchasing Decisions Consider Patient Outcomes, Cost, and Provider Demand

LHS report that improving patient outcomes (67%) is the top factor inspiring robot-assisted surgery purchasing, followed by increasing surgical precision (44%) and expanding surgical capabilities to new therapeutic areas (44%). These motivating factors echo broader organizational goals of improving clinical care and reducing care variation, as well as integrating new treatment paradigms. LHS’ ability to demonstrate better clinical outcomes from their robotics purchases will be increasingly important given the rise in value-based care. As payment models continue to shift towards value, LHS will face pressure to demonstrate that their robotics solutions are generating sufficiently superior clinical outcomes to justify the higher treatment expense. Top criteria used to evaluate purchasing decisions include operational considerations such as cost (67%) and demand from providers (67%), followed by a push for innovation (44%) and opportunity to reduce clinical variation (44%).

Costs of Surgical Robots Impede Shift to Ambulatory Facilities

LHS believe the migration of robotics to ambulatory facilities is inevitable, but face considerable barriers to entry in this space

Ambulatory Shift Inevitable, But Slow

Despite a broader shift of health services from inpatient to ambulatory settings, LHS report that few or none of their robotics procedures are delivered in ambulatory surgical centers (ASCs) or other ambulatory facilities, due primarily to the lack of an economic model that supports easy entry into this market.

Factors limiting the transition to ambulatory settings include:

- Upfront capital costs required
- Lower reimbursement of procedures relative to inpatient setting
- Market dynamics (e.g., location/proximity of ambulatory centers, ownership structure)
- Limited portability of devices



LHS Cite Concerns with Reimbursement in Ambulatory Setting

“With all of the technology moving outside the hospital, ROI becomes more difficult to achieve. Outpatient procedures are reimbursed at a lower rate and the equipment creates an increase in disposables. And the robots aren’t really portable. Even the Mako – you can move it, but it is heavy, expensive, and delicate.”

-VP, Clinical Integration



LHS Plan to Enter ASC Market As Costs Become More Manageable

“We don’t currently have any orthopedic robots in our ASCs. A few years back, it was a challenge due to costs, but vendors are offering lease plans and rebates to help with the costs. We just hired a director to help us get into this space.”

-AVP, Orthopedics & Sports Medicine



LHS Anticipate Shift Toward Ambulatory Setting Will Vary by Location

“We are seeing a migration to ambulatory centers, but there’s a significant degree of variation from hospital to hospital or region to region. Migration is not the effect of a strategic plan in our health system. It has more to do with whether the ambulatory centers are already in place – their proximity and ownership varies depending on location.”

-AVP, Orthopedics & Sports Medicine

Health Systems Track Performance Metrics, But Struggle to Process Data

LHS Use a Variety of Performance Metrics to Measure Progress

Health systems use a range of metrics to assess the longitudinal performance of their robot-assisted surgery programs relative to their traditional surgery services. More than half (55%) of LHS measure revision rate, surgical site infections, length of stay, supply costs and time in operating room. These performance metrics align with key factors influencing LHS’ robotics purchasing decisions: improved patient outcomes and surgical costs. Complication rate, patient mortality, 30 day readmissions, and conversion to open surgery were also common metrics used by 44% of LHS.

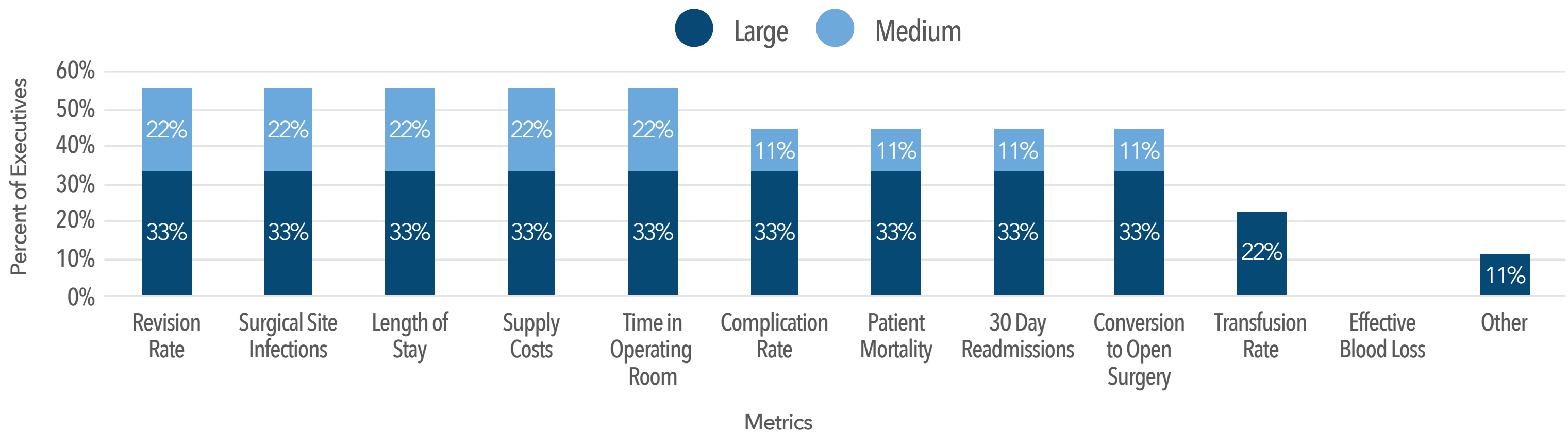
Robotics Devices Minimally Integrated with EHR

