New Technologies in Surgery

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Disclosures

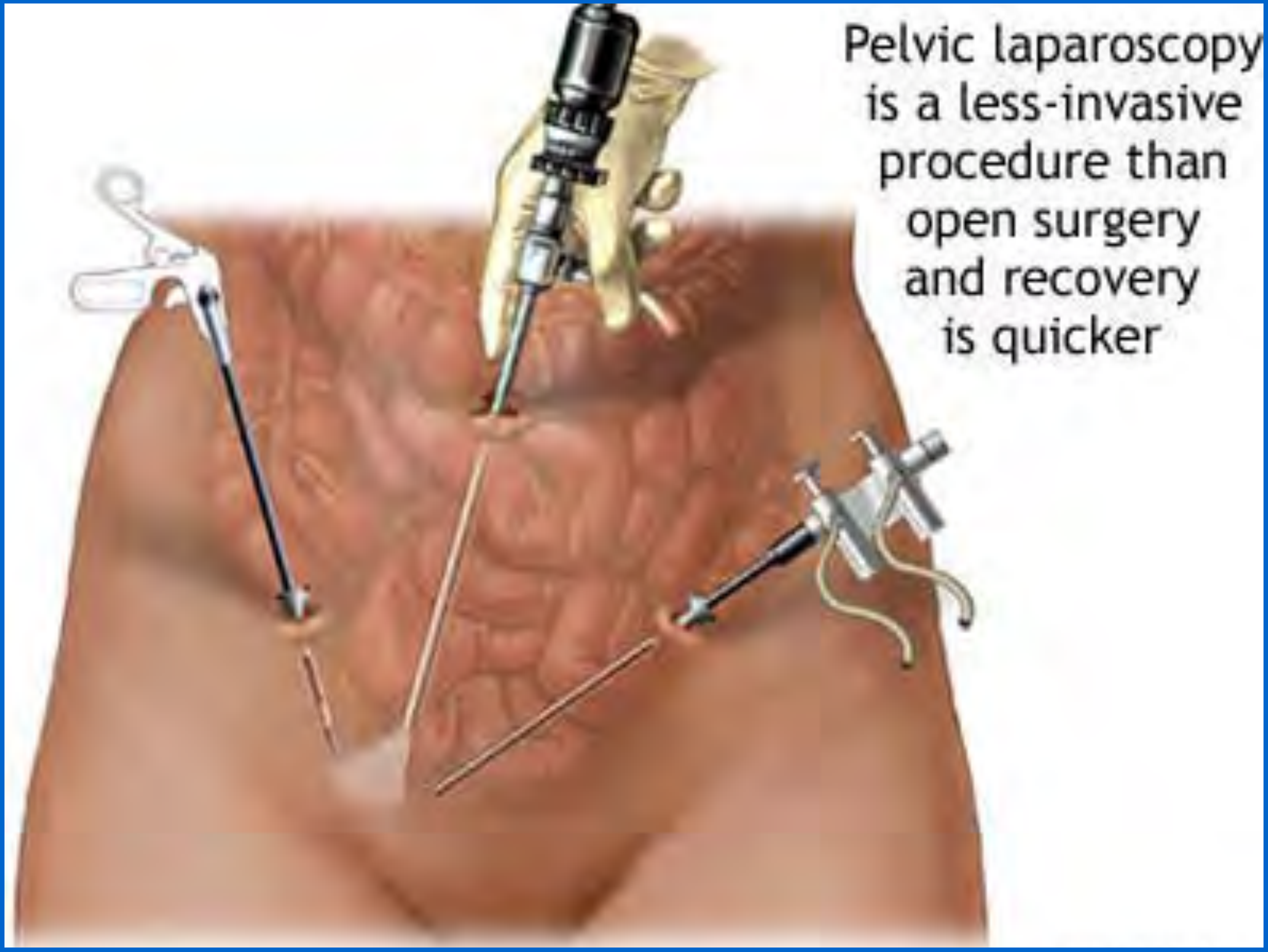
- DoD, NCI funding

Objective$

- Describe current environment of robotic surgery
- Strategies to evaluate innovations in surgery which may not change clinical outcomes but increase costs?
- Evidence new, expensive surgical technologies provide better outcomes for patients
- Discuss opportunities to attenuate the rising cost of oncologic surgery

What is robotic surgery and how does it differ from traditional open and laparoscopic approaches?

Laparoscopy – “look inside the abdomen”



Surgical Approaches

OPEN

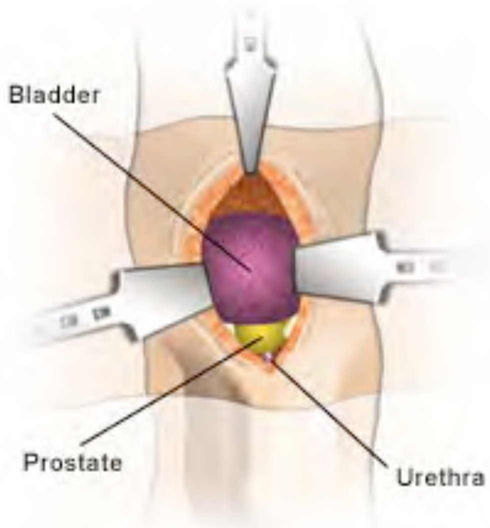
MINIMALLY INVASIVE

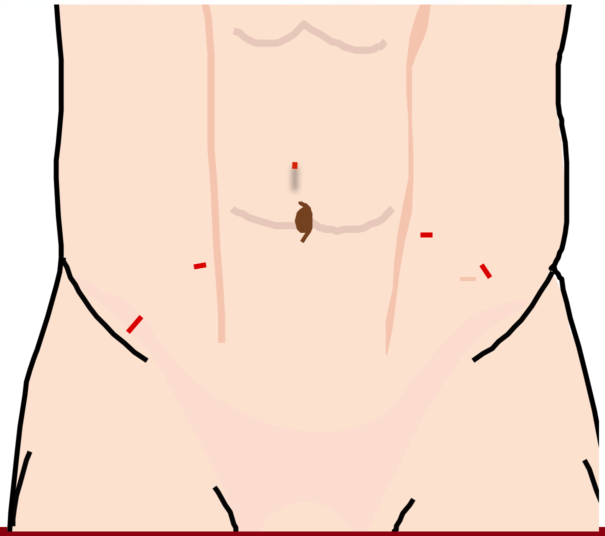
Incision Type

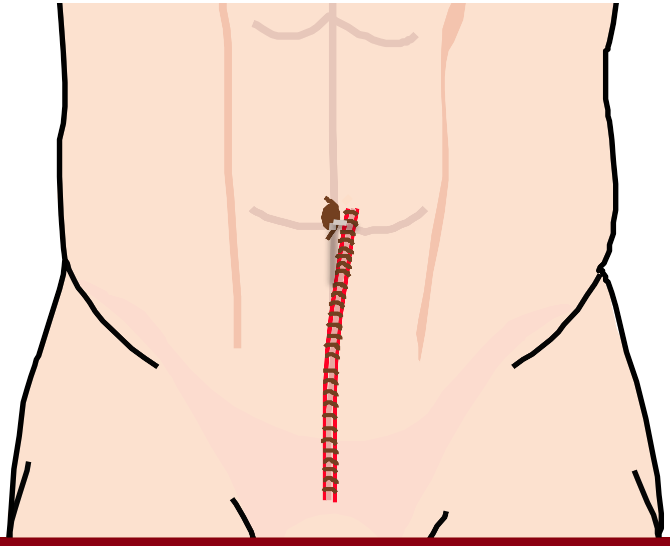
Standard Laparoscopic

Robot-Assisted

Minimally Invasive vs. Open Radical Prostatectomy







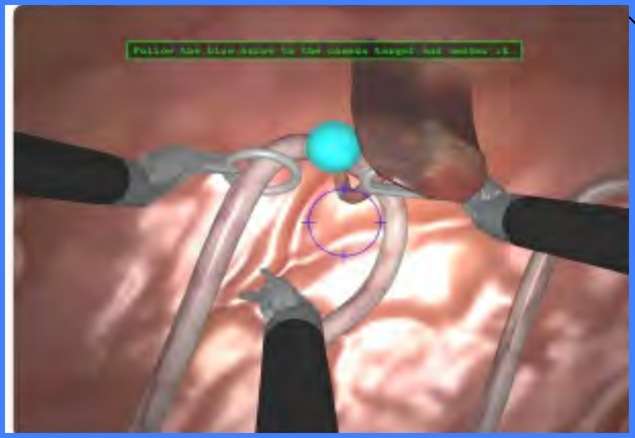
Robot - *robota*, "drudgery, labor, hard work"

$1.6 million

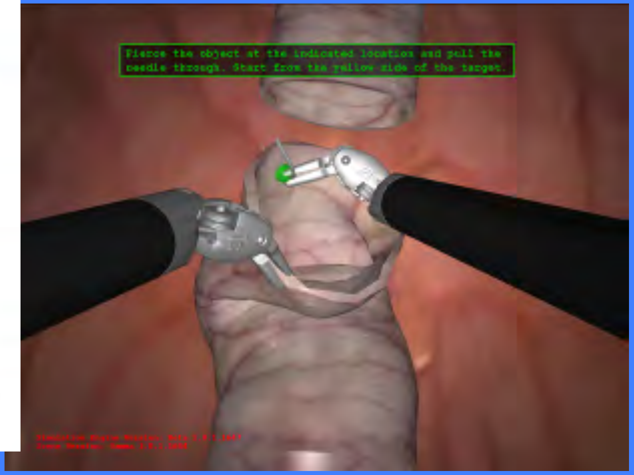
Robot - *robota*, "drudgery, labor, hard work"

