Laparoscopic Surgery vs Robotics: Is It Time to Hang It Up (or think about it)?

Kenneth D Vick MD FACS
Professor of Surgery
University of Mississippi Medical Center

University of Mississippi Health Care

1

1

Disclosures

I have no relevant financial disclosures for myself

My spouse is a speaker for Mimetics

University of Mississippi Health Care

2

2

Objectives

- Consider the growth of robotic technologies worldwide and in education
- Discuss the advantages of laparoscopic and robotic technology
- Postulate the future of surgical tech and its impact on our practice

University of Mississippi Health Care

3

JSLS Journal of The Society of Laparoscopic & Robotic Surgeons

JSLS. 2020 Oct-Dec; 24(4): e2020.00076.
doi: 10.4293/JSLS.2020.00076
PMCID: PMC7810432
PMID: 33510568

The Rise of Minimally Invasive Surgery: 16 Year Analysis of the Progressive Replacement of Open Surgery with Laparoscopy

Ace St. John, MD, Ilaria Caturegli, MD, Natalia S. Kubicki, MD, and Stephen M. Kavic, MD

University of Mississippi Health Care

4

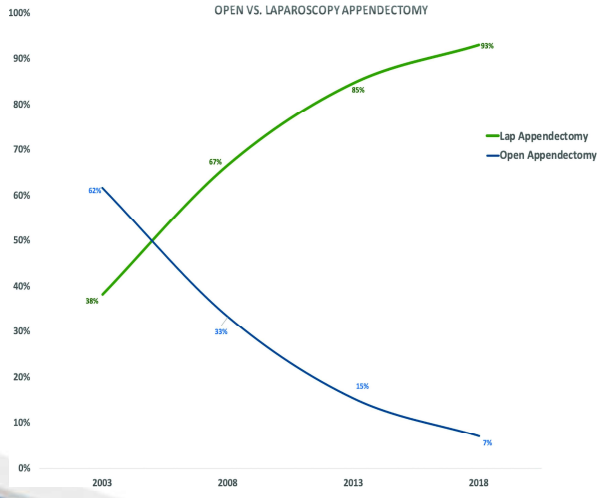
- Retrospective review of the ACGME national operative case log database of general surgery residents from January 2003 to December 2019.
- Compared the open vs. laparoscopic case numbers for cholecystectomy, appendectomy, inguinal hernia repair, colectomy, gastrectomy, and Nissen fundoplication.
- 462% increase in laparoscopic cases by general surgery residents over the 18-year interval, 2000 to 2018

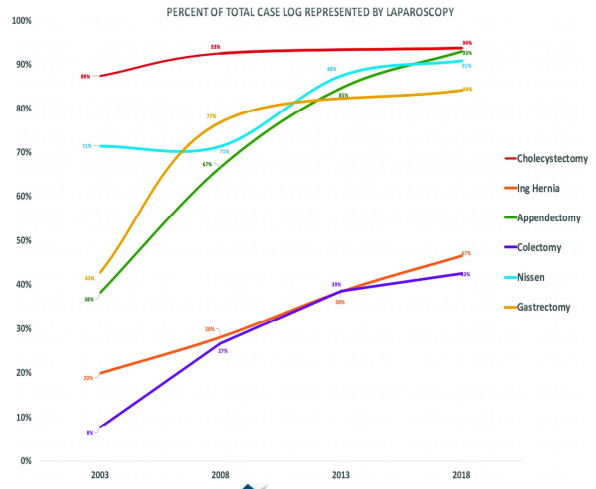
University of Mississippi Health Care

5

5

Ace St John, et al





University of Mississippi Health Care

6

6

"The increased predilection for a minimally invasive approach has led to debate on procedural competence, over reliance on technology by today's surgeons, and the question of whether surgeons remain adequately trained in open techniques"

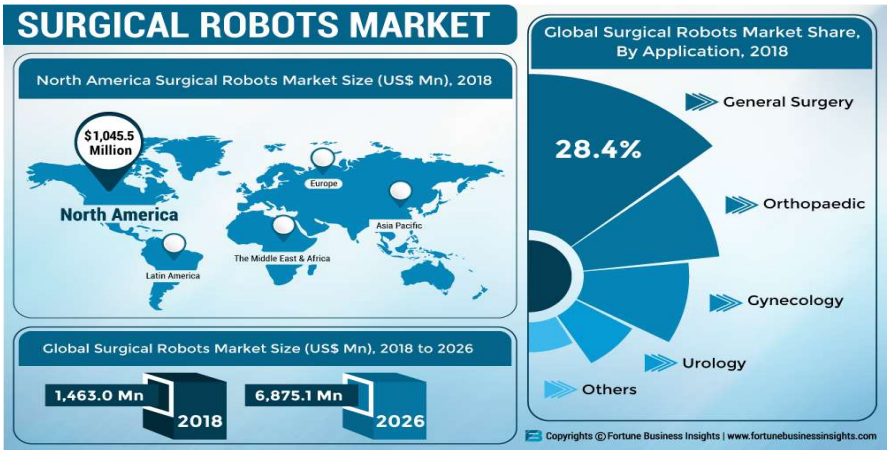
7

7

What About Robotic Surgery?

