

PREPARING FOR THE FUTURE OF THE OPERATING ROOM: ROBOTICS

JUNE 2020

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Introduction



Imagine a future where surgical robots have become small and affordable enough to be found even in non-specialized hospitals and outpatient clinics outside of a major metropolis...



Imagine a time when these robots can be put onto “auto-drive” mode to complete certain parts of an operation faster and more accurately than humans...



Imagine a world where a specialist can conduct operations in several cities in multiple countries – all in a day’s work from one centralized location...



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Introduction

Operating rooms (ORs) are one of the most critical areas and highest cost centers of a hospital – in some cases making up over 40% of total expenses. This makes them a prime target for innovation to improve efficiency and precision. The past decade has seen a significant shift in the use of sophisticated and automated technology in the OR, including:



High-resolution displays and surgical cameras that steer surgeons through an operation, projecting a patient's body into a GPS-style map, allowing surgeons to see any section of the patient anatomy before operating



Despite the high cost, the number of **hybrid operating rooms** is growing by 15% to meet the global increase in number of surgeries performed. They work by adding advanced imaging systems onto existing traditional operating rooms, increasing procedural efficiency and avoiding costly surgical revision



Speech recognition software is changing the way medical teams in the OR interact, for example, by video calling with colleagues outside of the OR for their advice. This "Siri-like" software is also revolutionizing how surgeries are performed, including adjusting equipment or zooming into a particular image



Apps such as "Touch Surgery," augmented & virtual reality are being used by the modern "digital doctor" to learn new procedures, via videos and simulations



Inpatient and day case surgeries have been driven by the uptake of minimally invasive surgery with OR design mirroring that trend; more recent digital technology is being used to set up 24/7 in-home monitoring systems to keep tabs on patients, remotely from one high-tech hub



Smart hospital design is surpassing traditional OR design, creating the perfect environment for successful surgeries. Innovations include advanced operating tables, self-ordering supply cabinets, customized lighting solutions and strategic monitoring of airflow and temperatures. All of this and more can be monitored and controlled, using dashboards and touch screens.

<https://www.mddionline.com/future-digital-surgery>
<https://www.merraine.com/5-disruptive-technologies-that-are-revolutionizing-the-operating-room>
<https://new.siemens.com/global/en/products/buildings/markets/smart-hospitals/operating-room.html>

We spoke to 10 leading robotic surgeons around the globe and collected quantitative data, together with SERMO, from 243 surgeons across the US and Europe to assess their take on what has worked well, where improvements are needed and what the future will hold for robotic surgery. This paper focuses on the impact that robotics has had on OR design, surgical practice and outcomes and highlights from our expert interviews.



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Brief history

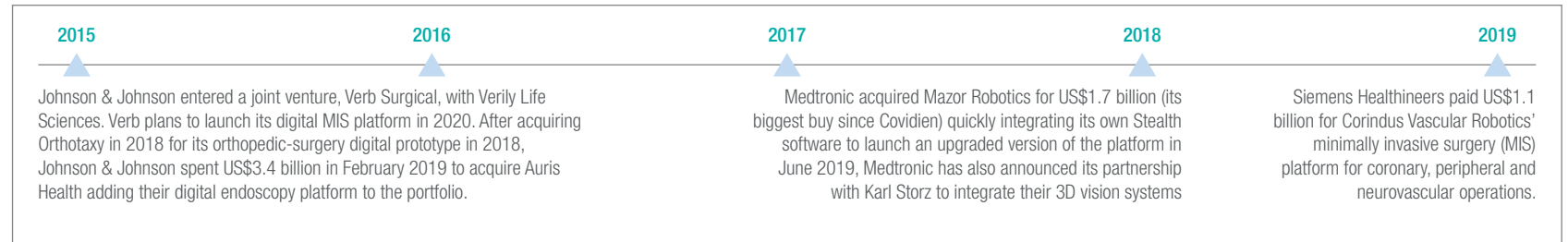
The idea of robotic surgery was initially developed for the military, in order to enable surgeons to operate on wounded soldiers from a remote and safe location. They first entered the civilian operating room two decades ago.

One might think that robotics would have had an immediate and transformative effect on surgical practice and outcomes, when first introduced in 1999 for urology, gynecology and bariatric surgeries. However, much like electricity, the computer and the worldwide web, the “Productivity Paradox” holds true – it takes on average 20 years for an innovation to reap productivity benefits. The thing about revolutionary technology is that it changes everything, and changing everything takes imagination. Instead of just replacing minimally invasive or open-surgical techniques with robots, surgeons and hospitals have had to redesign their ORs and ways of doing things to

get the best out of robotics. As technology advances and efficiencies are recently being realized, we see a broadening of robotic design and expanded use for other indications.