$2.4 million

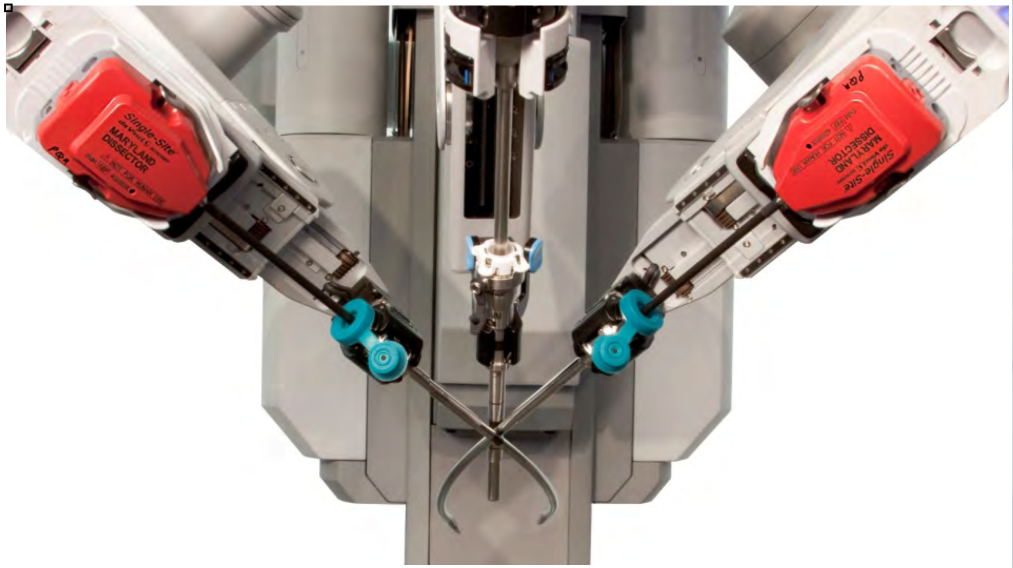
Skills Simulator - $100,000

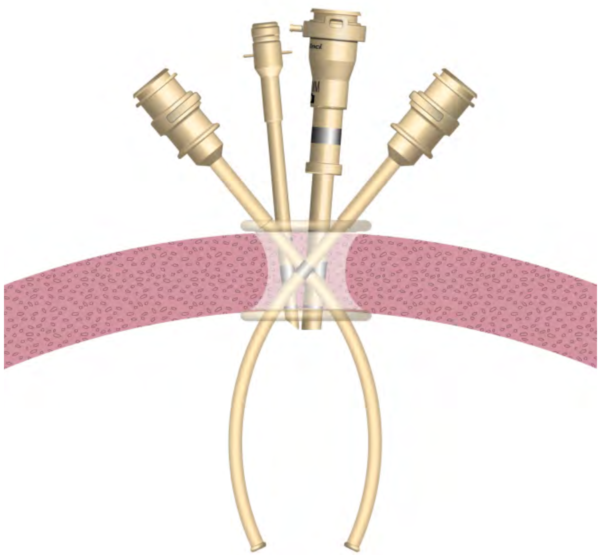


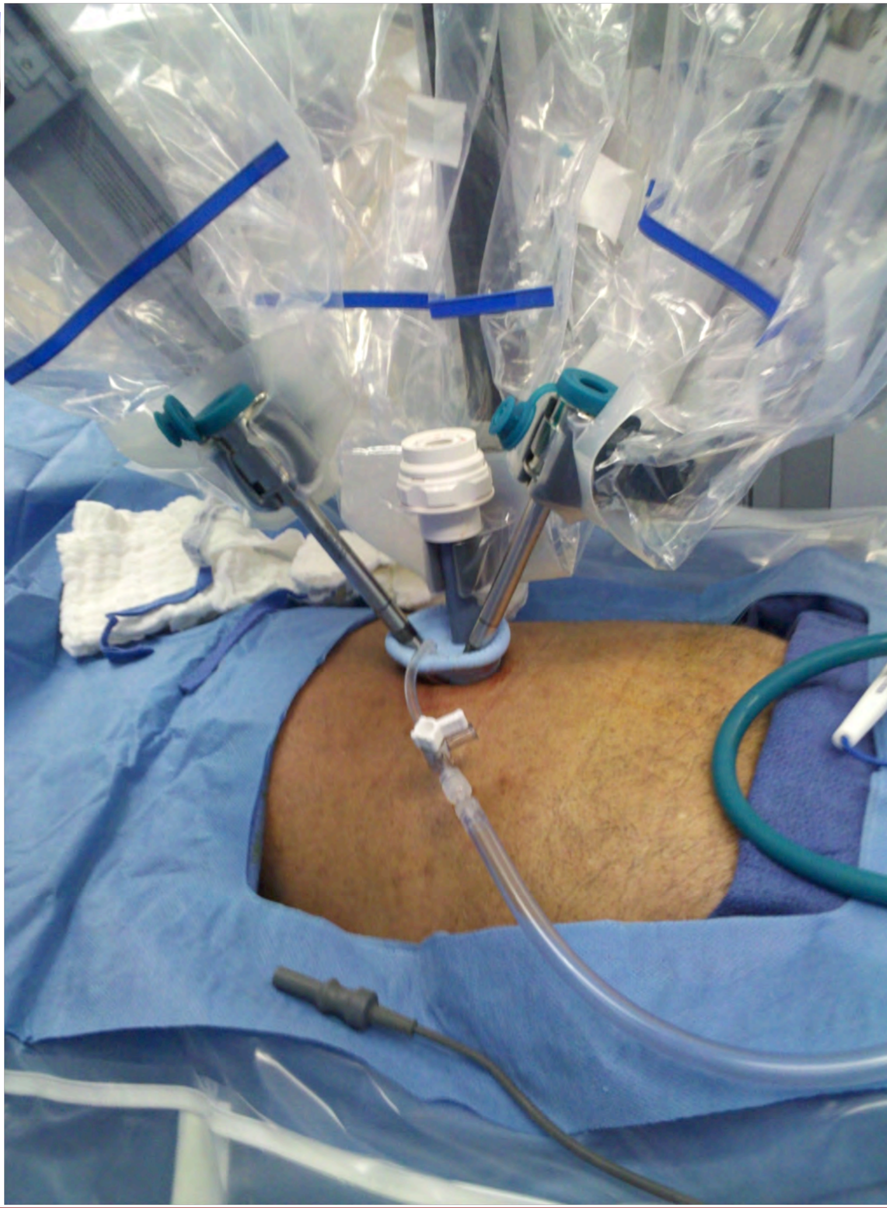
- System and Skills Training
  - *EndoWrist®* Manipulation
  - Camera Control
  - Master Clutching
  - Needle Driving
  - 4th Arm Swapping



The Next Innovation: Single Port Surgery







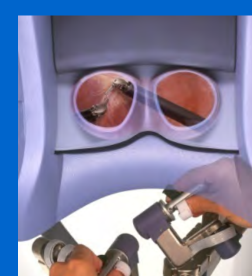
PRO

"You can do things with the robot that you can't do with a laparoscope — or only the world's best surgeon can do. It's kind of a democratizing tool…"

Dr. Richard Satava
University of Washington

Wristed Robotic Instruments

10x magnification



Ergonomic advantages for the surgeon

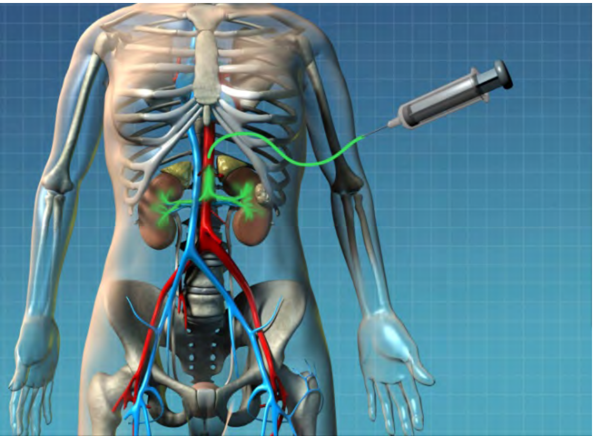

SURGICAL
MICROLINE

"Firefly" Fluorescence Imaging **$100,000**

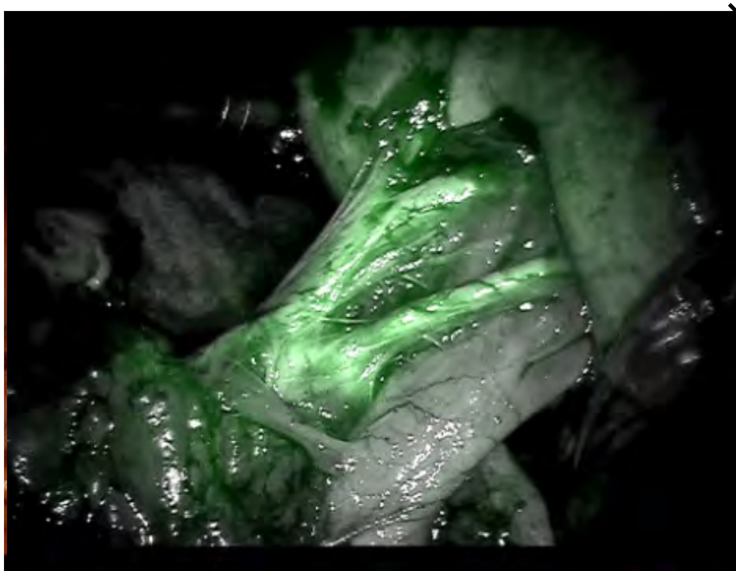
New camera head can pass fluorescence signal

Fluorescing signal overlaid with green hue in surgeon console

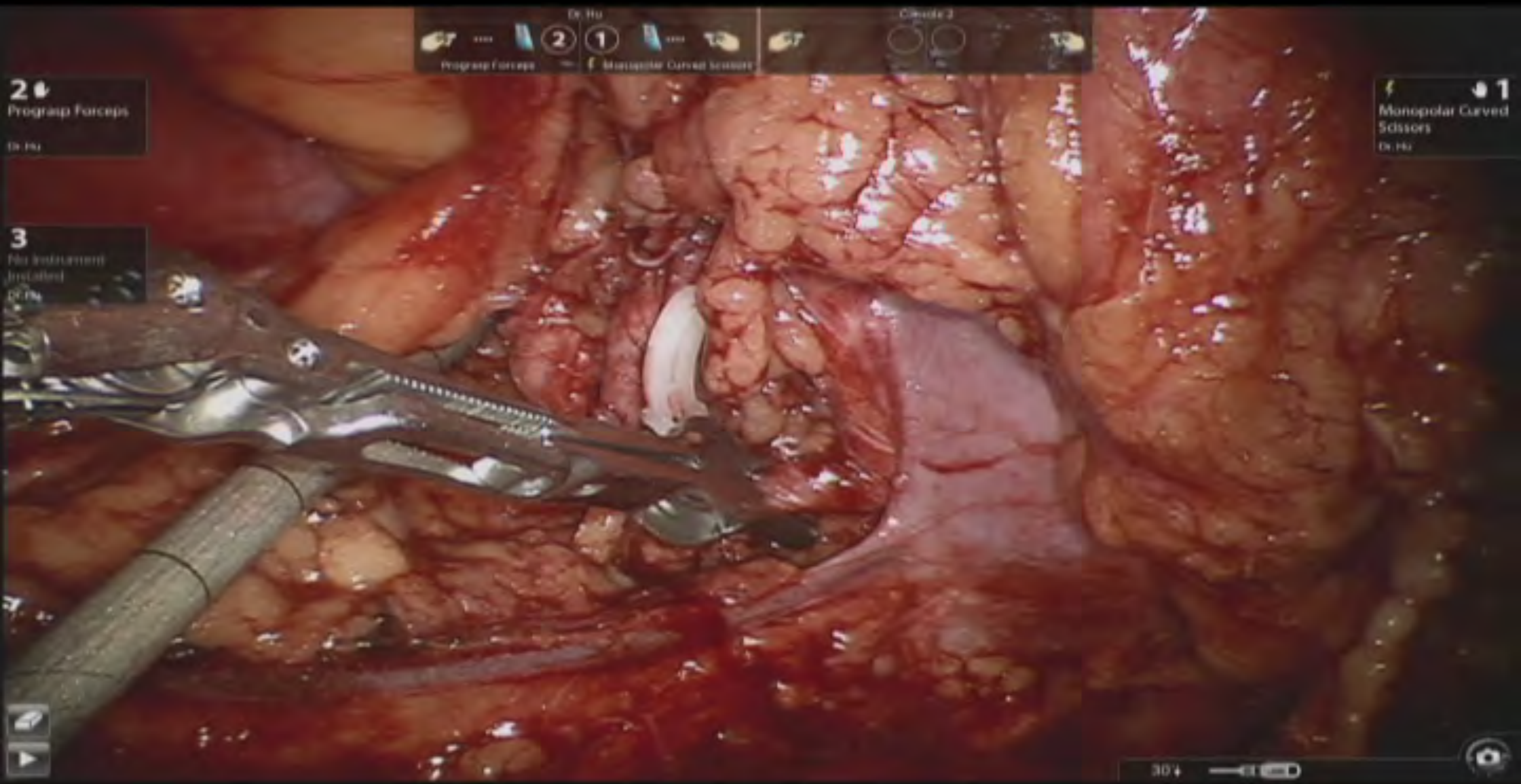
Laser Excites IndoCyanine-Green and Fluoresces



Renal arteries - fluorescence mode (NIR)

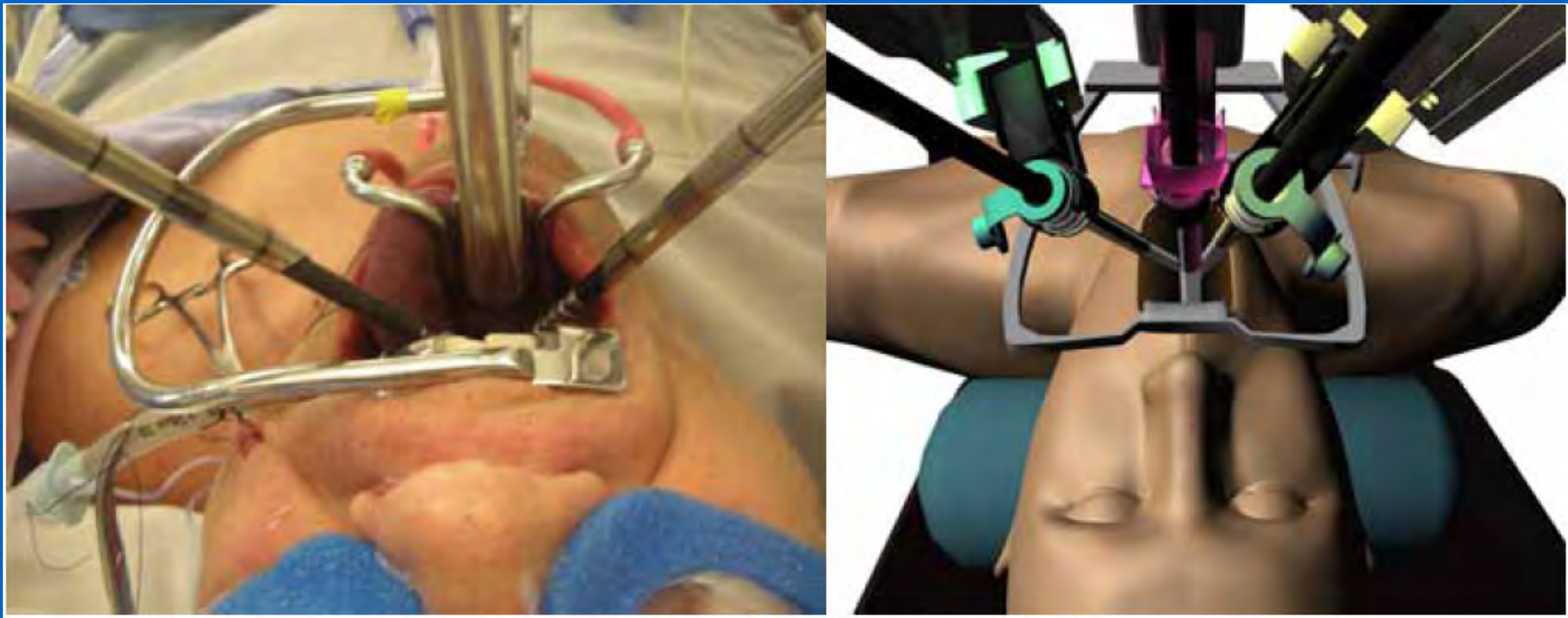


Flouresence imaging during partial nephrectomy



Transoral Surgery
FDA approval 2010

Transoral Surgery
FDA approval 2010



conventional surgery requires an almost ear-to-ear incision across the throat or splitting the jaw, and may resul in speech and swallowing deficits