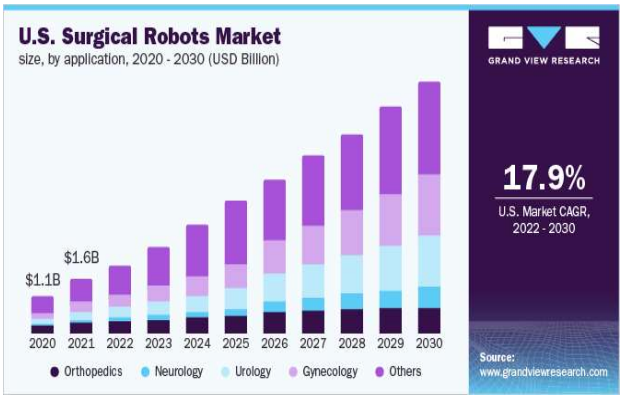
8

8



University of Mississippi Health Care

- Estimated Compound annual growth rate of almost 20%*
- In 2019 over 1.2 million operations performed worldwide on Davinci alone



*Grand View Research: Surgical Robots Market Size, Share & Trends Report
Surgical Robots Market Size, Share & Trends Analysis Report By Application (Orthopedics, Neurology, Urology, Gynecology), By Region (North America, Europe, Asia Pacific, LATAM, MEA), And Segment Forecasts, 2022 - 2030
Report ID: 978-1-68038-811-4

University of Mississippi Health Care

Advancement of MIS through Technology

- Technology has made the 'impossible possible'
  - Energy devices
  - Stapling platforms
  - Efficient access to the abdomen and other body cavities
  - Better ergonomic design for surgeons

University of Mississippi Health Care

11

11

Advantages of Laparoscopy over Robotics

- Multi-quadrant surgery may be easier
- Some tactile feedback
- Cost*
  - Initial investment
  - Cost per case
- Lower maintenance
  - Laparoscopy is ubiquitous at present
  - Can be performed in critical areas of need/underserved areas

University of Mississippi Health Care

12

12

Cost of Laparoscopy vs Robotics

- Bakshi, Godwin, and Teixeira (2016)
- Cost and reimbursement analysis of robotic versus conventional laparoscopic surgery
  - operative time and costs
  - LOS
  - overall hospital expenses
  - reimbursement and the contribution margin per cpt code

COST ANALYSIS OF ROBOTIC ASSISTED SURGERY VS LAPAROSCOPY IN GENERAL SURGERY
Chetna Bakshi, MD, Andrew Godwin, MD, Julio Teixeira, MD. Presented at the SAGES 2017 Annual Meeting in Houston, TX

University of Mississippi Health Care

13

13

- 1927 patients who underwent 1716 laparoscopic and 211 robot assisted general and bariatric cases
- Average total cost
  - Overall $8,955 vs $15,319 (Lap vs Robot)
  - Gen Surgery $7,675 vs $9,436 (lap vs robot)
- Contribution margin
  - Gen surg: $7,761 vs $3,473 (Lap vs Robot)
  - Bariatric: $14,149 vs $6,165 (Lap vs Robot)
- '…there is no clear evidence that institutions lose money with robot assisted surgery…'

University of Mississippi Health Care

14

14

LOS and Robotics vs Laparoscopy

- Many studies tout LOS as a major advantage, but not all

Experience with 10 years of a robotic surgery program at an Academic Medical Center

Sarah B. Stringfield, Lisa A. Parry, Samuel G. Eisenstein, Santiago N. Horgan, Christopher J. Kane & Sonia L. Ramamoorthy

Surgical Endoscopy **volume 36**, pages 1950–1960 (2022)

15

15

- Almost 3500 robotic cases from 2005-2016 were compared to laparoscopic equivalents in the UCSD system
- LOS was 3.3 days for robotics vs 3.0 days for lap
- Cost per day for admission after robotic surgery was 1.7 times greater than the cost of open or laparoscopic surgery

16

16

Robotic Advantages

University of Mississippi Health Care

17

17

Learning Curve of Robotics

- Some studies suggest that at equal levels of experience, the learning curve is easier with robotic surgery than with laparoscopy*
- Large meta-analyses show mixed results however

