

Platform Agnosticism: Are Robotic Systems Interchangeable in Complex/Revisional Surgery?

Erik B. Wilson, MD, FACS

Professor of Surgery

Vice Chair of Surgery

Bariatric Surgery Medical Director Memorial Hermann Hospital

Division Chief, Minimally Invasive and Elective General Surgery

University of Texas Medical School at Houston

Platform Agnosticism: Are Robotic Systems Interchangeable in Complex/Revisional Surgery?

Yes, Eventually

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Disclosures

Johnson&Johnson-Teaching/Research

Medtronic-Teaching/Research

Intuitive-Teaching/Research

Gore-Teaching

Activ Surgical-Research

Boston Scientific-Teaching/Research

Endogenex-Research

CMR-Research

Distalmotion-Research

GI Windows-Chief Medical Officer

What Is the Goal of Minimally Invasive Surgery?

Better minimally invasive surgery

1. More precise and accurate
2. More reproducible and consistent
3. Easier on the surgeon physically and mentally
4. More efficient--quicker

More minimally invasive surgery

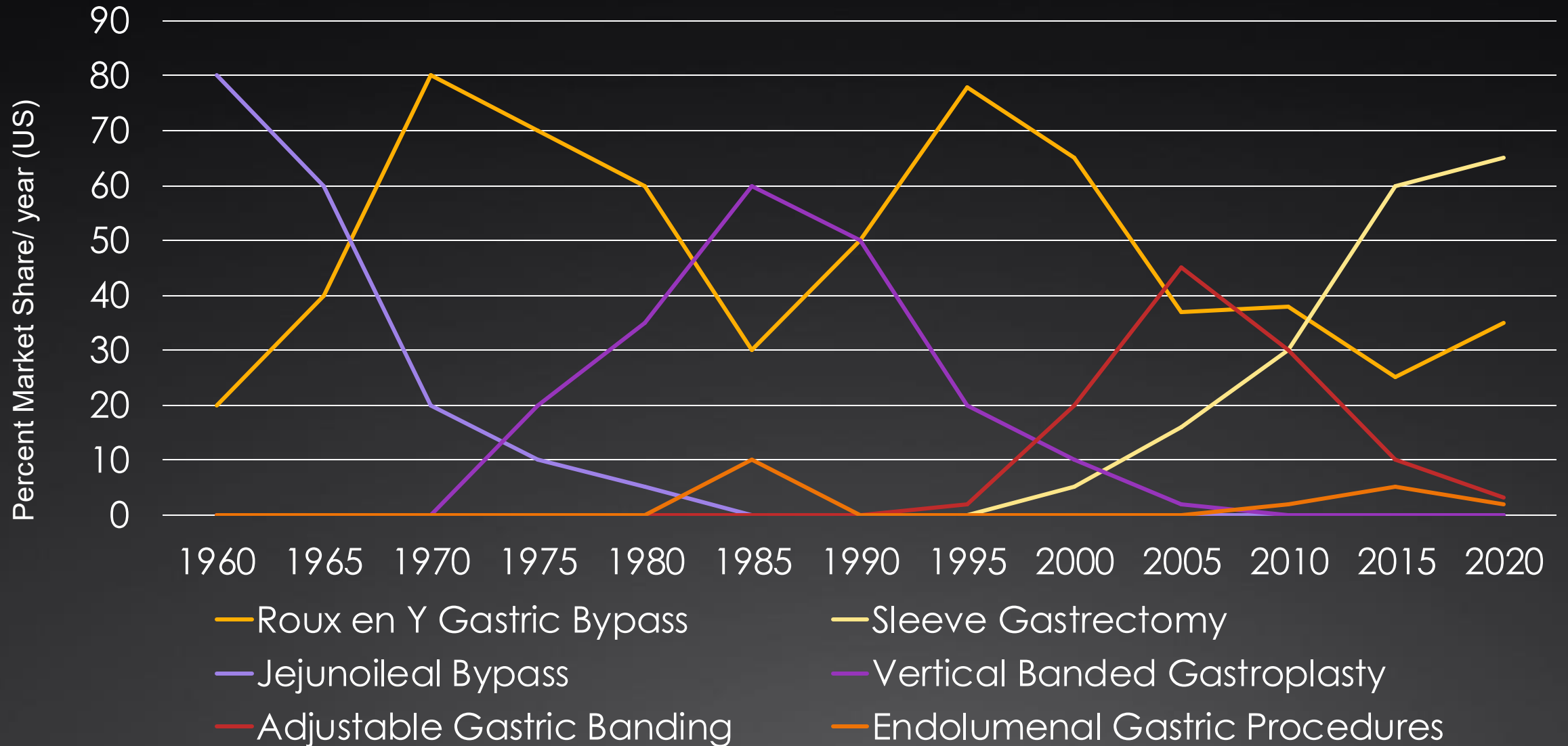
1. Stop open surgery
2. Optimize the procedure to the patient
3. Fewer incisions
4. No incisions

Surgeons want to operate at a high level and talk to patients about operating at a high level and that's it!