Two decades after its initial launch, patents for Intuitive’s Da Vinci systems are expiring, opening up the market to new competitor products thus changing the market dynamics.

Companies such as Stryker, Smith & Nephew, Zimmer Biomet and Globus Medical have all made acquisitions (and/or signed collaborations) to acquire or enhance robotic surgical platforms.



<https://overcast.fm/+JJ-UamQml> – 50 things that changed the Modern Economy 'Dynamo' PODCAST
Informa Pharma – Robotically Assisted Surgical Devices_Dec 2019



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Drivers & barriers

There are six main drivers to the growing use of robotic surgical platforms:

1. **The aging population, global burden of disease and subsequent general hospital bed shortages** are highly motivating reasons to use robotics as in many cases, patient recovery time is reduced
2. **Introduction of less expensive systems** and the launch of systems that do not require use of disposable instruments is bringing down the per procedure cost, meaning more can afford robotics
3. **Technological advances** in robotic systems are enabling more widespread use, e.g. haptic feedback and modular components increasing versatility, as well as the availability of portable devices that allow transfer between operating rooms and create suitability in ambulatory surgery centers
4. **Increased emphasis on physician and operating room safety** drives use of robotics as they have the potential to significantly reduce and potentially eliminate the need for intraoperative fluoroscopy
5. **Integration of robotic training into medical residency programs** will further drive the adoption of robotics within each surgical specialty
6. **Regulatory approvals of robotic systems** for additional clinical indications and in new geographic markets has led to procedure volume growth

While use of robotic surgical platforms have been increasing, there are geographical differences to adoption.

- The volume of demand is the highest in the US, at around 70% of global sales, due to procedure volume growth, the reimbursement system (robot-assisted is classified as minimally invasive, which is covered by insurers), and the trend amongst manufacturers to invest a larger portion of their efforts in the US.
- Reduced spending and smaller budgets for healthcare providers have limited the overall volume of installed robotic platforms in Europe, with 14% of global sales in the five major EU markets.
- Asian countries, particularly Japan, China and South Korea with substantial investment in technological advancements, serve as new revenue pockets for the medical robotic systems market. High investment costs still limit the installation of robotics to large tertiary/university hospitals in key metropolitan cities, where there is the highest suitable case load.

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Drivers & barriers

It is generally accepted that robotic surgical systems offer similar benefits to those offered by minimally invasive surgery (MIS), including shorter recovery time, less scarring and reduced healthcare costs, due to shorter hospital stays driving uptake over open methods. The jury is still out on whether the additional cost of robotics over traditional laparoscopic procedures carries sufficient additional benefits.

Key Benefits, and how they are measured by hospitals to justify investment, fall into three categories:

General benefits

- Experts found it easier to train on robotics than anticipated
- Robotics is an “easier” option
- Ability to treat higher patient case loads

Benefits during surgery

- Seen as an enabling technology
- Improved precision and ergonomics
- Allows surgeons to perform otherwise difficult or impossible surgeries
- Enables more efficient use of the OR

Benefits post-surgery

- Post-surgical complications are less frequent and complex
- Reduced recovery time
- Fewer readmissions at day 7, 30, 90
- Reduced post-operative pain and scarring

Even with the benefits presented and being on the market for two decades (and counting), robotic surgical systems are still not considered mainstream. A number of factors have, and some will continue to, impede the adoption to these systems.

Key Barriers

- Insufficient clinical evidence
- Lack of competition means high costs
- Lack of (adequate) government reimbursement
- Access to/availability of robotic platforms or trained surgeons
- Patient acceptance and demand

<https://www.medicaldevice-network.com/features/da-vinci-surgical-robot-competitors/Ou et al., 2011>



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The future

While ORs have been transforming over the past decade, there are even more innovative tools being developed to further enhance efficiency and precision. Some of these tools will have an impact in the short term but more “idealistic” innovations (such as advanced AI, remote-controlled surgery) will take longer to reach the OR. The experts we spoke to anticipate it will take at least another decade to get to a point where these innovations are truly integrated into the OR.

AI is already breathing new life into robotic-assisted surgeries making it easier for surgeons to navigate small incisions and limit strains on joints. In the future, advanced AI will allow robots to “explore” the patient’s body and give the surgeon several courses of action to choose

from. Once an action is selected, the robot could execute the fine precision work, while the surgeon supervises.

Another aspect of futuristic robotic-assisted surgeries will enable one surgeon to oversee procedures in multiple hospitals and countries, without having to leave his or her position, thus granting access to specialized care in smaller, non-specialized hospitals – as long as the hospitals can have the robotic platform. This model will establish a more decentralized network-based care, with surgeons overseeing procedures from their centers of excellence, while procedures are taking place out in the larger community.