Evidence favoring robotic surgery

European Association of Urology

Bladder Cancer

Comparative Analysis of Outcomes and Costs Following Open Radical Cystectomy Versus Robot-Assisted Laparoscopic Radical Cystectomy: Results From the US Nationwide Inpatient Sample

Hua-yin Yu[a], Nathanael D. Hevelone[b], Stuart R. Lipsitz[b], Keith J. Kowalczyk[c], Paul L. Nguyen[d], Toni K. Choueiri[e], Adam S. Kibel[a], Jim C. Hu[f,]*

Table 3 – Unadjusted and propensity-adjusted outcomes

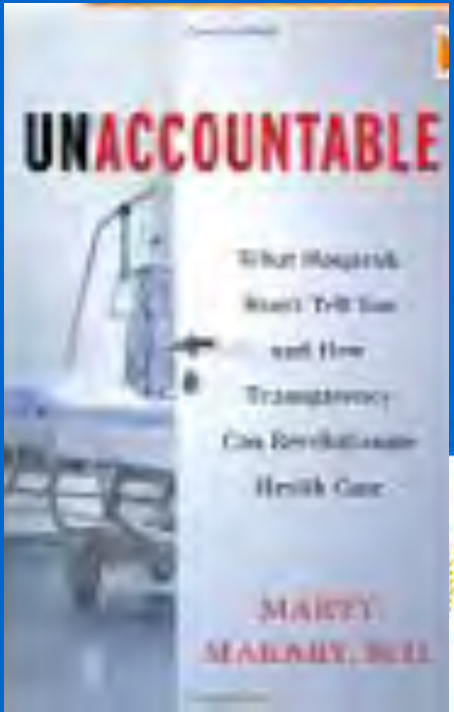
	Unadjusted			Adjusted		
Primary outcomes	Open *n* = 7168	Robotic *n* = 1144	*p* value	Open	Robotic	*p* value
Categorical	No. (%)			%		
Deaths	170 (2.4)	0	<0.001	2.5	0	<0.001*
Inpatient complications	4318 (60.2)	541 (47.3)	0.004	63.8	49.1	0.035
Blood transfusion	2966 (41.4)	351 (30.7)	0.075	37.9	32.0	0.448
Parenteral nutrition	906 (12.6)	82 (7.2)	0.025	13.3	6.4	0.046*
Routine discharge	1924 (27.5)	342 (29.9)	0.726	28.2	19.4	0.099
Lymph node dissection	4954 (69.1)	987 (86.3)	<0.001	67.0	76.8	0.248
Continuous	Median (IQR)			Median (IQR)		
Length of stay, d	8 (7.8–8.2)	7 (6.6–7.4)	<0.001	8 (7.8–8.2)	8 (7.2–8.8)	0.999
Costs, $	24 607 (23 741–25 474)	30 563 (28 911–32 215)	<0.001	24 303 (23 265–25 341)	28 100 (25 015–31 185)	0.023*
Secondary outcomes						
Categorical	No. (%)			%		
Complication subtype						
Cardiac	645 (9.0)	55 (4.8)	0.013	10.3	5.6	0.110
Respiratory	1282 (17.9)	144 (12.6)	0.067	18.4	15.2	0.421
Genitourinary	798 (11.1)	91 (8.0)	0.243	11.3	6.6	0.112
Wound	526 (7.3)	48 (4.2)	0.059	7.6	4.6	0.185
Vascular	258 (3.6)	31 (2.7)	0.636	3.6	1.8	0.316
Miscellaneous medical	3115 (43.5)	380 (33.3)	0.035	47.6	35.9	0.096
Miscellaneous surgical	739 (10.3)	69 (6.0)	0.043	10.3	6.7	0.217

IQR = interquartile range.

CON

"Out of all the instruments and surgical tools that hospitals have adopted, this is one of the most expensive items in American operating rooms today…"

Marty Makary



The NEW ENGLAND JOURNAL of MEDICINE

Perspective
AUGUST 19, 2010

New Technology and Health Care Costs — The Case of Robot-Assisted Surgery

Gabriel I. Barbash, M.D., M.P.H., and Sherry A. Glied, Ph.D.

Technological innovation in health care is an important driver of cost growth. Doctors and patients often embrace new modes of treatment before their merits and weaknesses are fully under-

performed laparoscopically before robots were introduced; the introduction of robotic technology affects expenditures associated with such procedures primarily by increasing the cost per

Procedures Performed by Robot-Assisted Surgery, Current Cost per Procedure, and Estimates of Change in Cost, as Compared with Standard Procedure.*

Procedure	Mean Cost per Procedure in 2007	Change in Cost		Procedures Performed in the United States in 2007
		Excluding Robot	Including Robot	
		dollars		*no.*
Mainly laparoscopic procedures				
Pyeloplasty	10,065	1,400	3,400	4,823
Nephrectomy	14,943	10,600	NA	45,879
Nissen fundoplication	13,060	600 to 2,100	1,200 to 22,300	17,283
Cholecystectomy	10,366	500	1,700	326,350 *
Unilateral adrenalectomy	14,707	1,400	2,900	5,387
Rectopexy	9,040	NA	700	1,603
Splenectomy	28,205	3,000	3,200	14,530
Gastric bypass	21,275	NA	2,900	13,782
Thymectomy	17,983	NA	2,400	362
Laparoscopic hysterectomy	8,951	2,500	NA	14,101
Mainly open surgical procedures				
Radical prostatectomy	11,352	2,200	400 to 4,800	79,875 *
Radical cystectomy	32,388	0	1,600	8,570
Myomectomy	6,721	NA	3,200	32,616
Sacrocolpopexy	7,328	5,500	NA	4,557
Non-laparoscopic hysterectomy	7,328	NA	NA	279,871 *
Salpingostomy	5,607	1,400	NA	2,370
Nissen fundoplication	31,333	−1,200	0	6,128
Low colon–rectum anterior resection	16,688	1,600	NA	17,942
Esophagectomy	39,622	NA	2,700	119
Lung lobectomy	23,021	3,900	NA	6,642
Mitral-valve repair	45,914	600	3,700	14,191
Atrial septal defect closure	36,767	1,000	4,000	2,284

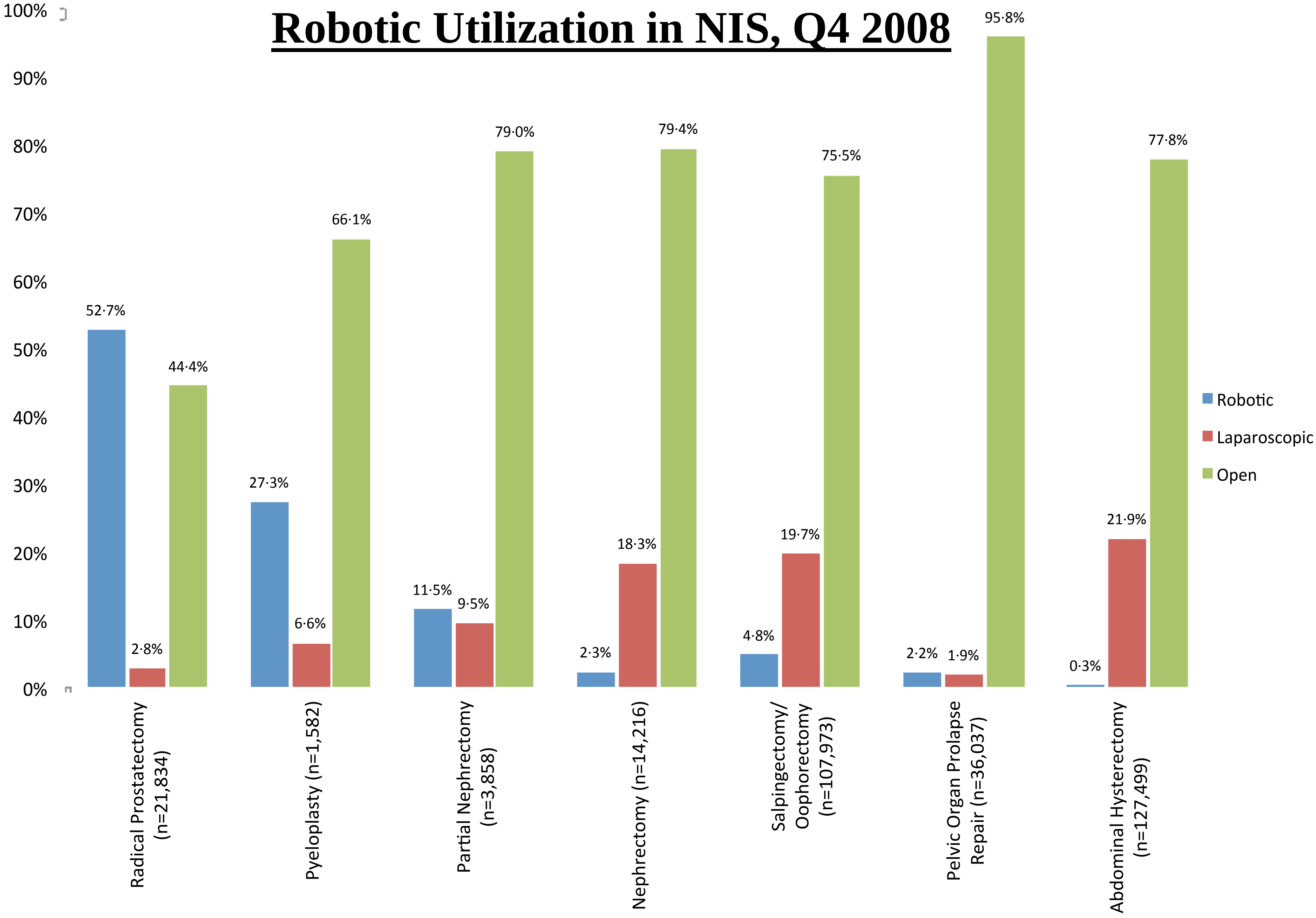
RESULTS

- Adds **13%** to the cost surgery
- Prostate surgery: appears to lead more men to choose surgery than if robotic surgery had not been offered.
- Replacement of open with robotic surgery in procedures where it is currently used adds **$2.5 billon/year**

