

Robotic Surgery: An Overview

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Date of Submission: 17-10-2024

Date of Acceptance: 27-10-2024

There has been a rapid growth in the implementation of surgical robots in recent years, this technology brings many advantages to the patients. However, it is complex to operate and requires high precision motor skills and tactical perceptions. While the obstacles remain the same, the continued evolution of this technology promises to enhance surgical care and improve the lives of countless patients in the years to come.

Also known as Robot-Assisted Surgery, RS utilizes specialized robotic platforms to support surgeons in performing delicate operations. One of its conveniences is that it improves the surgeon's precision and accuracy during surgeries. Another benefit is that many robotic surgeries are performed using a laparoscopic technique (key hole incision). This results in less trauma to the body, leading to reduced pain, shorter recovery time and lower risk of infection.

The surgeon can have a magnified pseudo 3-dimensional (3D) view of the surgical area which helps in identifying structures more accurately and allows for better decision-making during procedures.

India is the world's 5th largest economy, hence the healthcare sector is rapidly expanding and creating a big demand for robotic technology. Over the past twelve years 12,800 surgeries have been performed with robotic assistance (Bora et al.2020). It is expected to increase and revolutionise the healthcare system

I. Advantages:

- 1) Robotic surgery has smaller incision which lead to minimal scarring and reduced risk of infections.
- 2) Pain and discomfort is considerably lesser, which helps in faster recovery time thereby the patient can return to normal activities sooner.
- 3) The precision of robotic instruments often leads to less bleeding during surgery. This is particularly important in complex surgeries where blood loss can complicate the procedure and recovery.
- 4) Recovery time required is less leading to shorter hospitalisation and lesser cost.
- 5) Robots provide enhanced ergonomics and comfort for the surgeons, helps to eliminate human errors as they are less fatigued.

II. Challenges:

- 1) The initial investment cost for set up of robotic assisted surgeries run into millions eg. Da Vinci Surgical System costs around \$2 million initially.
- 2) Surgeons require specialized training to operate robotic systems effectively. Ensuring that enough skilled professionals are available is crucial for the widespread adoption of this technology.
- 3) The annual maintenance fees and operating cost for RAS can be substantial ranging from \$100,000 to \$200,000 each year which becomes difficult to recover and makes it unaffordable for some healthcare facilities.

III. Cost-Benefit Analysis:

In spite of the high initial cost, the long-term savings of RAS system (due to reduced hospitalisation stays and improved outcomes) may reduce the cost overtime. According to a study conducted by John Hopkins, it was shown that 20% of the total cost of ownership was recovered within 3 years.

IV. Applications Of Robotic Surgery:

Robotic assisted surgeries can be best applied in areas like Appendectomy, Colectomy, Gallbladder removal, Gastric bypass, Hernia repair, Hysterectomy, Mitral valve repair, Pancreatectomy etc.

V. Conclusion:

As technology continues to advance, the potential for robotic surgery to transform healthcare is immense. Ongoing developments in robotic systems are aimed at enhancing their capabilities, making them more intuitive and user-friendly for surgeons. The integration of artificial intelligence and machine learning may further optimize surgical outcomes, paving the way for even more sophisticated procedures in the future.

In conclusion, robotic surgery is not just a technological marvel; it is a transformative approach that improves patient outcomes and enhances surgical precision. As this field continues to evolve, it holds the promise of redefining the standards of surgical care, making procedures safer and more effective for patients worldwide.

References:

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