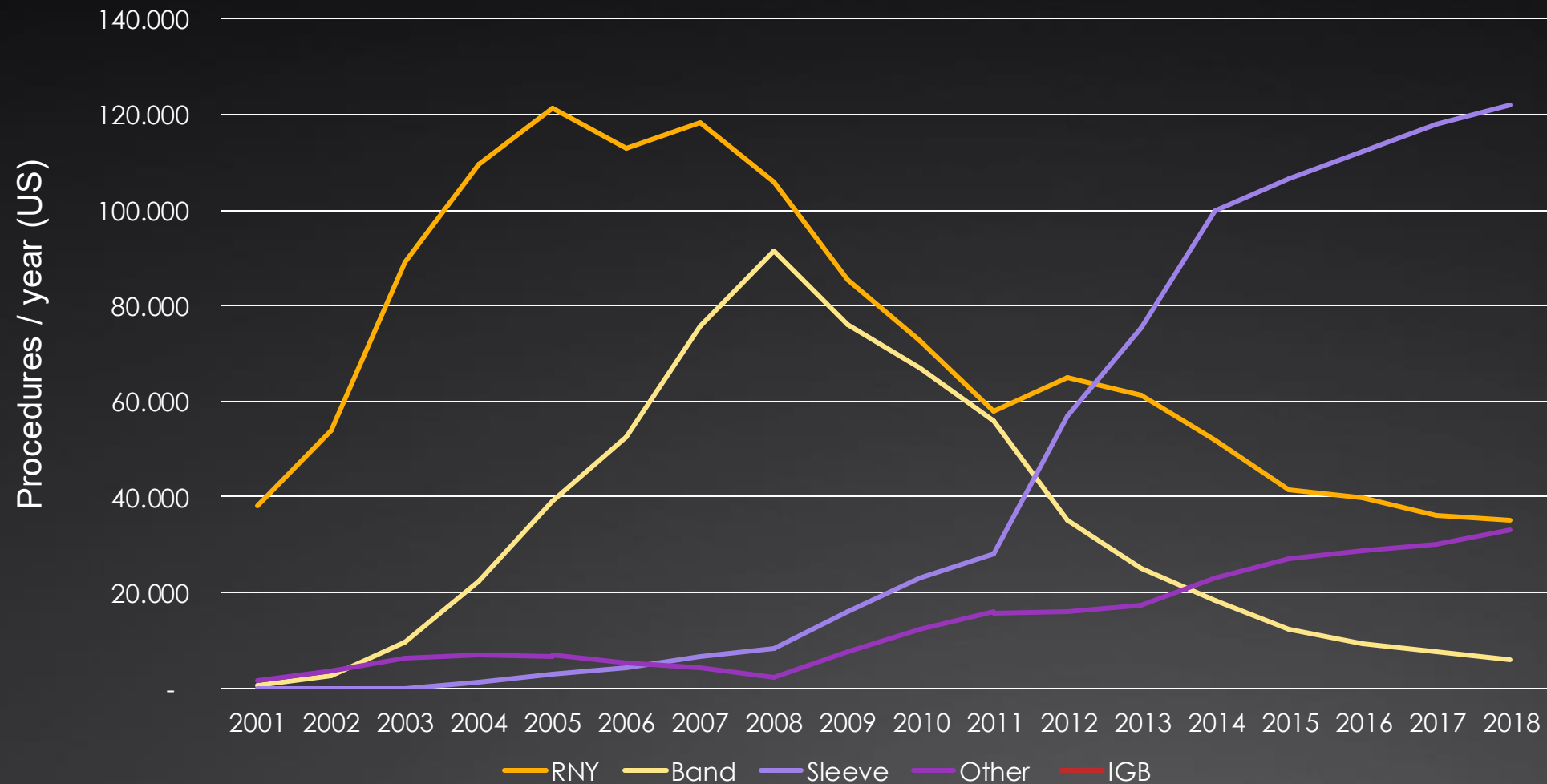
Digital is Driving the Process:

Robots, Telesurgery, Endolumenal, AI & Automation

Bariatrics are Driven to One Leading Procedure



Bariatric Procedures Should Balance with Better Understanding of the Disease and Treatment Incentives



Sleeve easier but doesn't make it better for each patient

Bypass wakes you up in the middle of the night

Bariatric surgeon growth was tied to band growth and now sleeve growth

One surgery all day long is good business

Democratizing Surgery and Bariatric Surgery with Robotic Platforms

Laparoscopic Trends

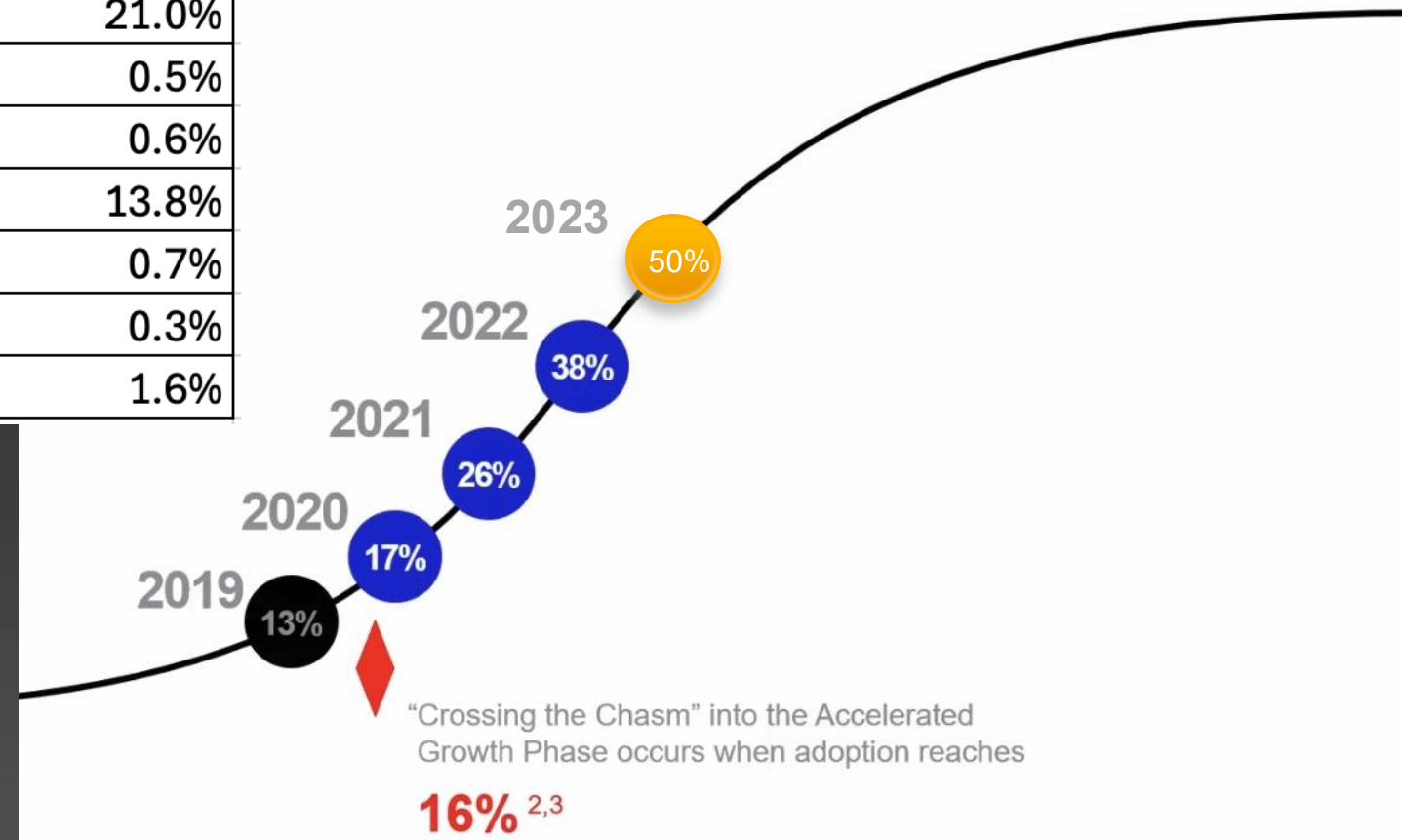
	2020	2021	2022	2023
Sleeve	63.2%	59.2%	59.5%	61.5%
RYGB	19.4%	19.8%	19.9%	21.0%
Band	1.1%	0.5%	1.3%	0.5%
BPD-DS	1.4%	1.7%	1.9%	0.6%
Revision	12.9%	14.0%	13.1%	13.8%
SADI	0.3%	0.5%	0.7%	0.7%
OAGB	0.9%	0.6%	0.5%	0.3%
Other	0.8%	3.8%	3.1%	1.6%

Growing Robotic Bariatric Surgery with Increasing Complexity

Robotic Increasing Anastomotic Cases:

Less sleeves more Bypass and Switch from 2020 to 2025 from Robotic Bari Surgeons

Thank You Intuitive!