FDA approved Robotic Procedures

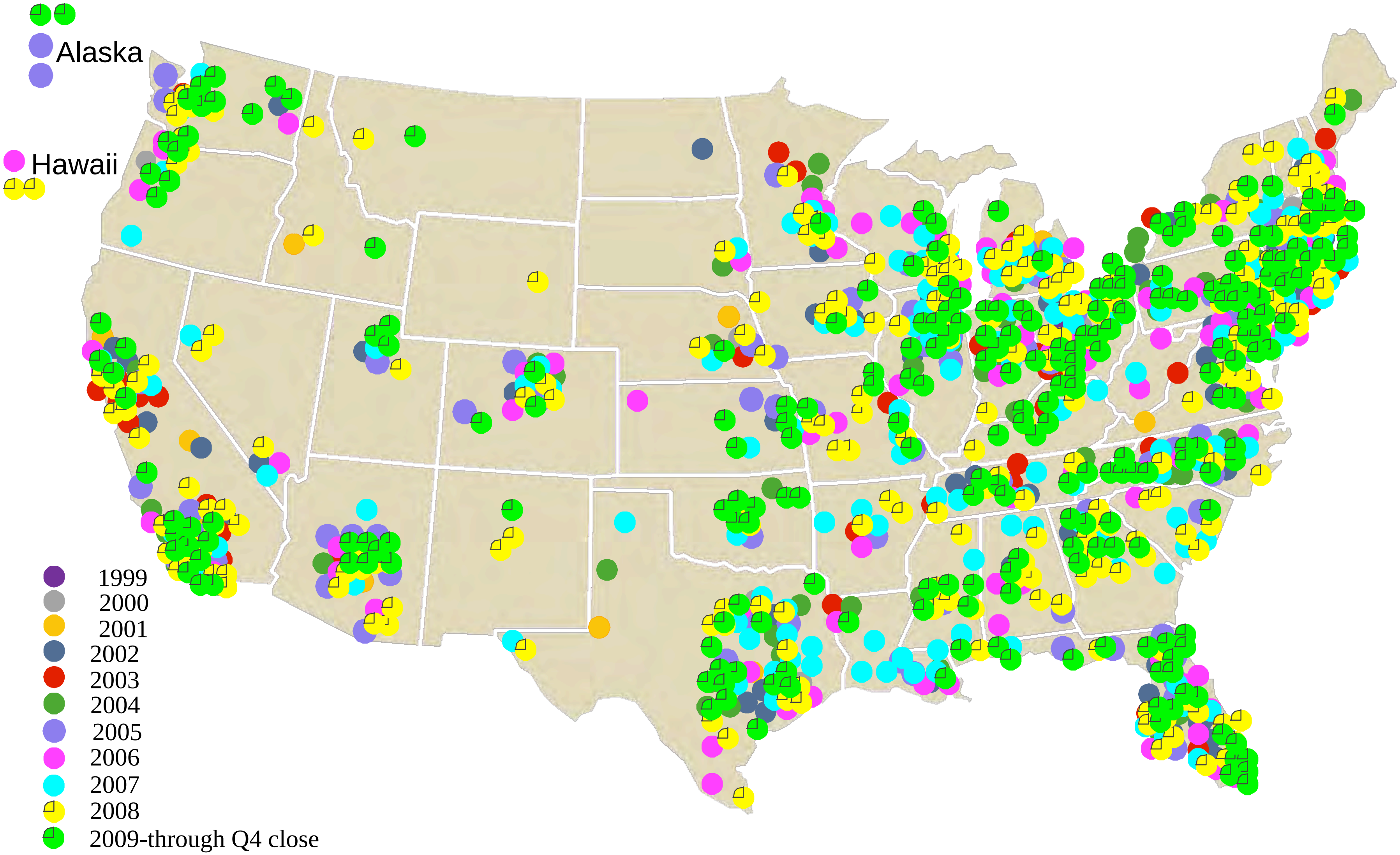
Urology	Gynecology	Cardiothoracic	General
Prostatectomy	Hysterectomy	Mitral Valve Repair & Replacement	Gastric Bypass
Nephrectomy	Myomectomy	Single Vessel Beating Heart Bypass	Nissen Fundoplication
Partial Nephrectomy	Sacral Colpopexy	Multi-Vessel Beating Heart Bypass	Heller Myotomy
Pyeloplasty	Pelvic Lymphadenectomy	Single Vessel Arrested Heart Bypass	Gastrectomy
Cystectomy	Tubal Reanastomosis	Multi-Vessel Arrested Heart Bypass	Colon Resection
Donor Nephrectomy	Vaginal Prolapse Repair	IMA Harvesting	Thyroidectomy
Ureterolithotomy	Dermoid Cyst	Coronary Anastomosis	Arteriovenous Fistula
Pelvic Lymphadenectomy	Endometrial Ablation	Atrial Septum Aneurysm	Toupet
Adrenalectomy	Oophorocystectomy	Atrial Septal Defect Repair	Pancreatectomy
Cystocele Repair	Oophoroectomy	Tricuspid Valve Repair	Adrenalectomy
Excision of Renal Cyst	Ovarian Cystectomy	Thrombectomy	Hemi-Colectomy
Lymphadenectomy	Ovarian Transposition	Thymectomy	Sigmoidectomy
Testicular Resection	Salpingectomy	Esophagectomy	Splenectomy
Renal Cyst Decortication	Salpingo-Oophorectomy	Percardial Window	Pyloroplasty
Uretetro Transplant	Colposuspension (Burch)	Lobectomy	Gastroplasty
Nephropexy	Tubal Ligation	Pneumonectomy	Appendectomy
Ureterectomy	Tubalplasty	Pacemaker Lead Implantation	Intra-rectal Surgery
Rectocele Repair		Mediastinal Resection	Bowel Resection
Varicocele		Pulmonary Wedge Resection	Lumbar Sympathectomy
Ureteroplasty			Liver Resection
Ureteral Implantation			Cholecystectomy
Vaso-vasostomy			Hernia Repair

Robotic Utilization in NIS, Q4 2008

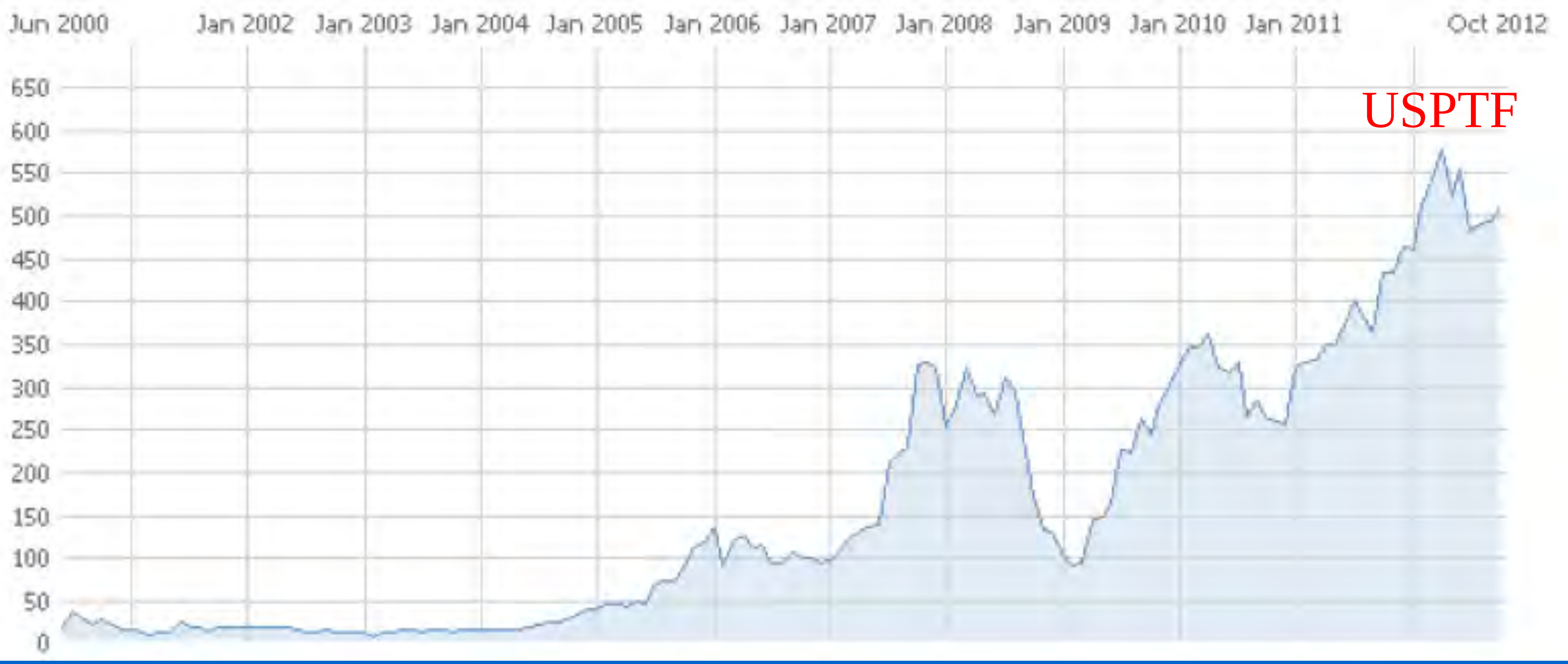


Yu, J Urol 2012

daVinci® Surgical System U.S. Installed Base 1999 – 2009



ISRG Monopoly



Marketing / Media Attention

BusinessWeek

March 14, 2005

Personal Business Health

The Robot Is In—And Ready to Operate

More and more surgeries—from prostate to heart—are being performed by doctors remotely guiding robotic arms. BY CAROL MARIE CROPPER

for patients include less pain and shorter recovery times.

An older form of minimally invasive surgery, laparoscopy, also uses miniature surgical instruments inserted through small incisions—although guided directly via long handles in the surgeon's hands—and comes with some of the same advantages. But that method provides a two-dimensional view rather than the robotic system's 3-D vision and is harder for newcomers to master, says Dr. Vipul Patel, a Birmingham (Ala.) surgeon and a leader in robotic prostatectomies. Also, with laparoscopy, there's no computer to adjust the size of the surgeon's hand movements or screen out tremors.

would allow a doctor to operate on a patient on the other side of the world—peering into binocular-like lenses at views provided by the camera inside the patient. The doctor guides the robot's work by twisting his wrists in stirrup-like handles, moving his thumb and forefinger in scissor-like loops, or tapping foot pedals to focus the camera or move a robotic arm.

The most common robotic surgery is prostatectomy, or the removal of the prostate gland located just below the

ogical and infertility operations. Its use has grown from just 1,500 procedures in 2000 to an estimated 20,000 last year.

Doctors who perform such surgery say they can see better because the smaller incisions mean less blood and the robot magnifies what's shown. They also say the robotic computer's ability to filter out routine hand tremors and scale down movements when tinier cuts are needed means more precision. Apart from smaller incisions and less blood loss, benefits

QUICKIE RECOVERIES

ROBOTIC TECHNOLOGY doesn't come cheap, which is one reason it's in fewer than 300 hospitals worldwide. But while it might add, say, $1,000 to the surgical cost of a prostatectomy, and $4,000 to a heart mitral valve operation, total costs of around $24,000 (for a prostatectomy) and $30,000 to $40,000 (for the heart procedure) remain about the same because of savings from shorter hospital stays and less pain medication, according to surgeons who use the robot.

A Different Sort of Sawbones

Here is a list of the most common robotic operations, along with some of the leading hospitals and doctors in the field. For a complete list, go to businessweek.com/extras

PROSTATECTOMY
Henry Ford Hospital Detroit
Dr. Mani Menon
City of Hope National Medical Center Duarte, Calif.
Dr. Mark Kawachi, Dr. Timothy Wilson

MITRAL VALVE REPAIR
Pitt County Memorial Hospital Greenville, N.C.
Dr. Randolph Chitwood
St. Joseph's Hospital Atlanta
Dr. Douglas Murphy

CORONARY ARTERY BYPASS
Alliance Hospital Odessa, Tex. Dr. Sudhir Srivastava
Lenox Hill Hospital New York
Dr. Valavanur Subramanian
Centennial Medical Center Nashville, Tenn.
Dr. Louis Brunsting