Most LHS (66%) report that their robotics devices are at least somewhat integrated into their EHR. Medium size health systems (44%) were more likely to report that devices were somewhat integrated compared to large health systems (22%). Another 33% of LHS report that devices are not at all integrated with EHRs. Larger health systems may have more difficulty integrating robotics solutions into their EHR due to more extensive and complex EHR systems.

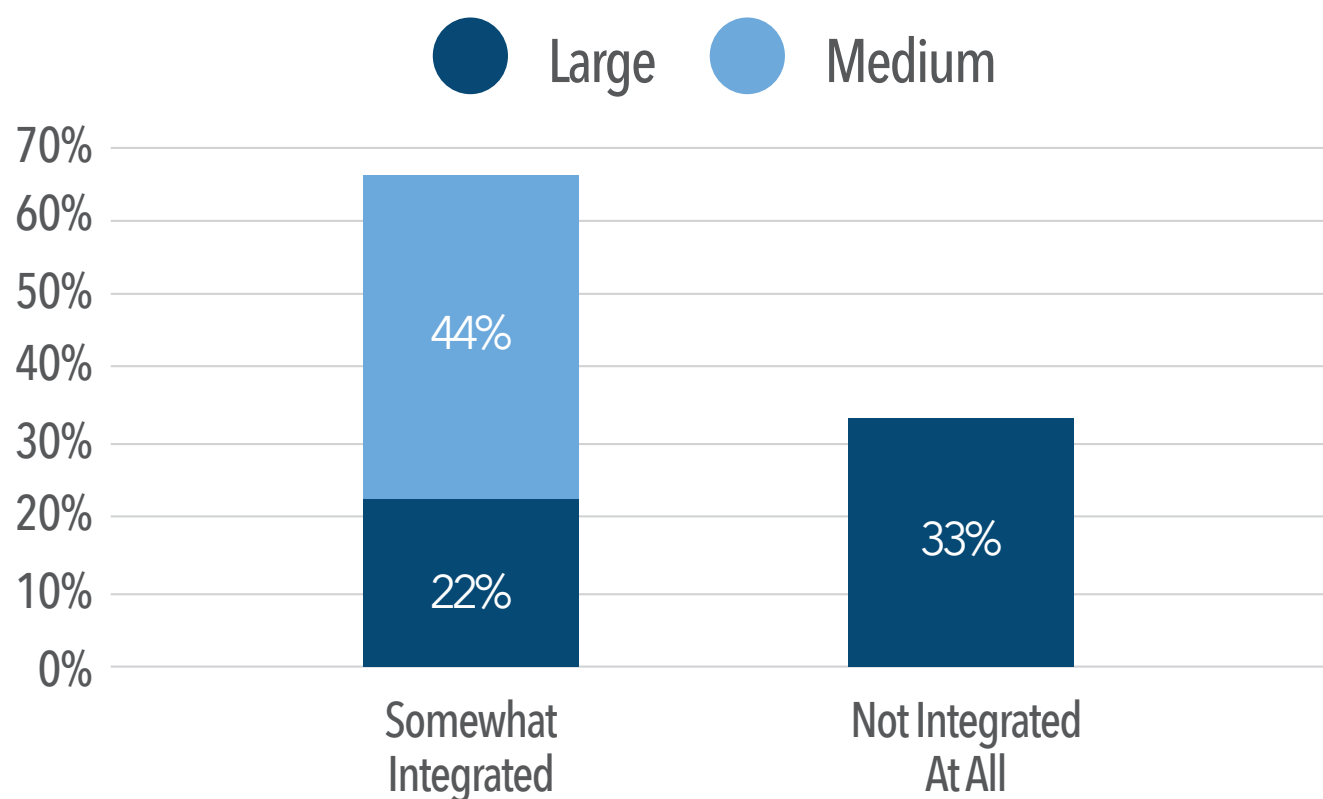
“Our surgical data lives in a portal. It’s not real-time, but it’s available the next day. We transfer it to Excel and it tells us how long the surgeon used the robot and what tools were used. Then we have to link that information up to our own data to analyze the performance metrics.”