Democratizing Surgery and Bariatric Surgery with Robotic Platforms

Growing Robotic Bariatric Surgery with Increasing Complexity

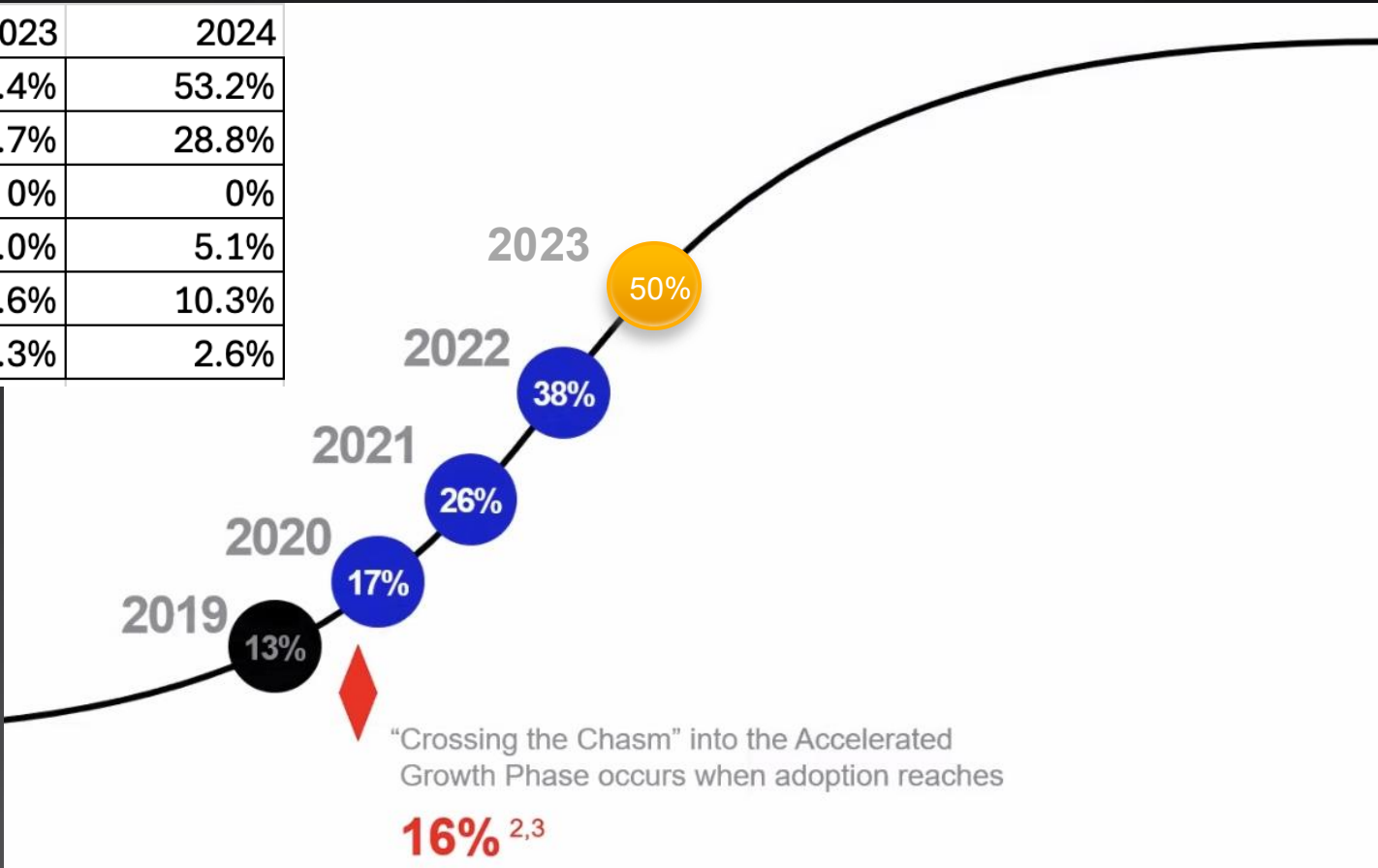
Robotic Trends

	2020	2021	2022	2023	2024
Sleeve	61.0%	60.7%	58.7%	56.4%	53.2%
RYGB	29.0%	29.3%	29.6%	28.7%	28.8%
Band	0%	0%	0%	0%	0%
BPD-DS / SADI	6.5%	6.5%	3.5%	4.0%	5.1%
Revision	3.5%	3.5%	7.9%	9.6%	10.3%
Other	0.0%	0.0%	0.5%	1.3%	2.6%

Robotic Increasing Anastomotic Cases:

Less sleeves more Bypass and Switch from 2020 to 2025 from Robotic Bari Surgeons

Thank You Intuitive!



Robotic Bypass Revisions 2010

Bariatric revisional surgery

Obes Surg. 2010 Jul 30. [Epub ahead of print]

Reasons and Outcomes of Reoperative Bariatric Surgery for Failed and Complicated Procedures (Excluding Adjustable Gastric Banding).

Patel S, Szomstein S, Rosenthal RJ.

Section of Minimally Invasive Surgery and The Bariatric and Metabolic Institute, Cleveland Clinic Florida, 2950 Cleveland Clinic Blvd., Weston, FL, 33331, USA.

Abstract

BACKGROUND: The rise of bariatric surgery has lead to an increasing number of reoperations for failed bariatric procedures. The reasons and types of these operations are varied in nature and remain to be defined.

METHODS: A retrospective review of a prospectively collected database was conducted to identify patients who underwent laparoscopic revisional surgery for non-gastric banding-related bariatric procedures between 2001 and 2008.