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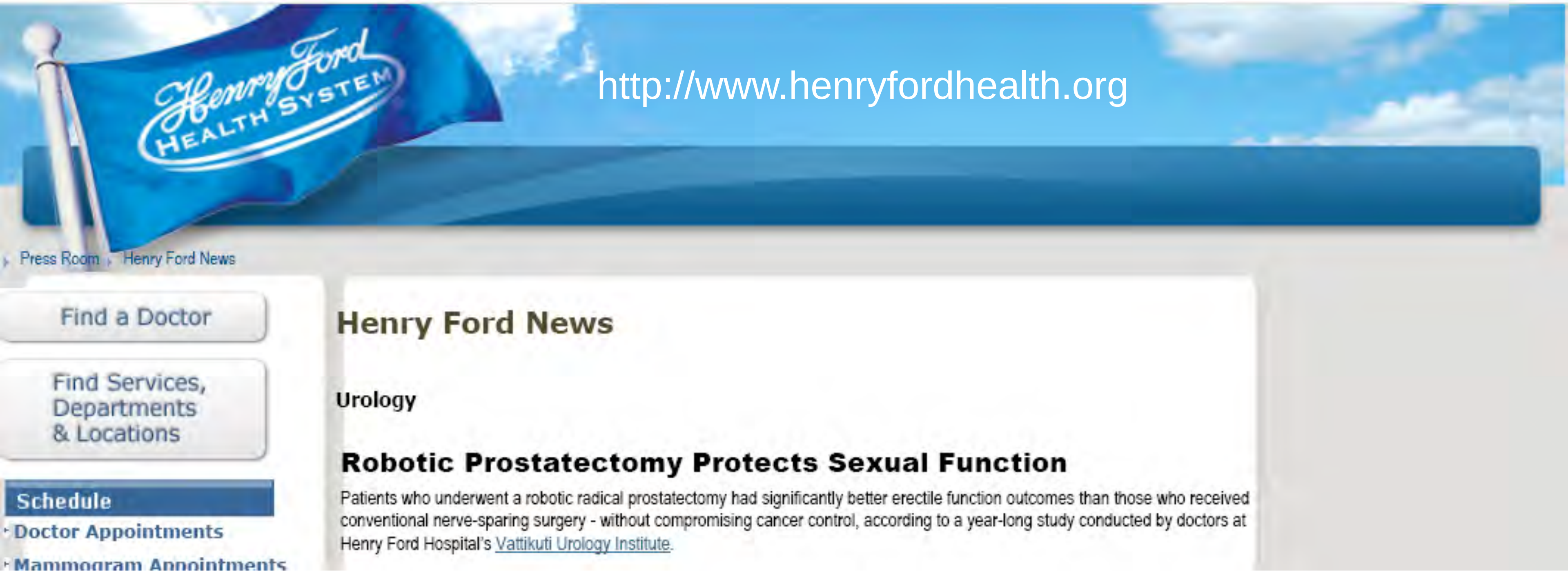
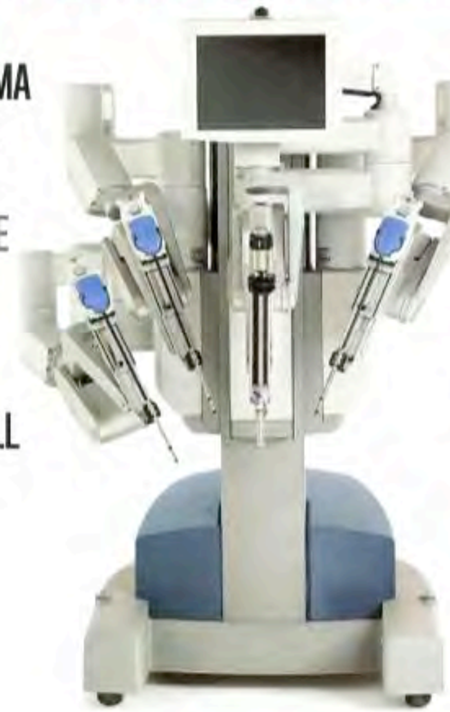


"The potency outcomes with our robotic surgery are the highest reported to date….Of the patients undergoing the procedure, **97 percent achieved erections strong enough for intercourse** - with about half not requiring medication to do so."

U.S.News & WORLD REPORT
www.usnews.com
August 2009

America's Best HOSPITALS

How new technology is transforming medical care



7 WAYS BARACK OBAMA WILL CHANGE HEALTHCARE

A TOUR OF THE HOSPITAL OF TOMORROW

NEW HOPE FOR STEM CELL RESEARCH

THE ART OF MEDICINE

14 PIONEERS ON THE CUTTING EDGE

THE TOP HOSPITALS IN 26 SPECIALTIES

AND MORE

$4.99
08>

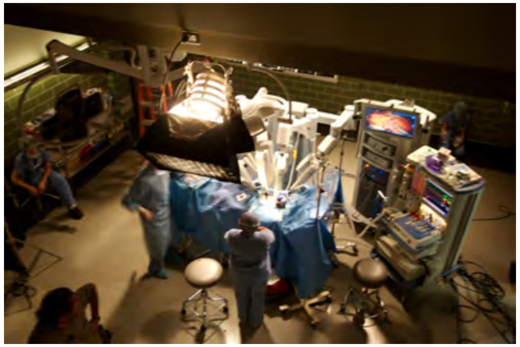
Media Coverage

- The Doctors
- CNN With Sanjay Gupta
- Good Morning America
- Grey's Anatomy

CNN – American Morning Show


Good Morning America

Grey's Anatomy

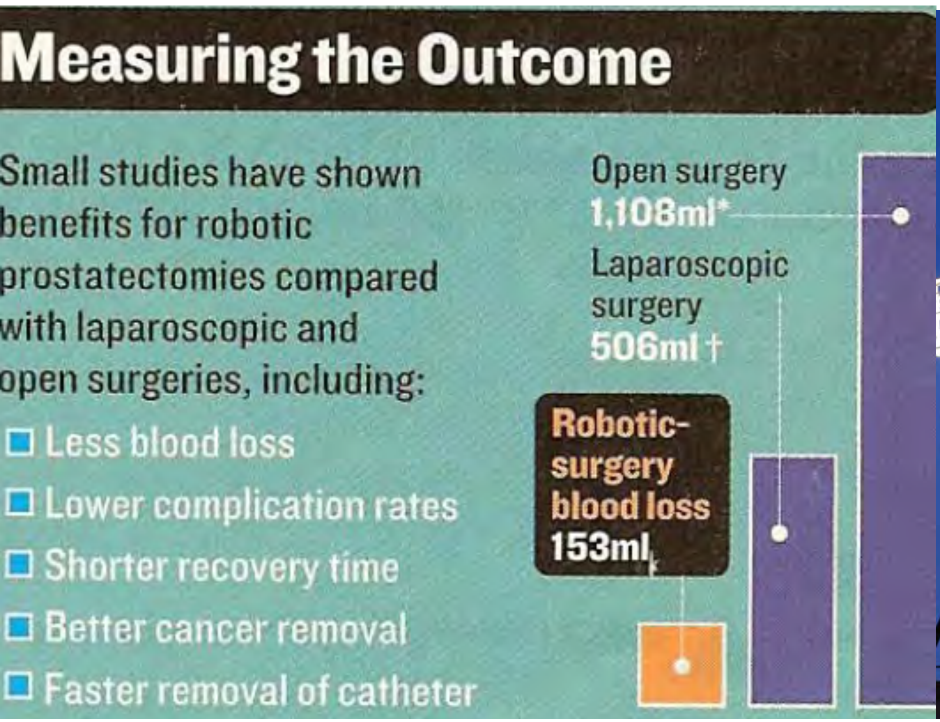


The Doctors


da Vinci

Public View of Robotic Surgery

Direct-to-consumer-advertising



Newsweek
12/12/05

I-90/Mass Pike at Fenway Park

Case Study:
Radical Prostatectomy

The New York Times

July 7, 2009

In Health Reform, a Cancer Offers an Acid Test

“Prostate Cancer a litmus test for health care reform”

Proton Beam Therapy Exceeds $100k

JOURNAL OF CLINICAL ONCOLOGY | ORIGINAL REPORT

Cost Implications of the Rapid Adoption of Newer Technologies for Treating Prostate Cancer

Paul L. Nguyen, Xiangmei Gu, Stuart R. Lipsitz, Toni K. Choueiri, Wesley W. Choi, Yin Lei, Karen E. Hoffman, and Jim C. Hu

Adoption of IMRT and robotic prostatectomy led to an additional $350 million spent on prostate cancer.

Costs of Radical Prostatectomy for Prostate Cancer: A Systematic Review

Christian Bolenz [a,], Stephen J. Freedland [b], Brent K. Hollenbeck [c], Yair Lotan [d], William T. Lowrance [e], Joel B. Nelson [f], Jim C. Hu [g]*

Study no.	Authors (study year)	Reference	Study design	RP approaches (no. of patients); direct costs[a]	Cost premium for MIRP[b] (%)	Comment
1	Guillonneau, Vallancien (2000)	18	Retrospective	**RRP (100); $6296** LRP (120); $5058	**−$1238 (−25)**	First cost comparison between RP approaches
2	Benoit, Cohen (2001)	17	Retrospective	RRP (104); $5305[c]	n.a.	OR/surgical time and units of blood transfused were the main drivers of costs for RRP
3	Makhlouf et al. (2002)	20	Retrospective	RRP (29); $7476[c]	n.a.	Higher OR and surgical supply costs than [17]
4	Silverstein et al. (2004)	23	Retrospective	**RRP (123); $9757[d]** RPP (279); $7195[d]	n.a.	Perineal RP was associated with lower costs when pelvic lymphadenectomy was not performed
5	Anderson et al. (2005)	16	Retrospective	RRP (67); $5253[c] **LRP (30); $6760[c]**	**$1507 (22)**	Main cost drivers for LRP were higher surgical supply costs and higher OR costs due to longer OR time
6	Jayadevappa et al. (2005)	19	Prospective	RRP (40); $3384[c]	n.a.	Only prospective cost study; incremental costs of PCa within 1 yr postprostatectomy were considered
7	Mouraviev et al. (2007)	21	Retrospective	RRP (197); $5259[c] RPP (60); $5273[c] **RALP (137); $5386[c]**	**$127 (2.4)**	First study comparing actual direct costs associated with RALP vs other approaches
8	Bolenz et al. (2010)	6	Retrospective	RRP (161); $4437[d] LRP (220); $5687[d] **RALP (262); $6752[d]**	**LRP: $1250 (22)** **RALP: $2315 (34)**	Largest direct comparison of costs for RRP, LRP, and RALP
9	Hohwü et al. (2011)	7	Retrospective	RRP (154); €3863[c] **RALP (77); €8369[c]**	**€4506 (54)**	*Only study applying standardized health economic evaluation criteria; RALP was not found to be cost effective
10	Rebuck et al. (2011)	22	Retrospective	RALP (200); $11 806[c] and $9258 (after modifications in OR processes)	n.a.	Highest OR and surgical supply costs; provides suggestions for cost savings when performing RALP
11	Tomaszewski et al. (2012)	24	Retrospective	RRP (n = 358); $4075[c] **RALP ($n$ = 115); $6489[c]**	**$2414 (37)**	Highest frequency of RP cases among studies on direct costs of RP

Open retropubic prostatectomy versus robot-assisted laparoscopic prostatectomy: A comparison of length of sick leave

LENA HOHWÜ[1], OLOF AKRE[2,3], KNUD VENBORG PEDERSEN[4], MARTIN JONSSON[3], CLAUS VINTHER NIELSEN[5] & OVE GUSTAFSSON[1]

[1]Department of Clinical Science, Intervention and Technology, Karolinska Institutet, Stockholm, Sweden, [2]Clinical Epidemiology Unit, Department of Medicine, Karolinska Institutet, Stockholm, Sweden, [3]Department of Molecular Medicine and Surgery, Karolinska Institutet, Stockholm, Sweden, [4]Department of Urology, Aarhus University Hospital Skejby, Aarhus, Denmark, and [5]Department of Social Medicine, Institute of Public Health, Faculty of Health Sciences, Aarhus University, Denmark

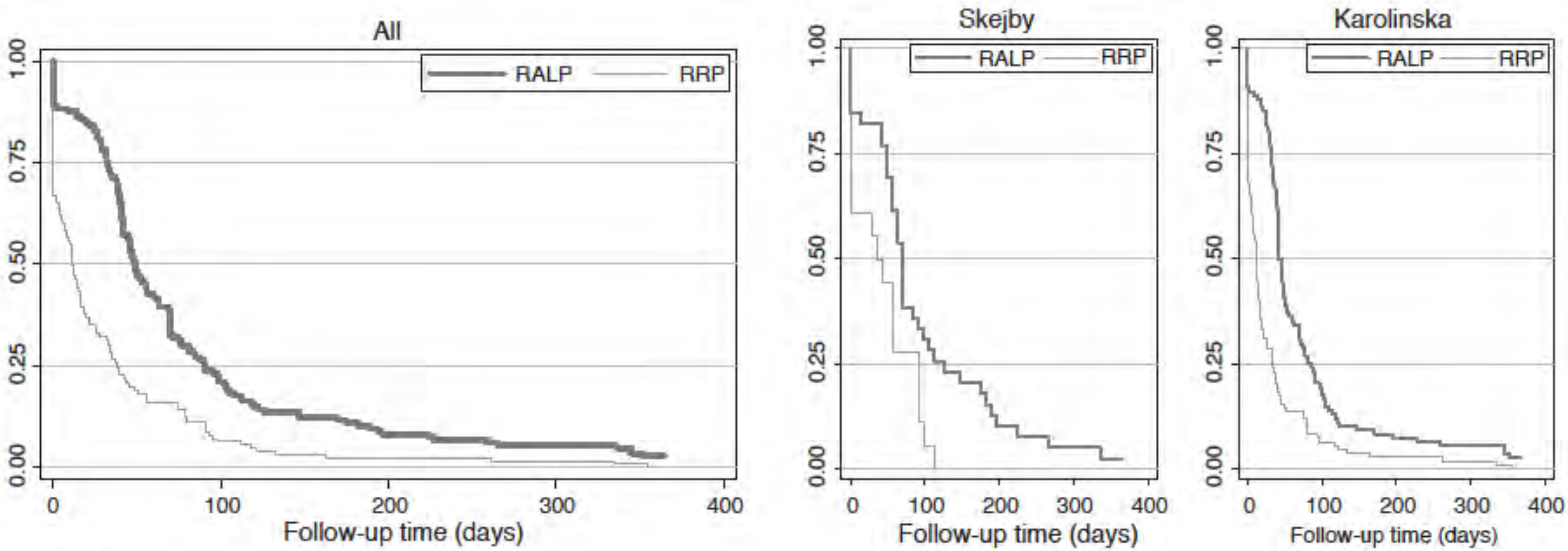


Figure 1. Kaplan–Meier plot estimates time (days) of returning to work after radical prostatectomy for two different groups of patients: for the entire study population (All) and stratified by centre. RALP = robot-assisted laparoscopic radical prostatectomy; RRP = radical retropubic prostatectomy; Skejby = Aarhus University Hospital Skejby; Karolinska = Karolinska University Hospital.