- Chief Medical Officer

Metrics to Measure Performance of Robot-assisted Surgery

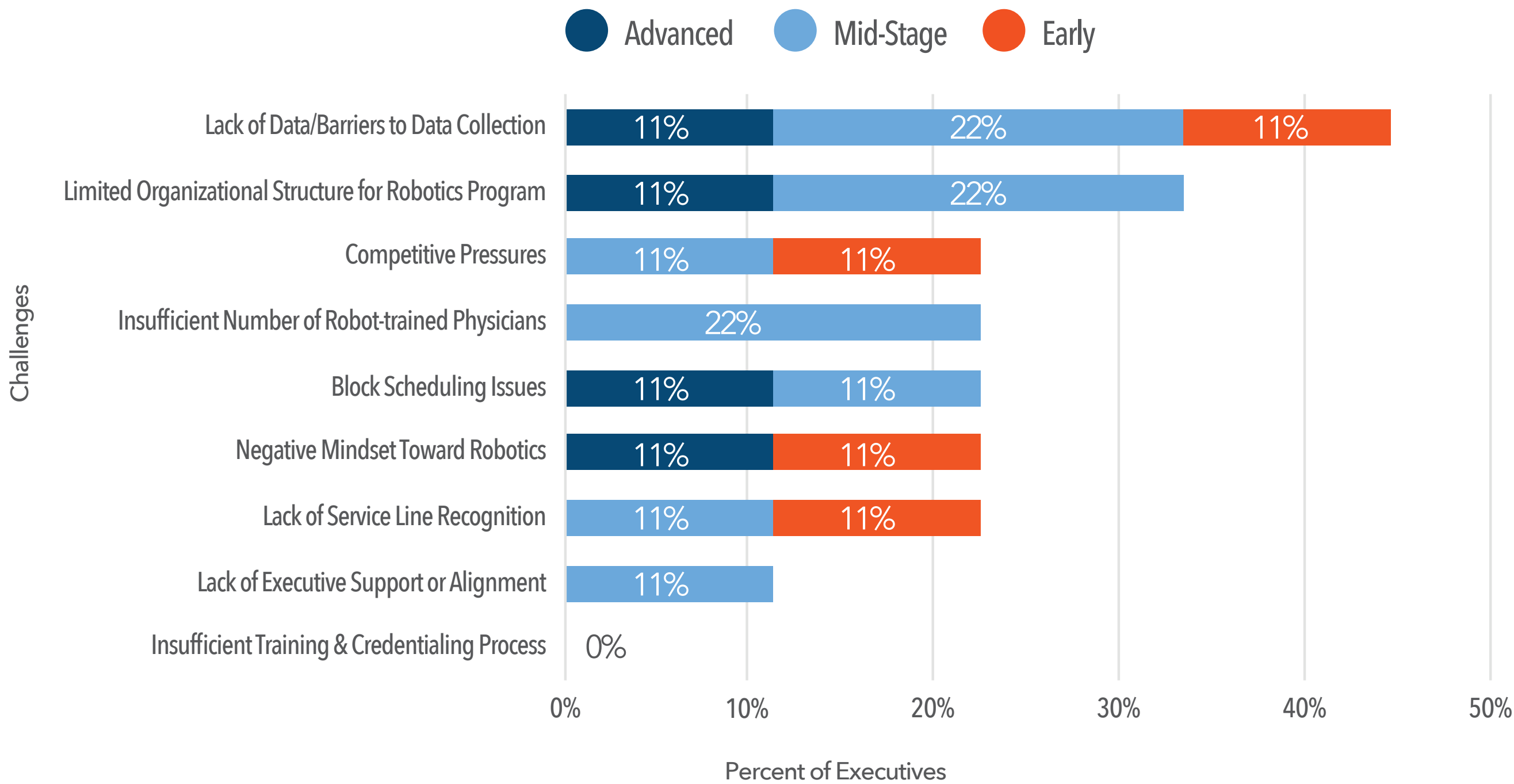


Level of RAS Intregation with EHR



Lack of Data Poses Top Challenge to Robot-Assisted Surgery Programs

Top Challenges for Robot-assisted Surgery by RAS Maturity



Surgical Programs Seek More Data Insights

LHS cite lack of data and barriers to data collection (44%) as the top challenge facing RAS programs. Given the upfront investments required of surgical robots, data insights are necessary to validate the device’s ROI. Lack of actionable data or barriers to data collection leave clinicians and administrators in the dark on the operational and clinical effectiveness of the device.