RESULTS: Of 384 secondary bariatric operations, 151 reoperative procedures were performed. Twenty-six vertical banded gastroplasties (17.2%), 2 mini-gastric bypasses (1.3%), 2 non-divided bypasses (1.3%), 1 distal Roux-en-Y gastric bypass (RYGBP; 0.7%), and 2 sleeve gastrectomies (1.3%) were converted to RYGBP. Three RYGBP (2%) and four jejunoileal bypass procedures (2.6%) were reversed secondary to malnutrition. One jejunoileal bypass (0.7%) and one biliopancreatic diversion (0.7%) underwent sleeve gastrectomies. Three pre-anastomotic rings were removed due to erosion (2%). Eleven pouch trimmings (7.3%), 16 redo gastrojejunostomies (10.6%), 5 redo jejunojejunostomies (3.3%), 36 remnant gastrectomies (23.8%), and 2 gastrogastic fistula takedowns (1.3%) were performed for pouch enlargements, strictures, and gastrogastic fistulas. Thirty-six patients (23.8%) underwent a combination of these procedures. The major morbidity (13.2%) was related to leaks. Other complications included wound infection, intra-abdominal abscess formation, and trocar site hernias. The mortality rate was 2%.

CONCLUSIONS: Reoperative bariatric surgery is a complex and growing field in bariatric surgery. The indications for surgical reoperation can vary depending on the procedure and reason for intervention. Laparoscopy appears to be a feasible approach. Though safe, morbidity and mortality are significantly higher than in primary bariatric procedure

151 revisions between 2001 and 2008

13.2% leak rate
2% mortality rate

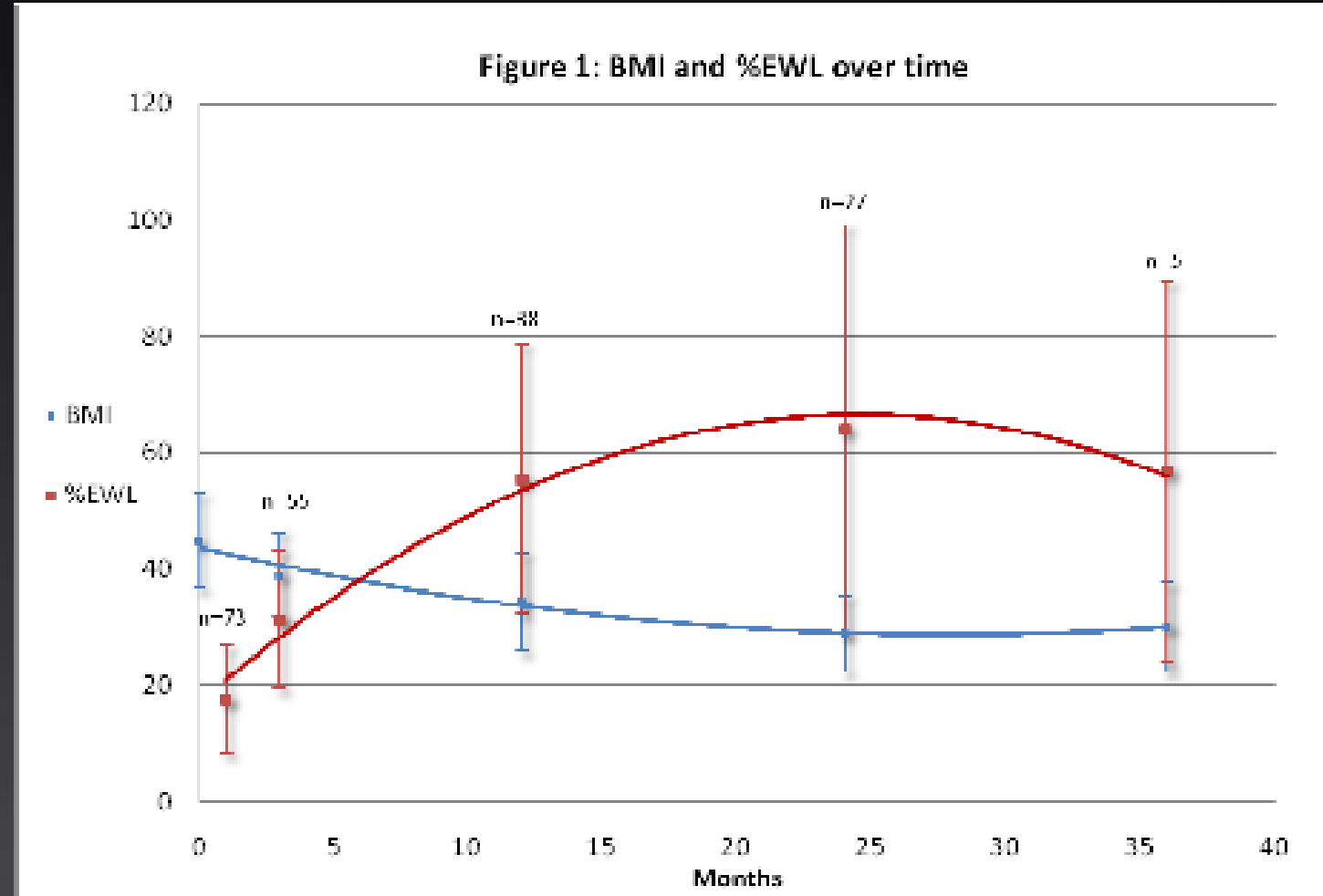
Revisional Bypass Weight Loss

99 patients / 2004-2010

42 Vertical GBs

29 Adjust GBs

28 Fixed GBs



Revisional Gastric Bypass

Complications

Gastrointestinal leak	0(0%)
Intraabdominal abscess	1(1%)
Hemorrhage	0(0%)
Pulmonary Embolism	0(0%)
Pneumonia	1(1%)
Rhabdomyolysis	1(1%)
Intestinal obstruction	2(2%)
Incisional hernia	1(1%)
Marginal Ulcer	1(1%)
Dehydration	2(2%)
Epigastric abdominal pain	2(2%)
Nausea Vomiting	4(4%)

Robotically assisted revision of bariatric surgeries is safe and effective to achieve further weight loss.

Snyder B1, Wilson T, Woodruff V, Wilson E

2004-2011: 99 revisions

17% overall complication rate

24% 90-day readmission rate

no leaks

no peri-operative mortalities

average operative time 204 min

World J Surg. 2013 Nov;37(11):2569-73.