Historical Evolution of Robotic Assisted Laparoscopic Radical Prostatectomy

1982 – Walsh describes nerve sparing technique

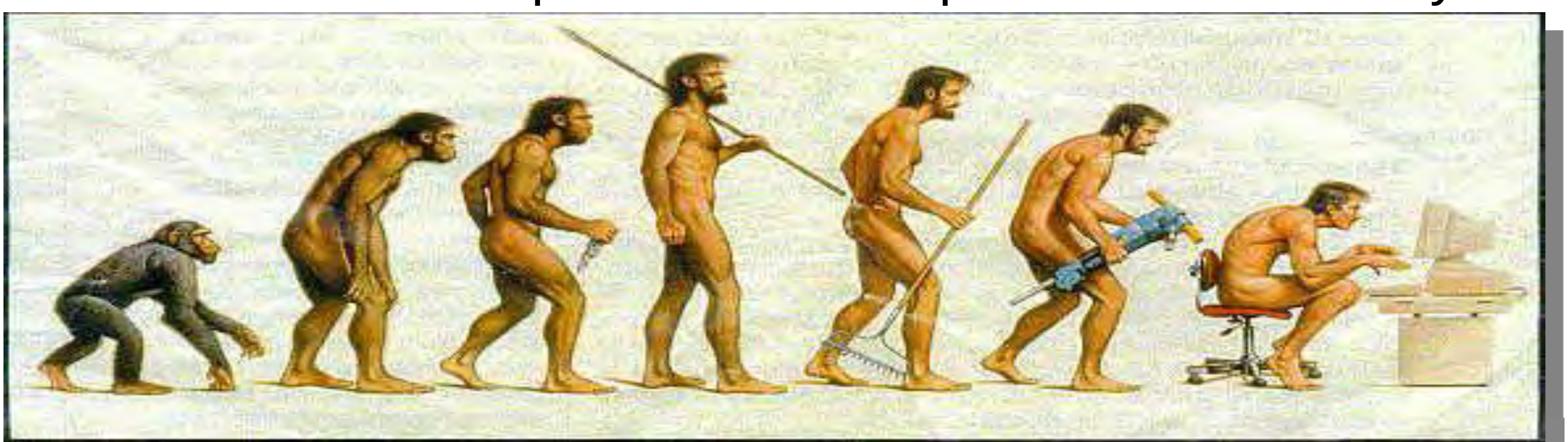
1991 – 1st Laparoscopic radical prostatectomy (LRP)

2000 – consistently reproducible advantages of LRP

2001 – Da Vinci robot applied to LRP

2008 – >50% of radical prostatectomies performed robotically

2010 – 75% of radical prostatectomies performed robotically



RP Volume Outcomes

The New England Journal of Medicine

Special Article

VARIATIONS IN MORBIDITY AFTER RADICAL PROSTATECTOMY

COLIN B. BEGG, PH.D., ELYN R. RIEDEL, M.A., PETER B. BACH, M.D., M.A.P.P., MICHAEL W. KATTAN, PH.D., DEBORAH SCHRAG, M.D., M.P.H., JOAN L. WARREN, PH.D., AND PETER T. SCARDINO, M.D.

Role of Surgeon Volume in Radical Prostatectomy Outcomes

By Jim C. Hu, Karen F. Gold, Chris L. Pashos, Shilpa S. Mehta, and Mark S. Litwin

Purpose: To examine the effect of hospital and surgeon volume on postoperative outcomes and to determine whether hospital or surgeon volume is the stronger predictor.

Patients and Methods: Using 1997 to 1998 claims data from a national 5% random sample of Medicare beneficiaries, we identified 2,292 men who underwent radical prostatectomy at 1,210 hospitals by 1,788 surgeons. Hospitals

Results: High-volume surgeons had half the complication risk (odds ratio [OR] = 0.53; 95% confidence interval [CI], 0.32 to 0.89) and shorter lengths of stay (4.1 v 5.2 days, P = .03) compared with low-volume surgeons. High-volume hospital patients tended to have fewer anastomotic strictures (OR = 0.72; 95% CI, 0.49 to 1.04). Patient age (≥ 75 years) was associated with more complications (OR =

Surgeon versus radical prostatectomy is the more important determinant of radical prostatectomy outcomes of peri-operative complications, length of stay, strictures

Influence of Surgeon and Hospital Volume on Radical Prostatectomy Costs

Stephen B. Williams,*,† Channa A. Amarasekera, Xiangmei Gu, Stuart R. Lipsitz, Paul L. Nguyen, Nathanael D. Hevelone, Keith J. Kowalczyk and Jim C. Hu

From the Division of Urologic Oncology, the Center for Cancer Prevention and Treatment at St. Joseph Hospital, Orange (SBW), and Department of Urology, David Geffen School of Medicine, University of California-Los Angeles, Los Angeles (JCH), California, and the Division of Urologic Surgery (CAA, KJK), Center for Surgery and Public Health (XG, SRL, NDH), and Department of Radiation Oncology (PLN), Brigham and Women's Hospital, Boston, Massachusetts

TABLE 2. Propensity score weighted median Medicare costs by Surgeon and Hospital volume*

		Surgeon volume			
		Low	**Intermediate**	**High**	**p-value**
Hospital Volume	**Low**	$9,638	$9,529	$9,582	0.817
	Intermediate	$9,915	$10,011	$9,420	0.032
	High	$11,257	$10,638	$9,611	0.004
	p-value	0.009	0.009	0.945	

* p=0.001 for differences in costs across combinations of surgeon volume and hospital volume; this p-value comes from a test-statistic that is a function of the interaction terms between surgical volume and hospital volume, as well as a function of the main effects of surgical volume and hospital volume.

High volume hospitals cost more, regardless of surgeon volume

August 21, 2011

Trade Commission Challenges a Hospital Merger

By ROBERT PEAR

WASHINGTON — Obama administration officials have been roaming the country, talking up their vision of a future in which doctors and hospitals team up to provide better care at lower cost. But a starkly different picture is unfolding this summer in a courtroom here, where lawyers from the Federal Trade Commission have been challenging a hospital merger in Toledo, Ohio.

“Hospital mergers in Toledo, Ohio resulted in higher reimbursements passed onto consumers as higher premiums, co-pays and other costs.”

Who should I find to do my radical prostatectomy?

Prostatectomists

ZAGAT
Ratings & Review

continence	potency	cancer control	cost
24	20	20	$$$$

Surgeon "X"

Surgery Preserves Potency, But HMOs Put Up Barriers; Finding the Right Doctor

By Amy Dockser Marcus, Wall Street Journal 6/19/2002

-

SURGEON INSTITUTION LOCATION	OUTCOME
James Brooks Stanford University Stanford, Calif.	Of 700 patients, 95% continence; 69% potency including all ages.
Peter Carroll University of California San Francisco	1000 patients, 98% continence; potency ranges from 50-80% with men who are under 65
William J. Catalona Washington University School of Medicine, St. Louis	Of over 3200 patients, 92% continence; 78% potency including all ages.
John Libertino Lahey Clinic Medical Center Burlington, Mass.	Of 1500 patients, 99.5% continence; 70% potency (not broken down by age) and without any additional therapy such as Viagra; potency is 50% for men with one nerve spared.
Peter Scardino Memorial Sloan-Kettering Cancer Center, New York	Of 2000 patients, 95% continence 76% potency for men under the age of 60.
Patrick Walsh Johns Hopkins Hospital Baltimore	Of over 3000 patients, 95% continence; 75% potency for men in their 60s; 90% potency for men in their 40s and 50s.

Source: The surgeons

LEGENDS IN UROLOGY

27 observations/modifications
3649 RP, 25 years

Patrick C. Walsh, MD
James Buchanan Brady Urological Institute
Johns Hopkins Medical Institutions
Baltimore, Maryland USA

TABLE 1. **Perfecting the technique: sequential modifications of radical prostatectomy 1982-present**

Date	Patient number	Description
September 1984	#110	Wide excision of the neurovascular bundle
March 1985	#160	Fine ligation of the branches of the NVB
April 1985	#166	Mucosal eversion at the bladder neck
September 1987	#474	Vicryl instead of chromic for anastomotic sutures
October 1987	#485	Bulldog clamps on hypogastric arteries
April 1988	#567	Accessory/Aberrant pudendal artery recognized
January 1989	#672	Direct division of the posterior striated sphincter
January 1989	#678	Lateral pedicle divided but not ligated
October 1989	#785	Intermittent compression devices on lower extremities
June 1990	#883	Preservation of aberrant anterior pudendal artery
February 1991	#989	Nerve graft series initiated
March 1995	#1680	Six urethral sutures
March 1995	#1688	Vicryl replaced by Monocryl
June 1996	#1497	McDougal clamp discontinued
July 1996	#1963	Refined division of the dorsal vein
March 1997	#2087	Video documentation; Viagra
September 1997	#2202	Pubic stitch
November 1998	#2425	Release of peritoneum
May 1999	#2545	Closure bladder neck/new stoma on anterior bladder
June 1999	#2553	2.5 power loupes
August 1999	#2587	Division umbilical ligament
August 2000	#2766	Stopped traction on bladder with malleable blade
October 2000	#2801	Bladder neck intussusception
May 2003	#3275	Babcock clamp to stabilize the anastomosis while tying the sutures
December 2004	#3558	4.5 power loupes
January 2005	#3581	8 cm incision
June 2005	#3649	High anterior release of the neurovascular bundle

DaVinci Robotic Surgery Training Course Agenda

Day 1

7:00 a.m.	Arrival / Registration / Program Overview
7:00 a.m. - 8:00 a.m.	Video Presentation
8:00 a.m. - 12:00 a.m.	System Overview and Draping (Lab)
	Laboratory Session – Inanimate model
	Surgical skills drills
12:00 a.m. - 1:00 p.m.	**LUNCH** (port placement presentation)
1:00 p.m. - 4:00 p.m.	Laboratory Session - Animate, Porcine (Lab)
	Patient Positioning
	Port Placement
	Positioning of Surgical Cart
	Robot Assisted Laparoscopic Pyeloplasty or Nephrectomy
	System shut down sequence/Emergency Conversion
4:00 p.m. - 4:30 p.m.	Question & Answer Session
4:30 p.m.	Adjourn

Day 2

7:00 a.m.	Arrival
7:00 a.m. - 12:00 a.m.	1-2 Live Case Observations: *da Vinci* Prostatectomy (OR)
12:00 p.m. - 1:00 p.m.	**LUNCH** (dVP Video)
1:10 p.m. – 4:00 p.m.	Laboratory Session - Animate, Porcine (Lab)
	Patient Re-positioning
	Port Placement
	Positioning of Surgical Cart
	Pelvic Skills Laboratory Session
4:00 p.m. - 4:30 p.m.	Wrap Up / Evaluations / Certificates

****This is the current anticipated itinerary. Schedule may change due to case availability.****

Expensive Learning Curve

The Wall Street Journal

HEALTH INDUSTRY | May 4, 2010

Surgical Robot Examined in Injuries

Article | Video | Comments (55)

SUBSCRIBER CONTENT PREVIEW

FOR FULL ACCESS: LOG IN OR SUBSCRIBE NOW - GET 4 WEEKS FREE

By JOHN CARREYROU

DOVER, N.H.—Wentworth-Douglass Hospital, a small community hospital in this coastal New England town, used a college hockey game to showcase its new technological marvel: a $1.4 million surgical robot named after Leonardo da Vinci.

