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Update: Robotic Surgery

Robotic surgery (also known as robot-assisted surgery) is one of the fastest-growing specialties in surgical medicine today. In the past two decades, it has seen a steep rise in utilization, and today it is integral to several medical specialties. Ultimately, successful utilization of robotic surgery still depends on the type of surgery performed and the experience and ability of the surgeons operating the systems. In this Global Health Brief, we update you on many of the recent important advances in robotic surgery.



Sincerely,
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Growth of Robotic Surgery

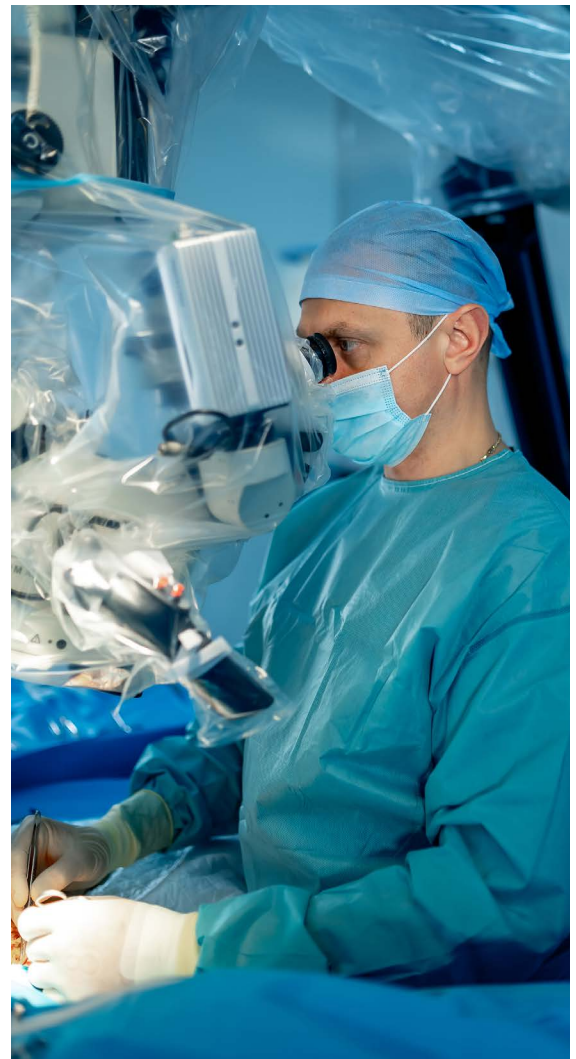
Robotic surgery has been in use for more than 30 years, and its continuous technical advances and refinements since then have made it safer and more effective.

It is also a surgical specialty utilization of which is growing quite fast: a 2020 study showed that from 2012 to 2018, whose utilization rose from 1.8% to 15.1% of all general surgery procedures.¹ Today, it is used frequently for urologic and gynecologic procedures, and for certain thoracic and kidney surgeries.

Common Benefits

Robotic surgery has been rapidly supplanting traditional open and laparoscopic surgeries. Robotic consoles enable surgeons to operate with far greater precision: traditional surgeries involve hands-on procedures on a patient's actual body, whereas a surgeon using a robotic console, with its miniature camera (or cameras) and multiple arms, can perform even highly delicate internal procedures with minimized risk.

Robotic arms can be calibrated for a high degree of specificity, enabling precise targeting of affected organs or lesions, far greater refinement of movement, and less risk to surrounding or healthy tissues.⁹ The surgeries are not only shorter in duration, but their smaller incisions means less blood loss and less post-operative infection risk.⁹ Studies have also shown that robotic surgery patients have shorter post-surgery hospital stays, shorter recovery times, and lower readmission rates than patients who underwent traditional surgeries for the same procedures.¹¹



Latest Technologies

During the past few years, several new systems have been introduced to the market, providing advanced capabilities and a greater choice of features.

Haptic feedback is one of the most highly anticipated advances. Traditional surgeons are guided by eyes and touch, and until recently, robotic systems could not provide an equivalent touch-sense. This made it challenging at times for surgeons to estimate the force exerted by a console's robotic arms during a procedure.³ Haptic feedback gives robotic surgeons a more precise sense of touch (known as telepresence) during their surgeries, which is increasingly enabling highly complex procedures with less risk of tissue injury.³

The robotic arms themselves have also improved substantially. Some manufacturers have developed multi-jointed arms that act much like the human shoulder, elbow, and wrist, providing a broader and more flexible range of motion. One new system, from da Vinci, features a single port platform: instead of separate robot arms, the unit has a single cannula through which three small flexible multi-jointed arms can extend once the cannula is inside the incision. This type of console enables more difficult procedures to be performed using a single incision, and within that incision, much improved maneuverability.⁴ Initially developed for urological and oral surgeries, this platform may have the potential to be widely used in specialties that involve surgeries inside small cavities.⁵

Table 1: Currently Available Robot Surgery Consoles

Robot surgery console	Approvals	Haptic feedback	Single port	Dual console
da Vinci Xi	FDA, CE Mark			
da Vinci SP	FDA		yes	
da Vinci Si	FDA			yes
Versius	CE Mark	yes		
Senhance	FDA, CE Mark	yes		
Avatera	CE Mark			
Hinotori	JMHLW			
Revo-1	KMFDS			

Two challenges remain: first, whether newer systems and their features will prove cost-effective and clinically useful, and second, how much initial and ongoing training will be needed.