Adhesiolysis: Bowel to Abdominal Wall

- * 2 tip ups
- * 1 monopolar scissor



Adhesiolysis: Bowel to Bowel

- * 2 tip ups
- * 1 monopolar scissor



2009-2019 Gastric Bypass

Outcomes of primary versus revisional robotically assisted laparoscopic Roux-en-Y gastric bypass: a multicenter analysis of ten-year experience

Pouya Iranmanesh¹  · John Fam² · Thomas Nguyen¹ · David Talarico² · Kavita D. Chandwani¹ · Kulvinder S. Bajwa¹ · Melissa M. Felinski¹ · Leon V. Katz² · Sheilendra S. Mehta³ · Stephan R. Myers² · Brad E. Snyder¹ · Peter A. Walker⁴ · Todd D. Wilson¹ · Angielyn R. Rivera¹ · Connie L. Klein¹ · Shinil K. Shah^{1,5} · Erik B. Wilson¹

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	Primary	Revision	P value
Leaks	.2% (2/806)	1.1%(3/266)	.101
GJ Leaks	.1% (1/806)	.4 (1/266)	.435

- Gastrointestinal leaks are a dreaded complication in bariatric surgery.
- Leak rates in the literature range from 0.1% to 1.2% after primary laparoscopic RYGB and 4.5 to 11.8% after revisional laparoscopic RYGB.
- Robotic results were consistent with the lowest leak rates found in the literature and the incidence of leaks after revisional RYGB was **markedly below** what has been reported with the laparoscopic approach, suggesting an advantage of robotic assistance for revisional RYGB.

What Technically Makes A Complex Case?

Adhesions, hostile field
No clean plane
Multiple field work
Tight spaces
Thick tissue
Visceral fat
Portal hypertension/ascites
Abnormal anatomy
Residual inflammation/fistulas

Gastropleural Fistula following Sleeve Gastrectomy

Julie Holihan, MS, MD
Minimally Invasive Surgery Fellow
McGovern Medical School

Doesn't the DV5 take us to the Next Level for Revisions?



Haptic Feedback-jury out on whether it truly helps.

Improved Ergonomics: Finally, but still not enough and way late

Visualization very good and ICG useful.

Modern High Level Processing Power-Great, and what's that doing now? Little so far

Good advanced energy and stapling algorithms

Console Continuity Between Platforms

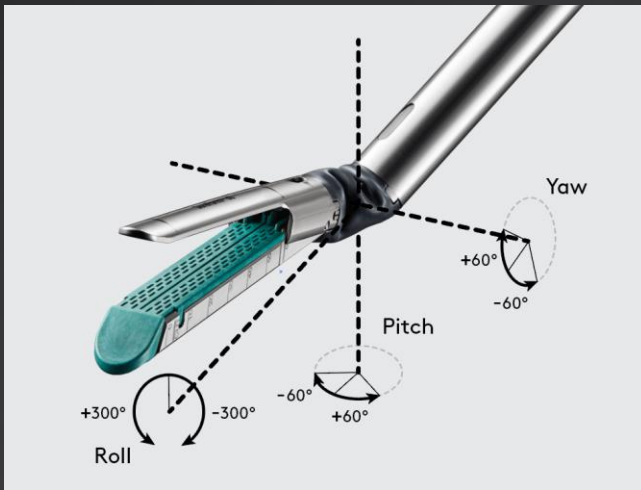
Thick Tissue Challenges

- * SmartFire parameters were tight
- * SmartFire could pause throughout a fire to allow time for tissue to compress but would time out after 3 times of minimal movement (5mm)
- * No override



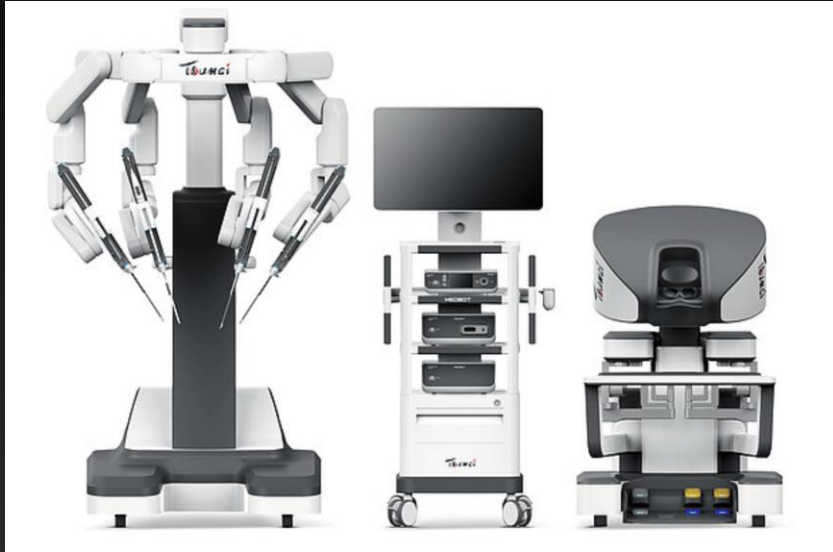
Improving the Algorithm

- * SmartFire can now pause more frequently throughout a fire to allow more time for tissue to compression
- * These changes were made to balance well with good staple line formation
- * Forcefire allows override

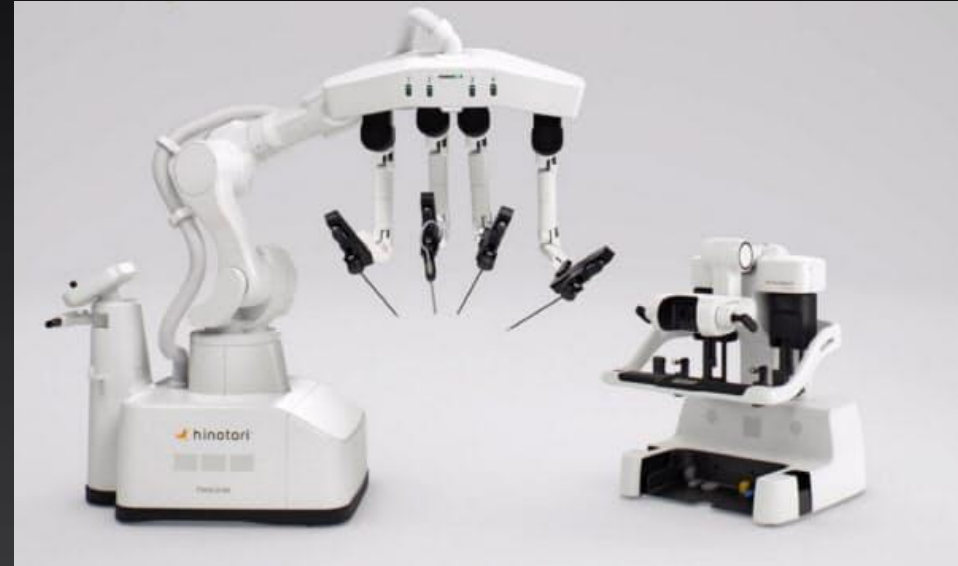


Boom Mounted Systems: Revisions?