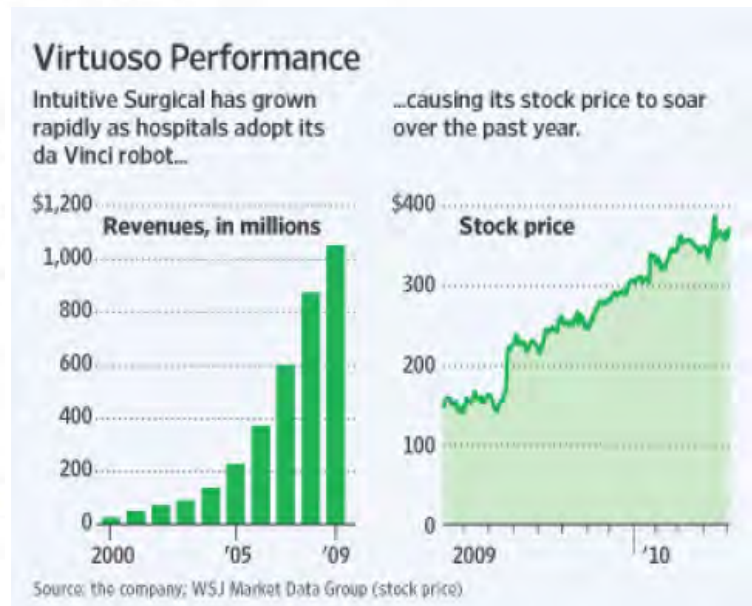
Intuitive Surgical

The da Vinci robot allows surgeons to operate through small incisions, avoiding the need to open up the abdomen.

Enlarge Image

Intuitive Surgical

More than 800 U.S. hospitals have acquired at least one of the da Vinci machines in the past decade.



Overcoming the Learning Curve for Robotic-assisted Laparoscopic Radical Prostatectomy

Marcos P. Freire, MD, PhD[1], Wesley W. Choi, MD[1],
Yin Lei, MD, Fernando Carvas, BS, Jim C. Hu, MD, MPH*

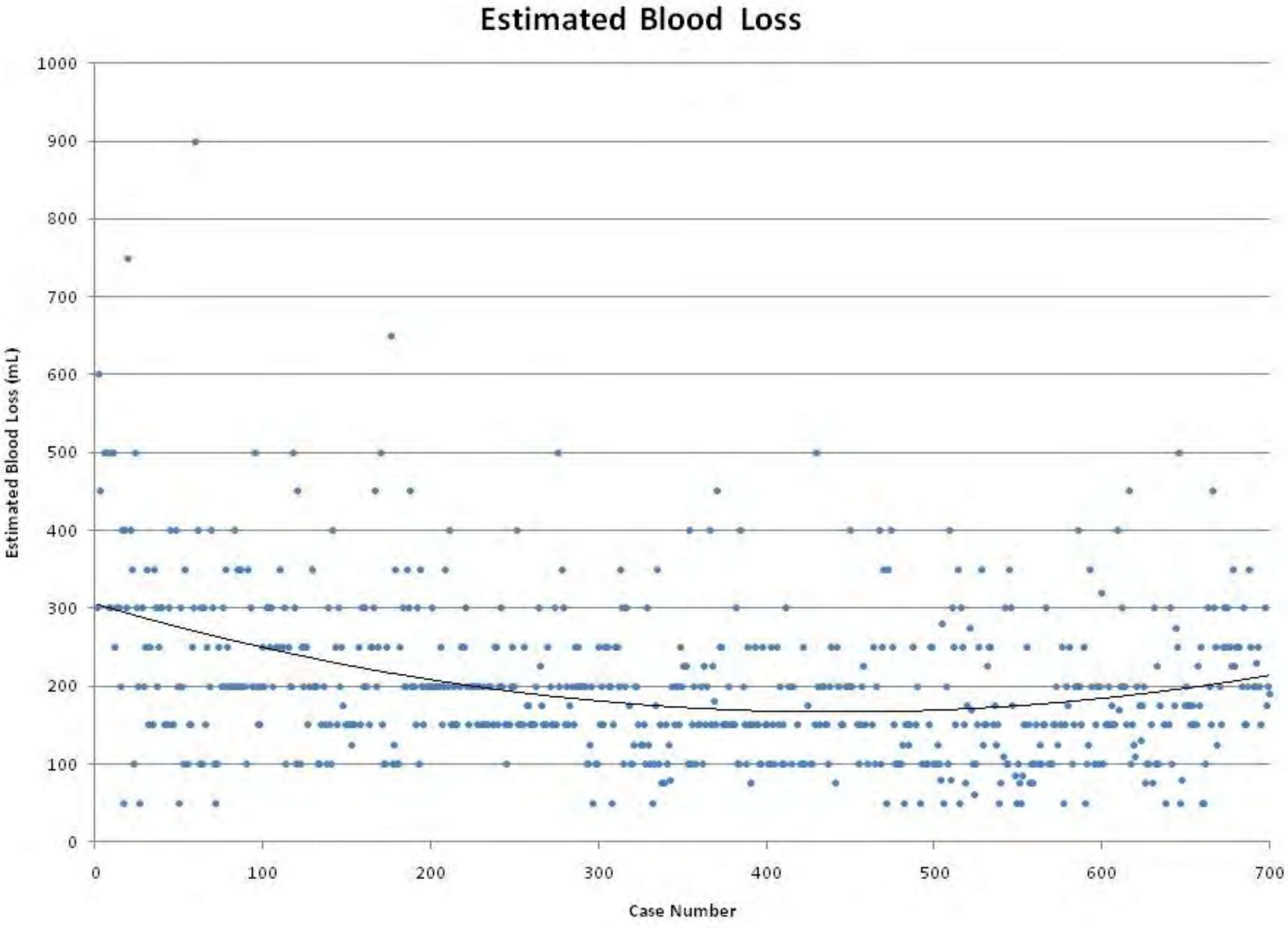
KEYWORDS

• Radical prostatectomy • Robotic surgical technique
• Prostate cancer • Learning curve

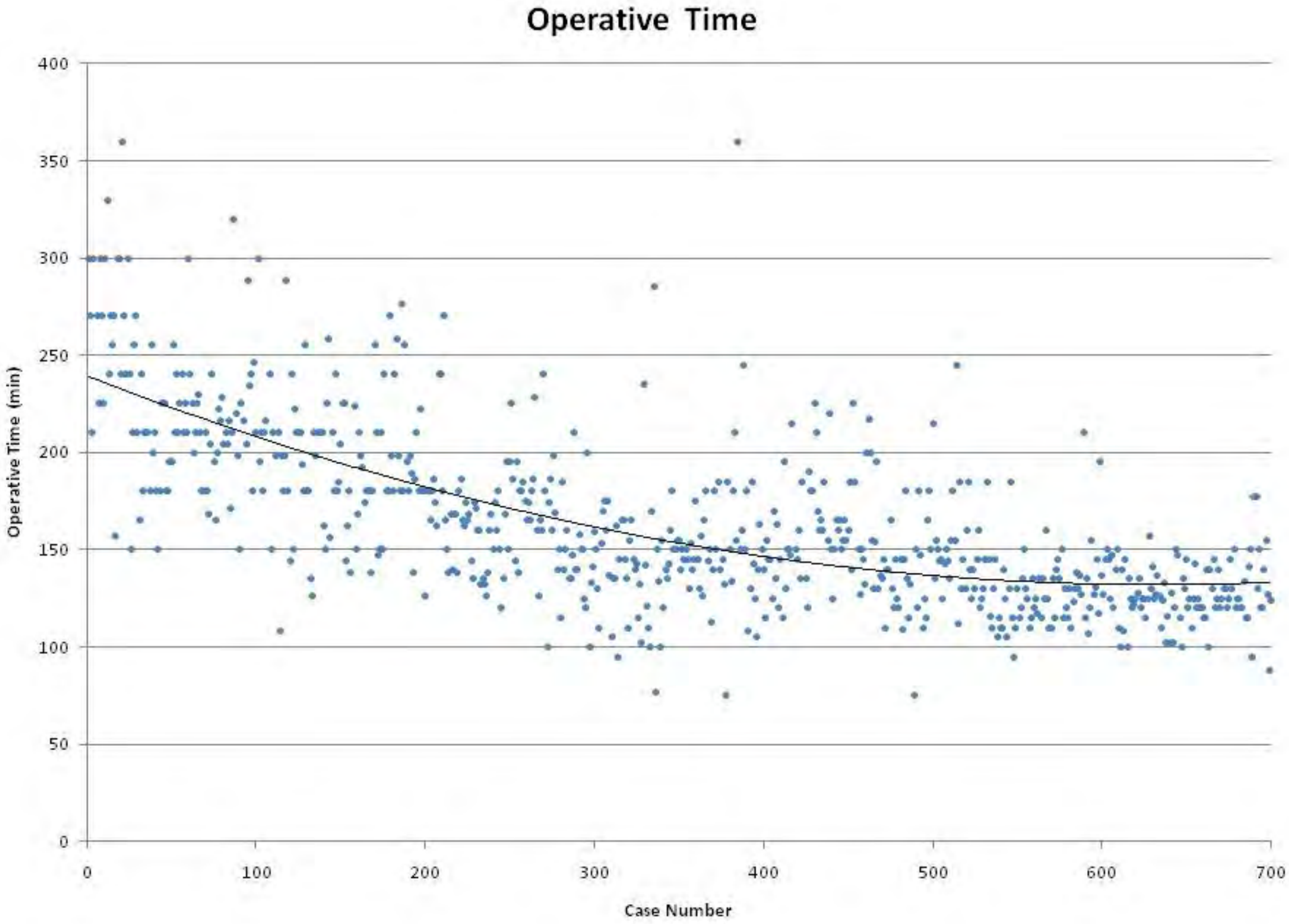
Learning Curve over the first 700 patients

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Overall Series Mean (Range)	p value
Operative Variables:									
Operative Time, mean (min)	225.8	194.7	163.3	149.1	152.5	134	126.8	163.7 (75-360)	<0.001
EBL, mean (mL)	270.1	228.3	196	175.6	173.4	165.4	197.2	200.9 (50-900)	<0.001
Surgical Margin Status:									
Overall Positive Margin (%)	17	6	18	12	13	10	13	12.7 (6-18)	0.176