Training and Credentials

While utilization of robotic surgery systems has experienced exponential growth, both in many parts of the world and across numerous specialties, standardization of training and credentialing for the surgeons using these systems has not yet been established.⁶

General surgery has been the fastest-growing segment every year since 2012. Indeed, in 2018, for the first time ever, more general surgery robotic procedures were performed in the U.S. than for any other specialty, representing a 32% increase in volume from 2017.

Proficiency of the surgeons operating these machines can differ from one specialty to another as well as from one machine to the next. No currently validated general robotic surgery curriculum exists in general surgery residency programs.⁷ Fortunately, instruction in robotic surgery has been gradually incorporated into training programs for several surgical specialties.

Surgeons in residency programs or already practicing who desire credentialing in robotic surgery are generally required to complete a minimum number of surgeries under supervision. In some countries, supervision is by their medical societies, to make sure they achieve a

sufficient level of competency.⁸ These surgeons will thereafter need to keep their credentials up to date. Many institutions have adopted 20 cases over a rolling 12- to 24-month period as a minimum for case volume, and it has been recommended that there be no absence of cases for longer than four months.⁸ As credentialing processes and requirements are different for each country and specialty, any query regarding credential validity should be checked with local medical societies.

Costs of Robotic Surgeries

The main considerations for robotic surgery in policy design and pricing are its high associated costs. Prices of the units, which can be as much as US\$4 million,¹⁰ have been a barrier to wider adoption of robotic surgery. Maintenance costs must also be factored in, which means charges for robotic surgery cases will frequently be higher than for conventional surgeries. If the surgeon's fee is subject to a policy benefit limit, the limit might need to be adjusted accordingly to reflect the higher fees. For example, the cost differential for kidney surgery between a robotic and conventional laparoscopic procedure could be as high as US\$1,132.¹²

In the future, some of robotic surgery's high costs may be offset by reduced recovery times, better outcomes, and lower need for readmission.

Claims Considerations

Robotic surgery continues to have great promise. However, its utilization depends on many factors, as there is no established single authority for all types of robotic surgery. As these surgeries vary from case to case, claims should be assessed carefully, based on stipulations in policy wordings. Some areas for focus include:

Personalized Treatment Choice

Some surgical disciplines, such as urology, nephrology, colorectal, and gynecology, have seen a wide application of robotics. Utilization should be supported by appropriate research or guidelines to show that the robotic procedure used meets medical standards of effectiveness and safety. The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), for example, has published The SAGES Atlas of Robotic Surgery, which contains definitive guidelines for these disciplines, addressing the fundamental principles, technology, operating room setup, and workflow.^{16,17} It could potentially serve as a reference point for determining if robotic surgery is indicated, or to ensure it is practiced safely for any particular medical condition.

Cost-Benefit

Robotically performed surgeries generally cost more

than non-robotic for the same procedure, thus making it necessary for any robotic surgery claim to be thoroughly assessed for unusual charges. The cost must be properly justified by the operating surgeon and the benefit established medically. Keep in mind that the newer and more advanced machines are more costly, so utilization of these devices must be managed properly. A good Medical Necessity definition for robotic surgery should exclude treatment that is more expensive but provides the same clinical outcome as traditional laparoscopic or open surgery. Thus, there is opportunity for pre-authorization to pre-emptively control cost of treatment when robotics is involved if the medical necessity of robotic surgery can be established prior to admission.¹¹

Credentials and Training

No single authoritative body currently regulates robotic surgery. Each surgical discipline has different criteria for accrediting an operating surgeon. The American Urological Association (AUA), which published credentialing guidelines for a urological surgeon to perform robotic surgeries, lists these two requirements:¹³

- Any surgeon operating robotically should be trained on the system to be used.⁸
- A surgeon who intends to do robotic surgery should be checked for credentials (based on clinical practice or medical societies for the particular specialty) to make sure that surgeon is well-trained to use the system.

Since training is scarce for robotic surgery, in some cases the robotic surgery operating theater will permit multiple doctors to be present for training purposes. Claims managers should clarify whether all of the surgeons listed in the claim are there for the surgery itself, or because they need extra console time. Pre-authorization is a good way of determining this, as robotic systems generally require only one operating surgeon.¹⁵

Conclusion/Summary

Assessing robotic surgery claims today presents unique and evolving challenges. As more surgeons are learning to operate robotically and with advanced systems coming to the market, more may switch from conventional to robotic methods.

To make sure that the procedure is both safe and beneficial for the patient, robotic surgery should be subject to determinations of medical necessity, and to its acceptance within medical specialties.

If there is ever doubt in a specific claim about whether a robotic surgery was or would be appropriate, further information should be requested from the operating surgeon(s) and assessed thoroughly to support the usage of robotic systems. ■

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