While use of robotic surgical platforms have been increasing, there are geographical differences to adoption.

1. Increased competition, price reduction and improved access
2. Increasing indications for robotics
3. Continued improvements in digital imaging
4. Miniaturization and migration out of the OR
5. Increased use of data/smart systems
6. Peripheral technology is expected to become more widespread
7. New/updated innovations focused on ease of use, better precision and ergonomics (e.g., single port systems)



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Impact of COVID-19

COVID-19 has had a profound impact globally. The biggest impact on surgeons is a drastic reduction in caseload, as elective surgeries are being postponed or canceled. As hospitals begin to open up for elective surgeries, various changes are likely to occur to accommodate the new environment.

Prioritization on a backlog of elective surgeries, as only urgent/emergency cases have been conducted and elective procedures have been postponed. Impact on procedural volume differ by country and even regionally within a country. As a result, rollouts will differ as well. Individual hospitals are already planning how to address the backlog, while balancing out resources consumed by treating COVID-19 and addressing patient concerns of potentially contracting an infection.

Introduction of new protocols

- Patient selection criteria are becoming more stringent, with each case being presented to a surgical committee for approval
- Patient preparation & screening to include COVID-19 tests in some cases
- Infection control during the surgery is stepped up with air seal devices, negative pressure ORs & more complex bio-cleaning

Delayed or decreased funding for new robotic surgical platforms, as a result of COVID-19-related costs on the system. Hospitals need to recoup their losses before they consider large capital expenditures. For manufacturers, reaching out at the right time to begin discussions will be crucial.

Increase in robotic use as some surgeons report that robotic surgery has less contact, so is viewed as safer. We have seen examples of various robots being used in hospitals during the COVID-19 pandemic and believe that these experiences could pave the way for more robotic use, including for surgeries.



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As the world grapple with the aftereffects of COVID-19, hospitals will likely take a longer time to regain their balance. Implementing new protocols, overcoming heavy financial losses and assuring the public that having surgical procedures is safe are among their immediate focus. Once things return to some form of normalcy, hospitals will then revisit purchasing needs of large capital equipment. In the meantime, manufacturers need to revisit their strategies to accommodate for the changing environment.

As the market becomes increasingly crowded, manufacturers will need to invest in the right strategy to differentiate their solutions. Leveraging

a connected digital ecosystem, gathering and using data to drive better outcomes and establishing outcomes-driven payment models will pave the way of the future.

Winning strategies will use deep learning algorithms to complement surgical expertise, by enhancing real-time decision making during complex surgeries. Ultimately, while surgical robotic platforms represent a key new technology – their interoperability with connected operating rooms of the future will be equally important for their long-term prospects.

Join our webinar for more insights and data

To glean more details on the topics covered in this paper, including the many opportunities for manufacturers to leverage, please register for our July 15 webinar, with live events hosted across different time zones:



July 15 (EU)

9:30 a.m. BST/10:30 a.m. CET

[Register](#)



July 15 (APAC)

4:30 p.m. SGT/4:30 CST

[Register](#)



July 15 (USA)

10:30 a.m. PST/1:30 p.m. EST

[Register](#)



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About Ipsos' Medical Devices & Diagnostics Center of Expertise

Expertise across the product lifecycle

Operating in more than 50 countries, our 1000+ healthcare experts support key business decisions for our clients throughout the commercial lifecycle – from early-stage strategy, through to product launch and performance optimisation. We do this through a uniquely integrated combination of therapeutic, market, analytical and commercial expertise, as well as gold standard, proprietary real-world evidence.



Early development

Market mapping/landscaping

- Assessment of unmet needs
- Regulatory environment
- Competitor landscape
- Current practice
- Patient pathways

Opportunity assessment & Identification

- Market sizing & forecasting
- Market segmentation



Late development

New product design & development

- Innovation workshops with R&D, marketing & customers to generate new ideas
- Fine-tuning existing concepts

Concept testing

- Pricing & value assessment
- Human factors/usability testing
- Conjoint analysis of best features/value per feature



Launch

Launch strategy

- Message/positioning testing
- Price optimisation
- Value proposition/story refinement
- Engagement strategies
- Preferred marketing channels
- Target identification



Post-launch

Brand health tracking

- Advertising and messaging effectiveness
- Brand equity
- Sales force effectiveness
- Awareness & usage

Customer experience/satisfaction

- Customer loyalty
- Value optimisation strategies



Portfolio management

Next-gen/upgrade strategies

- Assessment of unmet needs
- Identification of gaps in a portfolio

Portfolio (merger) management

- Optimisation of existing portfolio
- Risk of cannibalisation of new product design or merging of two company portfolios
- Rebranding effect in case of company mergers