*Colorectal Disease: The learning curve in robotic colorectal surgery compared with laparoscopic colorectal surgery: a systematic review. Julie Flynn, José Tomás Larach, Joseph C. H. Kong, Peadar S. Waters, Satish K. Warrier, Alexander Heriot. First published: 28 July 2021 https://doi.org/10.1111/codi.15843

University of Mississippi Health Care

18

18

Laparoscopic Surgery and Injury

- Society of American Gastrointestinal Endoscopic Surgeons (SAGES) Task Force on Ergonomics
  - Of 149 surgeons surveyed, 8-12% reported frequent neck and upper extremity pain
- Study by Bernie Lee Et al at Beth Israel
  - Systematic review that included 5828 physicians
  - From 1997 to 2015, prevalence of degenerative cervical spine disease and degenerative lumbar spine disease increased by 18.3% and 27%, respectively
  - 12% (277 of 2319 physicians) required a leave of absence, practice restriction or modification, or early retirement due to MSK disease

University of Mississippi Health Care

19

19

Ergonomic advantages of Robotic Surgery*

- Robotics conferred superior ergonomic benefits and reduced work load compared to laparoscopy, for both surgeons and trainees.
- Self-reported discomfort was lower in robotic procedures compared to laparoscopy and open surgery
- Some rates of physical strain still exist with inadequate console familiarization

*Int J Med Robot. 2020 Aug;16(4):e2113. doi: 10.1002/rcs.2113. Epub 2020 May 6. A systematic review of the true benefit of robotic surgery: Ergonomics. Ian Jun Yan Wee Li-Jen Kuo , James Chi-Yong Ngu

University of Mississippi Health Care

20

20

Where and When will 'critical mass' occur?

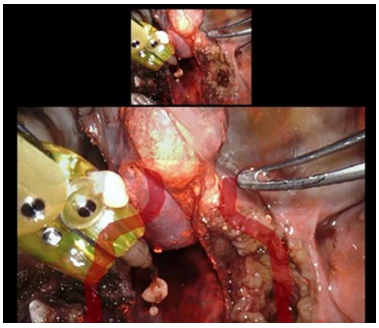
- Residents are seeking out robotic training
  - It is not just the hot thing to do
  - Will it go the way of vascular surgery? What kind of time horizon are we looking at?
- Will laparoscopic platforms become the "analog" to Robotics' "digital" technology?

University of Mississippi Health Care

21

21

Role of AI in Surgery

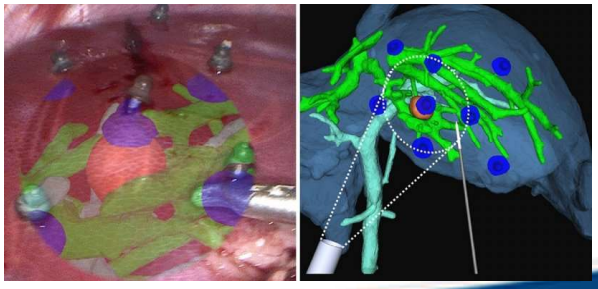


22

VR vs AR

- Totally immersive experience
- Environment is completely replaced
- Ideal for training

- 'Real World Setting'
- Digital elements are added to a live view
- More applicable for live surgery



23

Are Robots set for Future Tech Developments?

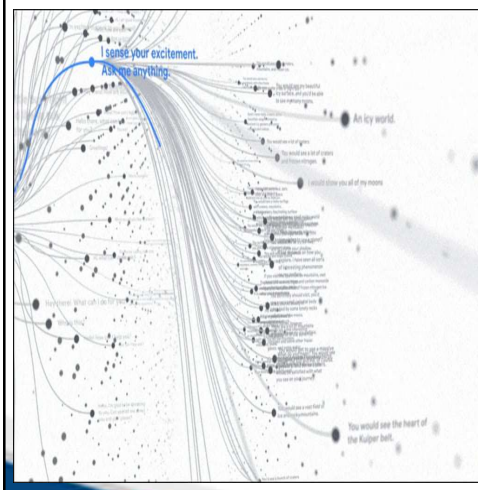
- More seamless integration of various technologies
- Tailor made for augmented reality
- Provides opportunities for total control by the operating surgeon
  - Optics
  - Retraction
  - Dissection
- Deep learning and hierarchical algorithm development can assist medical decision making

University of Mississippi Health Care

24

24

Summary



- There will always be a need for laparoscopic skills (probably?)
- As robotic surgery grows, greater distance will form between skilled laparoscopists and robotic surgeons
- Training challenges will increase for our residents
- Environment and Lifestyle choices will play a greater role in which skillsets rising surgeons will choose to develop

University of Mississippi Health Care

25

25