Without actionable operational and clinical insights, health systems are unable to make course corrections or adjustments to their programs in order to maximize effectiveness. Furthermore, insufficient data insights will pose an even greater challenge as value-based care becomes increasingly prevalent and LHS are pressed to justify the superior value of robotics solutions over traditional surgical methods for reimbursement purposes.

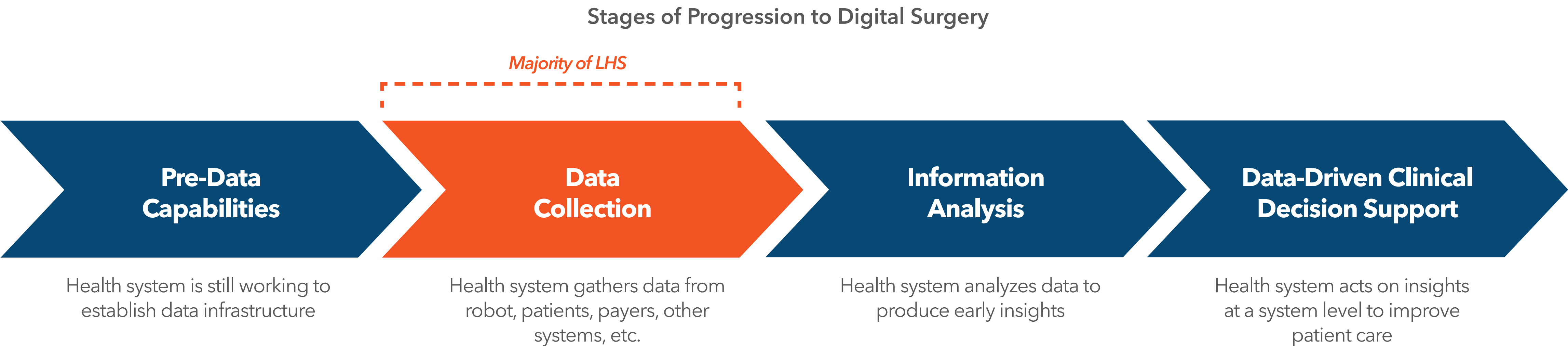
“There is only limited data we get from the robot, the rest we have to pull from other places. There are multiple platforms for quality, financial, and clinical outcomes. It is very manual and time consuming to assemble the data and it would be great to have one platform.”

- Chief Medical Officer

Most LHS Focused on Data Collection, But Need Support to Drive Insights

LHS Need Support to Move From Data Collection to Data Analysis

The majority of LHS are able to collect data from their robots, including reports that benchmark LHS’ surgical performance against other health systems or compare clinician performance across the service line. However, even advanced LHS encounter difficulties with processing the data and generating insights that guide clinical decision-making. As LHS progress on the path toward digital surgery, it is likely that they will need to focus on creating processes which enable meaningful data analysis to drive actionable clinical outcomes.



“It's kind of like a farmer sitting on top of an oil well. I don't know quite how to get [the data] out of the ground and what to do with it, but I know it's valuable.”

- Chief Medical Officer

Methodology

In March - May 2020, The Health Management Academy conducted a comprehensive literature review, as well as a quantitative survey and qualitative interviews with Leading Health System executives regarding their strategies and perspectives on implementing innovative technologies. The 18 total respondents represent 15 unique health systems. Respondent roles included System Chief Medical Officer; Chief Operating Officer, Clinical Program Services; Chief of General Surgery; Department Chairman, Orthopedics; VP, Orthopedics Service Line; VP, Clinical Integration; VP, Facility Executive; VP, Clinical Services; Associate VP, Orthopedics & Sports Medicine; Executive Director, Musculoskeletal Program; Senior Medical Director, Musculoskeletal Program; Senior Director, Patient Experience; Director, Orthopedics Service Line; and General Surgeon.

The responding health systems have an average Total Operating Revenue of \$6.2 billion and own or operate a total of 208 hospitals.

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The Academy

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100 Health Systems

500+ C-suite Executives

2,000+ Health System Leaders

66%

Inpatient
Admissions

62%

Outpatient
Visits

67%

Total
Physicians

62%

Total Operating
Revenue