Microport Toumai--No US Plan



Medicaroid: Hinotori—No US Plan



Sagebot Kangduo--
No US Plan



DaVinci Xi
and DV5
10 million
cases



Modular Arms Systems?



SSI Mantra—
US 2027-2028

Renovo Harmony-No US Plan

This is **Harmony LP**
Simplicity. Precision. Intelligence.



3DHD Laparoscope with
Fluorescence Imaging

Modular Surgical Robot with
Immersive Surgeon Console

Comprehensive Instrument Offering
Advanced Instrument-Ready

RENVO SURGICAL | CONFIDENTIAL

CMR Versius 2026 FDA Cleared—
Cholecystectomy
General Surgery
40,000+ cases



THE TOWER

Designed to be:

- Universal (RAS and lap)
- Upgradeable

THE SURGEON CONSOLE

Open design
3D HD visualization

ROBOTIC END EFFECTORS

Medtronic expertise

THE ROBOTIC ARM CART

Designed for:

- Mobility
- Flexible use

Investigational device currently under development. Not cleared or approved for sale in U.S. or any market.

Medtronic Hugo 2026 FDA Cleared—Urology
~20000 cases

Smaller Module Systems: Robotic Surgical Assistant



Moon FDA Cleared 2025

All Specialties

AI camera tracking

Uses standard lap instruments and cameras

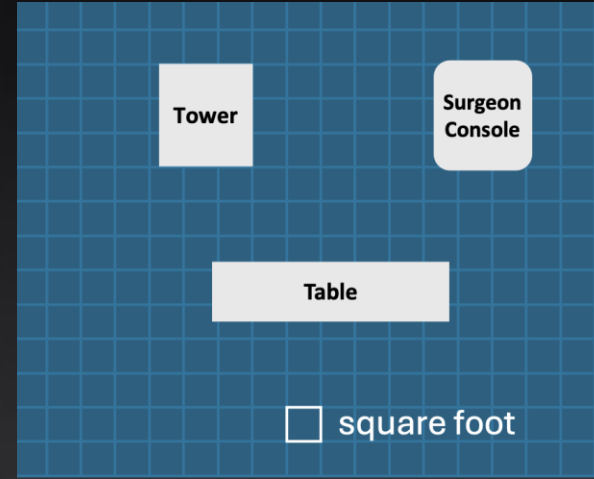
Designed for efficiency in outpatient procedures and driving surgeon autonomy

1/4 to 1/5 cost of DV

Lap tools for revisions



Table Integrated Arms: Modular Access Points without the Carts--Ottava



March 2025

- I have been part of the OTTAVA program since its inception.
- Table integrated arms—no modules no booms
- What most surgeons will comment on is the architecture – the arms stowed underneath the bed until deployed.
- FDA Clearance NOW—General Surgery
- Performance matching DV
- Advanced tools coming

High Performance Robotics in Revisions

Eliminate the carts

Truly integrate laparoscopy and robotics

Faster scaling and rotational scaling

Faster instrument exchanges

Right size the tech for the procedure

Flexible cameras

More port position options and arms: true 2 surgeon

More multiuse instruments

Combined endolumenal and laparoscopy at one console

Integrated sealing and stapling that supports the latest best in class devices

Telesurgery

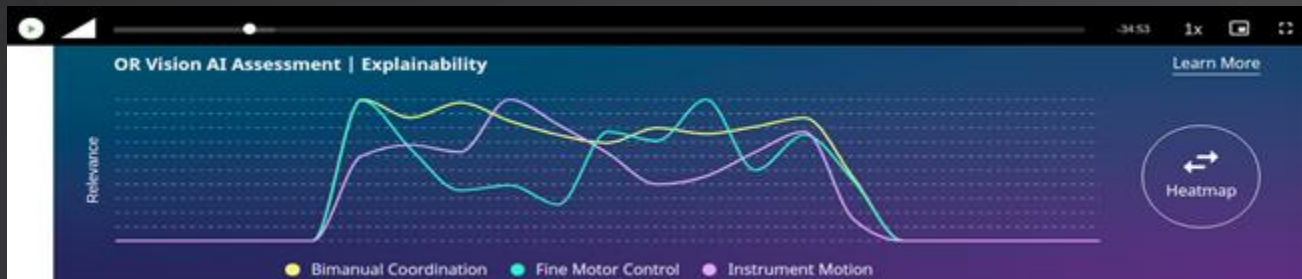
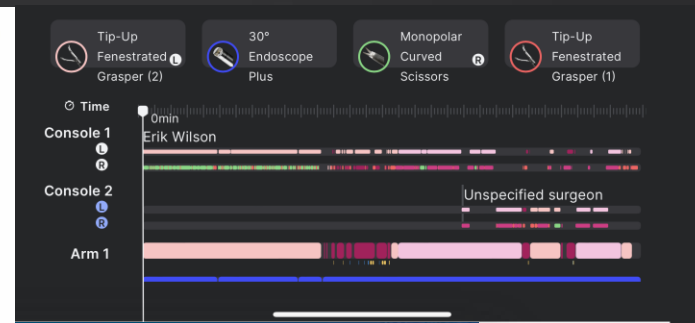
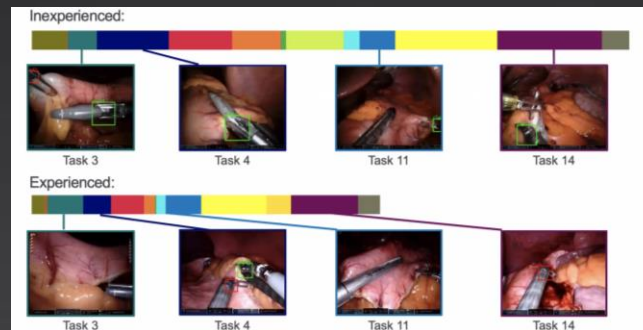
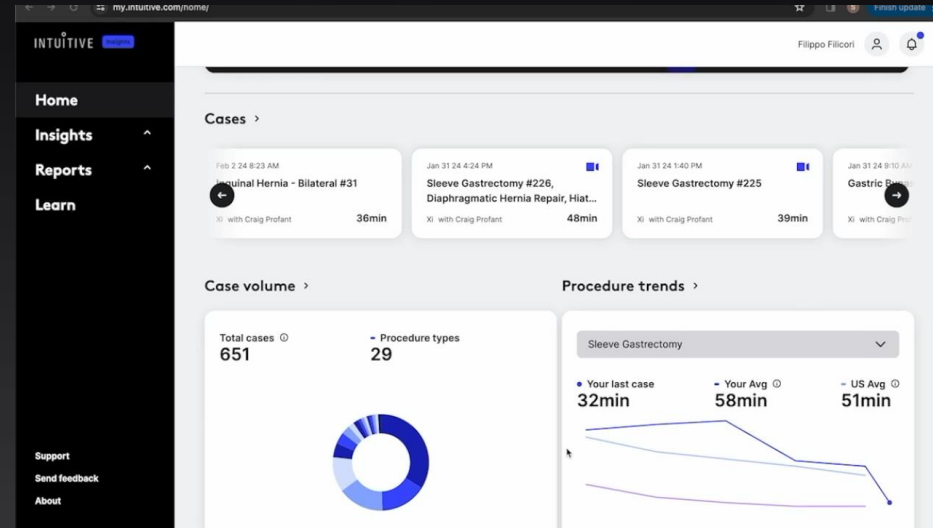
SIMULATION of Higher skill sets



AI in Bariatric Surgery

Video, Room, Kinematic, Ergonomic and EMR data

OR Black Box-Surgery Video, Room Video, EMR
Proximie-Surgery Video
Theator-Surgery Video, EMR
Touch Surgery-Surgery Video
C-SATS-Surgery Video
Activsight-Surgery Video
Versius-Surgery Video, Kinematic
Orpheus/Hub-Surgery Video, Kinematic
Apella-Room Video
Artisight-Room Video
CareSyntax-EMR
Qventus-EMR
Moon-Field and Surgeon Video



Characteristics of an ideal Surgical Digital Analysis Tool?

- Makes everyone safer
- Makes everyone more efficient
- Doesn't annoy us
- Deploys easily
- Brings financial value
- Doesn't create false incentives
- Augments Visual Reality and Dexterity



Using the Right Stapler for the Right Tissue-Filicori

Characterizing Advanced Stapling Technique Using Objective Performance Indicators in Robotic-Assisted Sleeve Gastrectomy: A Retrospective Cohort Study

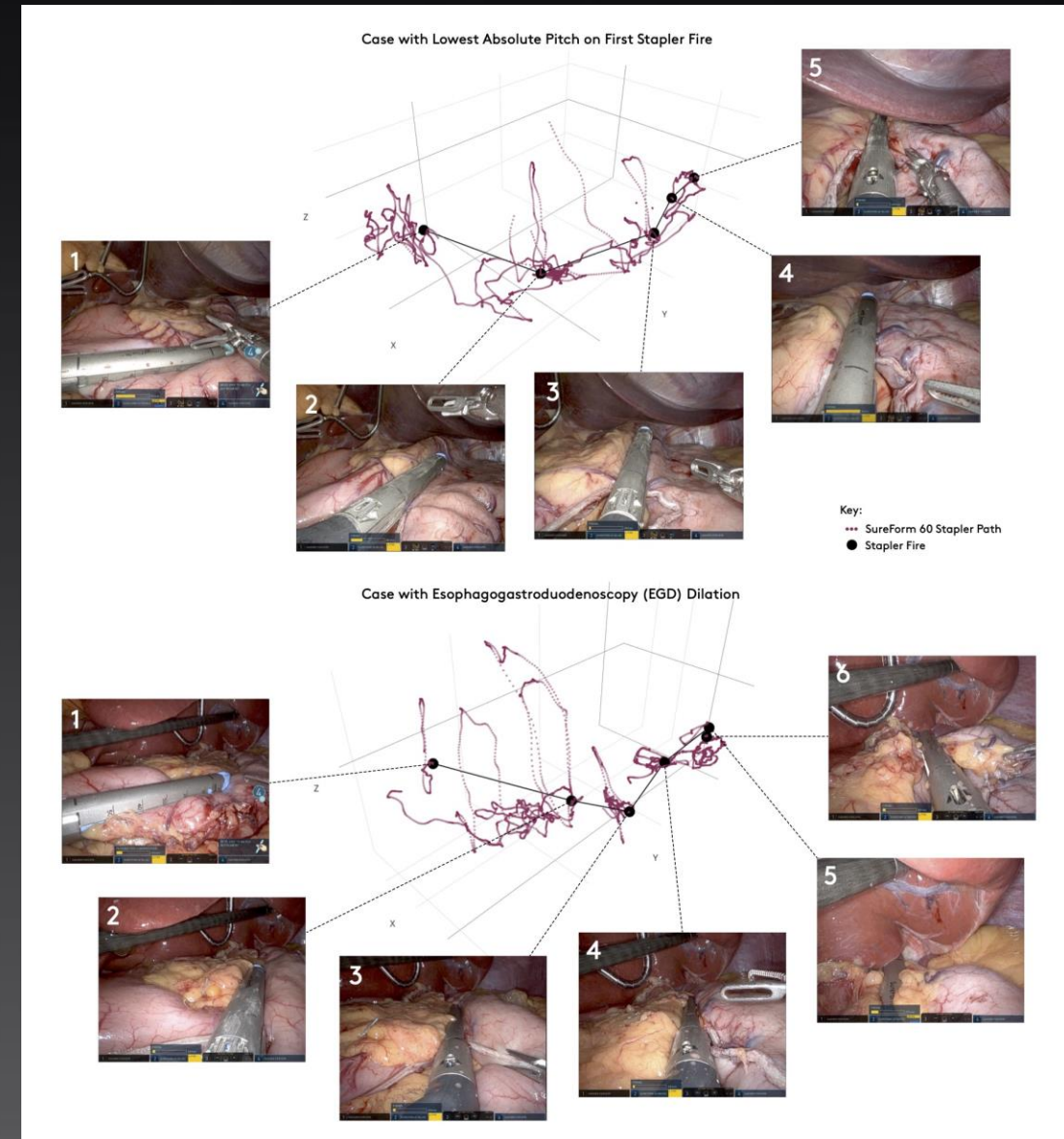
Sarah Choksi, MD^{1,2}, Bishaka Hirachan, BS^{1,2}, Jon Winalski, MD^{1,2}, Kavita Jain, MD^{1,2}, Ruben Salas-Parra, MD¹, Craig Profant, MD^{1,2}, Dimitre Stefanov, PhD^{1,3}, Max Berniker, PhD⁴, Vikrom Dhar, MD^{1,2}, Mitchell Roslin, MD^{1,2}, Andrew Yee, PhD⁴, Filippo Filicori, MD^{1,2}

Objective Performance Indicators

Sureform stapler in 344 robotic sleeve gastrectomies and correlate these measures with postoperative outcomes.

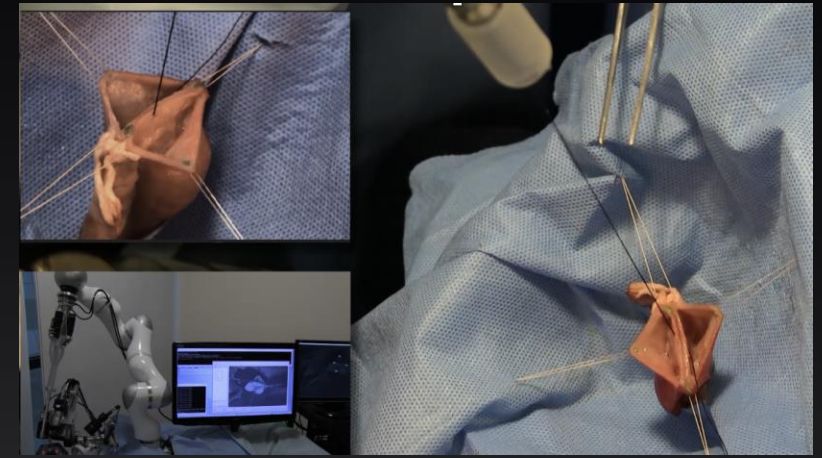
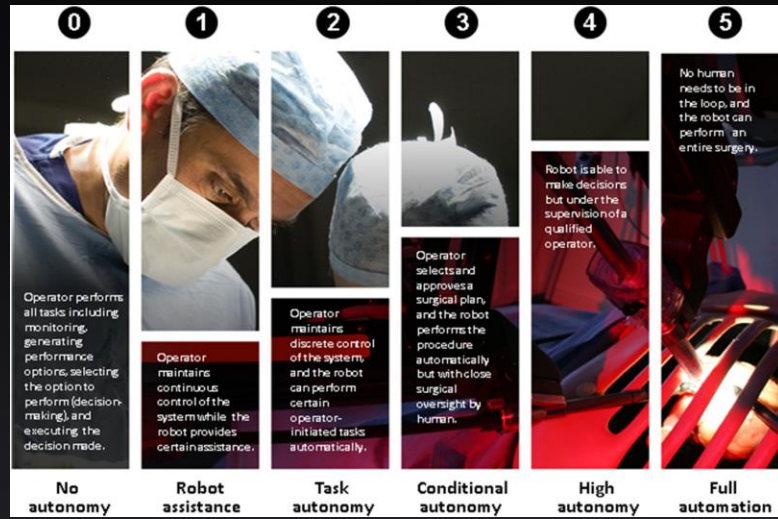
1. Stapling angles correlate with postoperative PO intolerance and staple line leaks

2. Cartridge staple height and peak firing force do not correlate with postoperative bleeding .



Task Autonomy

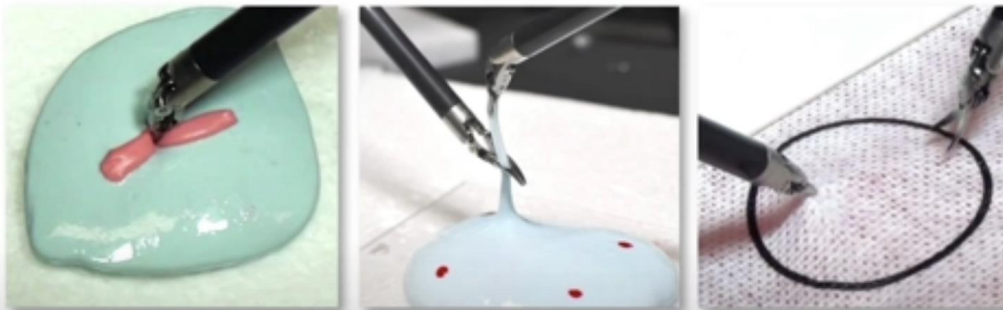
Reconstructions are more routine than dissections



Autonomous Robot Surgery

Performing Surgical Subtasks without Human Intervention

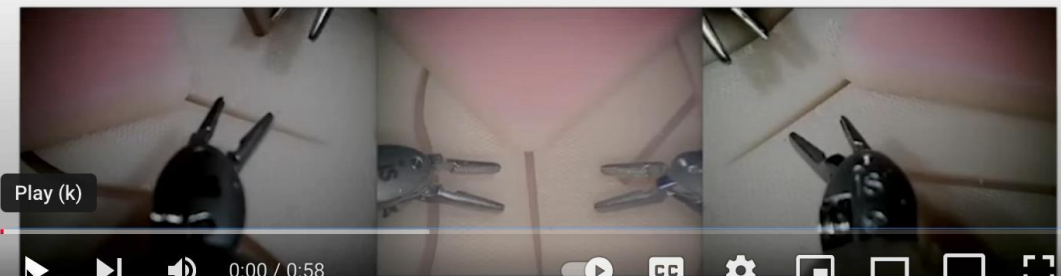
UC Berkeley, October 2014



Adithyavairavan Murali, Siddarth Sen, Ben Kehoe, Animesh Garg,
Seth McFarland, Sachin Patil, W. Douglas Boyd, Susan Lim,
Pieter Abbeel, Ken Goldberg



Surgical Robot Transformer: Imitation Learning for Surgical Tasks



Revisions and Telesurgery?

Get the experience to the patient

Within a hospital-one surgeon available for certain tasks

Within a hospital system-one surgeon for complex case support

Within a region/country/global-surgeon for remote complete surgery

Rural health deserts and emergency interventions

Telesurgery and Task Autonomy Overlay



Complex Revision Summary

Revisions have improved outcomes with robotic but currently that mean
Intuitive: All platforms with full instrument sets, staplers and energy can handle revisions ultimately

- * Digitization of the OR—engaging visual, kinematic, autonomy, telesurgery would help in complex cases
- * Endolumenal approaches assist with revisions (ms S.) Combined laparoscopic and endoscopic approaches—surgeons have the advantage
- * Ergonomics is more critical in long cases: plenty room for improvement across all platforms
- * Higher performance robotic systems with more choices, helping the most skilled surgeons be even better
- * Value based care becomes possible and appropriate in this new world



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Professor and Vice Chair of
Surgery
Division Chief, Minimally
Invasive Surgeons of Texas
University of Texas Health
Science Center at Houston

The 10th Annual Surgical Disruptive Technology Summit is the preeminent forum for innovation in general minimally invasive surgery bringing together entrepreneurs, venture capitalists, surgeons, and medical device companies all in one place to showcase new ideas, products and procedures. There will be multiple in depth panels in surgical robotics, endolumenal surgery, artificial intelligence, surgical training and many more.

THANK YOU
February 17-21, 2027
Houston Texas