Learning Curve over the first 700 patients

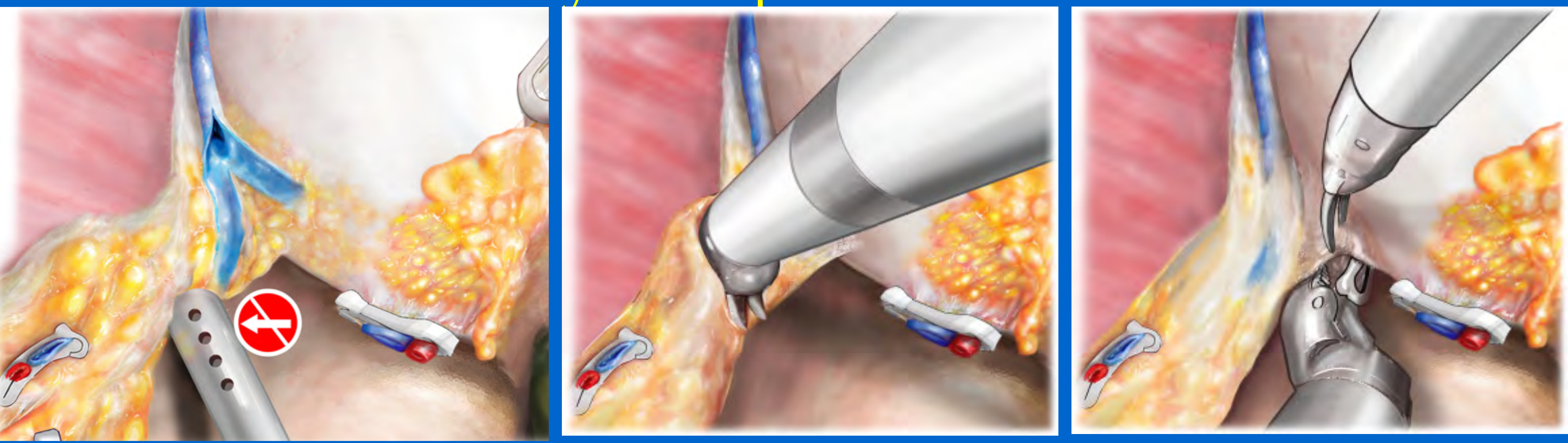


BWH Learning Curve over the first 700 patients

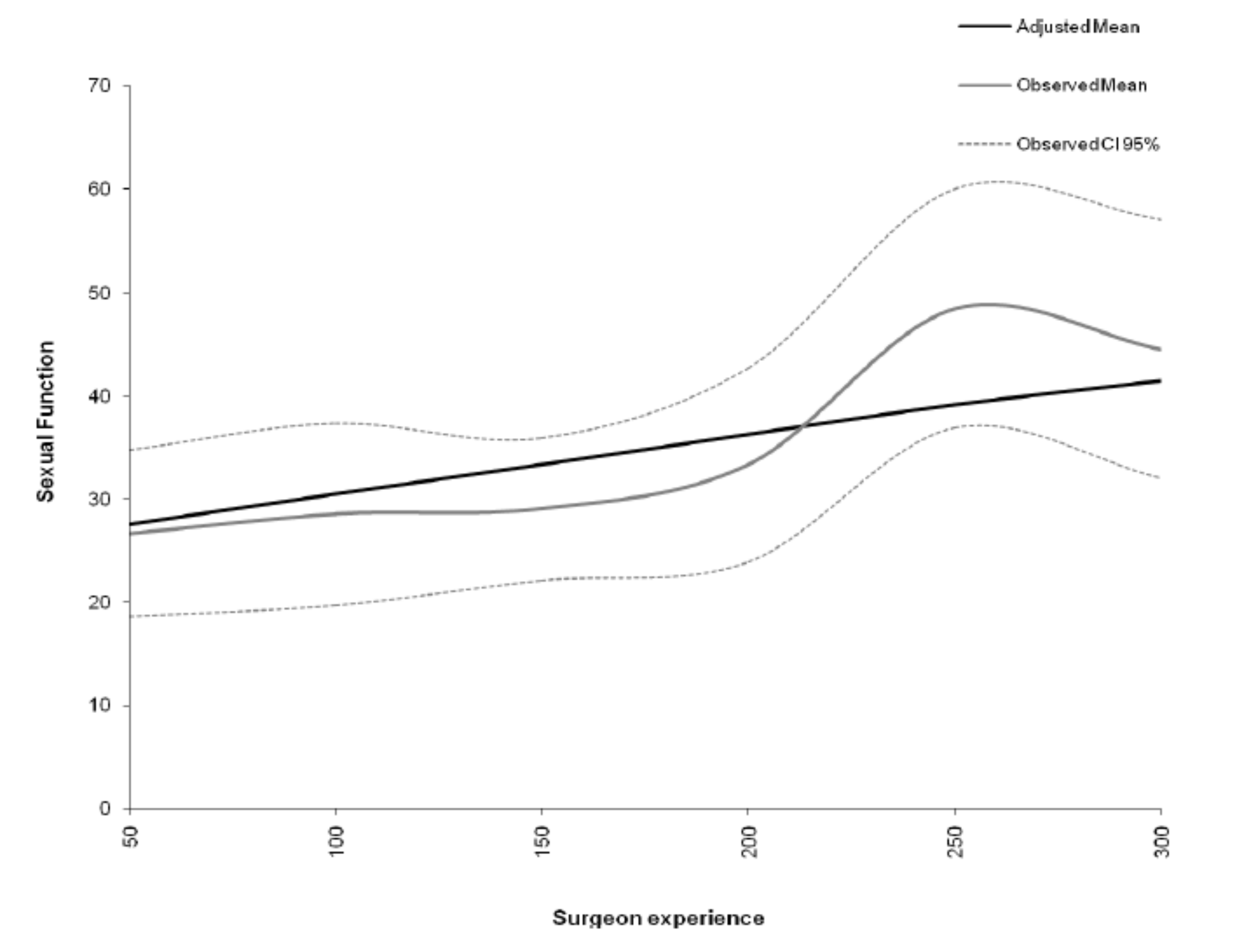


Heterogeneity of Nerve-sparing

- Multiple steps affect outcomes
  - Optiomal nerve-sparing dissection plane
  - How delicately is the plane achieved



12-month EPIC sexual function outcomes



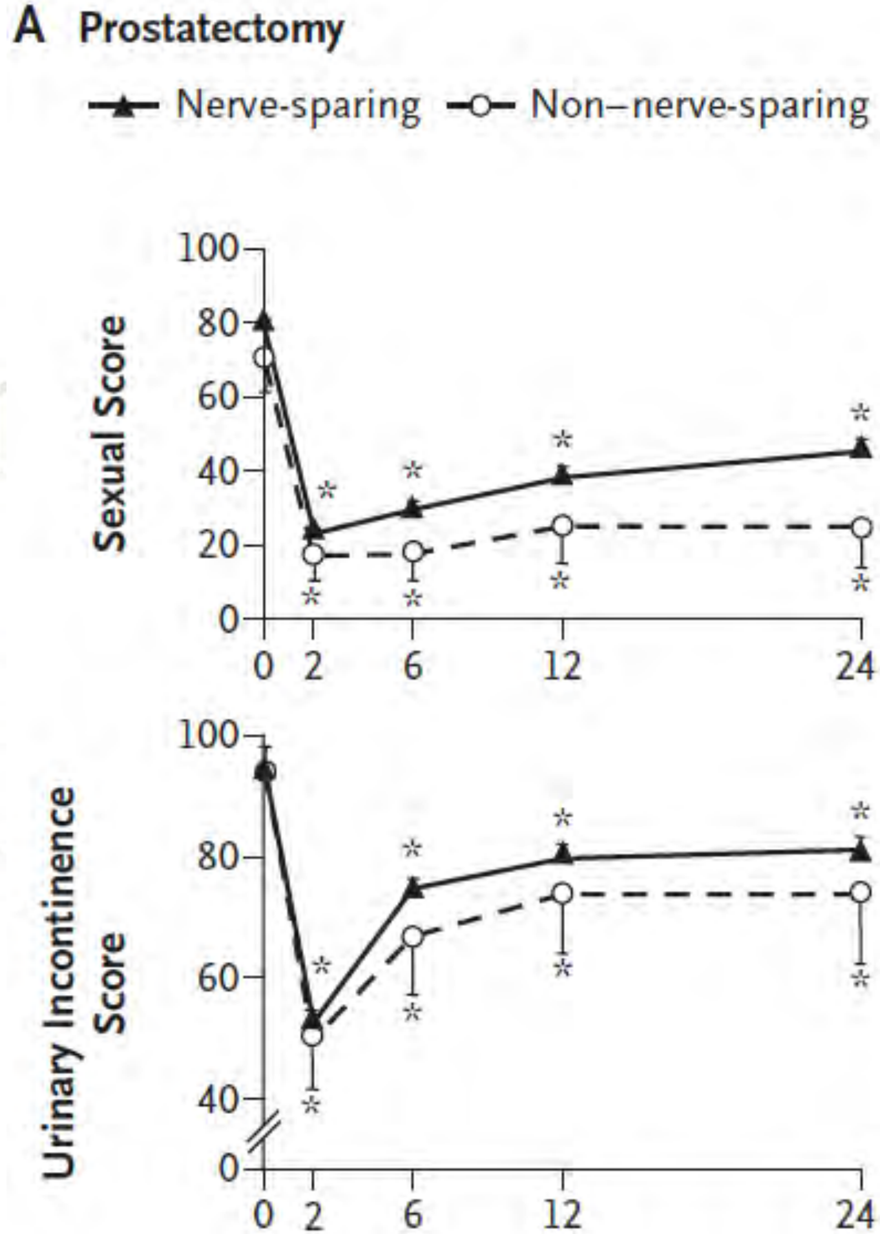
Beyond 450 procedures

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Quality of Life and Satisfaction with Outcome among Prostate-Cancer Survivors

Martin G. Sanda, M.D., Rodney L. Dunn, M.S., Jeff Michalski, M.D., Howard M. Sandler, M.D., Laurel Northouse, R.N., Ph.D., Larry Hembroff, Ph.D., Xihong Lin, Ph.D., Thomas K. Greenfield, Ph.D., Mark S. Litwin, M.D., M.P.H., Christopher S. Saigal, M.D., M.P.H., Arul Mahadevan, M.D., Eric Klein, M.D., Adam Kibel, M.D., Louis L. Pisters, M.D., Deborah Kuban, M.D., Irving Kaplan, M.D., David Wood, M.D., Jay Ciezki, M.D., Nikhil Shah, D.O., and John T. Wei, M.D.



available at www.sciencedirect.com
journal homepage: www.europeanurology.com

European Association of Urology

Platinum Priority – Prostate Cancer

Editorial by Patrick J. Bastian on pp. 323–324 of this issue

Cancer Control and Functional Outcomes After Radical Prostatectomy as Markers of Surgical Quality: Analysis of Heterogeneity Between Surgeons at a Single Cancer Center

Andrew Vickers [a,], Caroline Savage [a], Fernando Bianco [b], John Mulhall [c], Jaspreet Sandhu [c], Bertrand Guillonneau [c], Angel Cronin [d], Peter Scardino [c]*

[a] *Department of Surgery and Department of Epidemiology and Biostatistics, Memorial Sloan-Kettering Cancer Center, New York, NY, USA*
[b] *Columbia University Division of Urology at Mount Sinai Medical Center, New York, NY, USA*
[c] *Department of Surgery and Department of Urology, Memorial Sloan-Kettering Cancer Center, New York, NY, USA*
[d] *Department of Medical Oncology, Dana-Farber Cancer Institute, Boston, MA, USA*

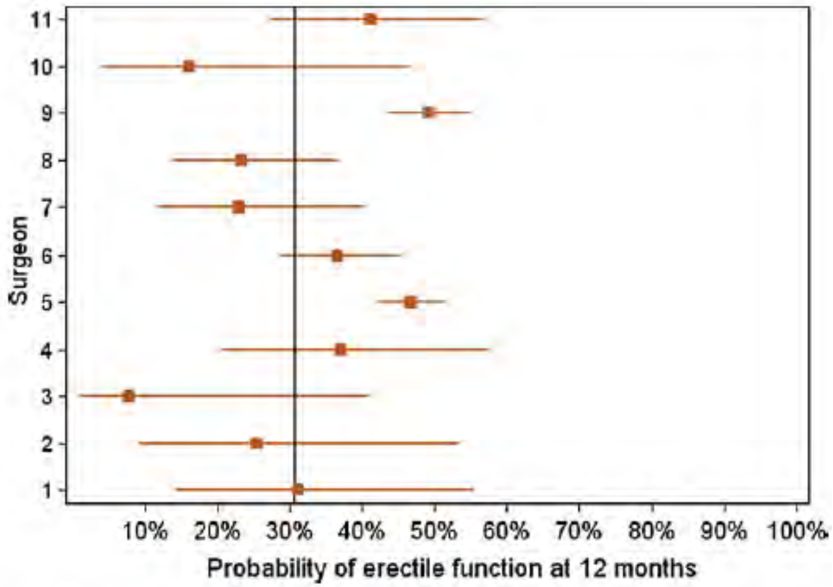


Fig. 1 – Forest plot for probability of erectile function (erectile rigidity score of 1 or 2) at 1 yr. The proportions are for a patient with the mean level of all covariates. The vertical line represents the mean adjusted proportion of patients with erectile function at 1 yr for all surgeons.

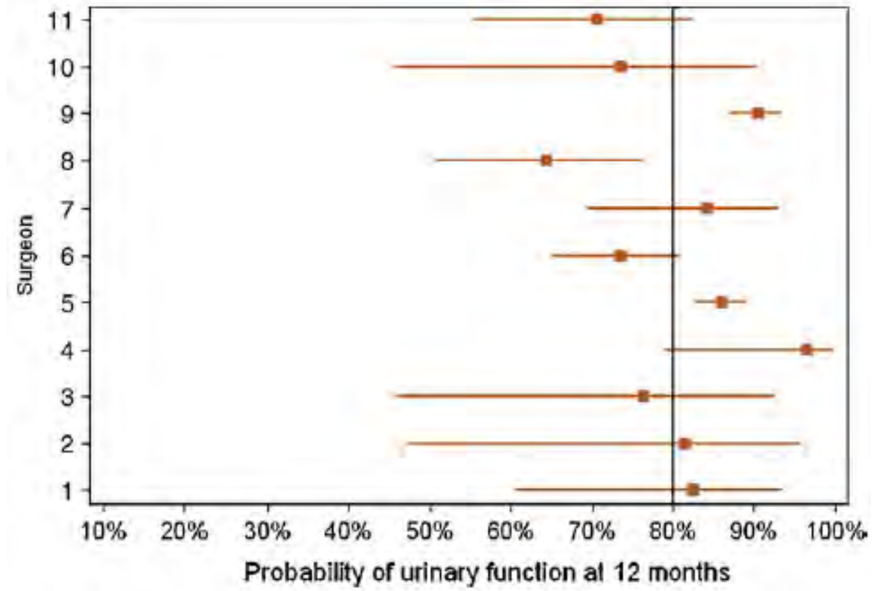


Fig. 2 – Forest plot for probability of full continence (urinary control score of 1 [no pads]) at 1 yr. The proportions are for a patient with the mean level of all covariates. The vertical line represents the mean adjusted proportion of patients who were continent at 1 yr for all surgeons.

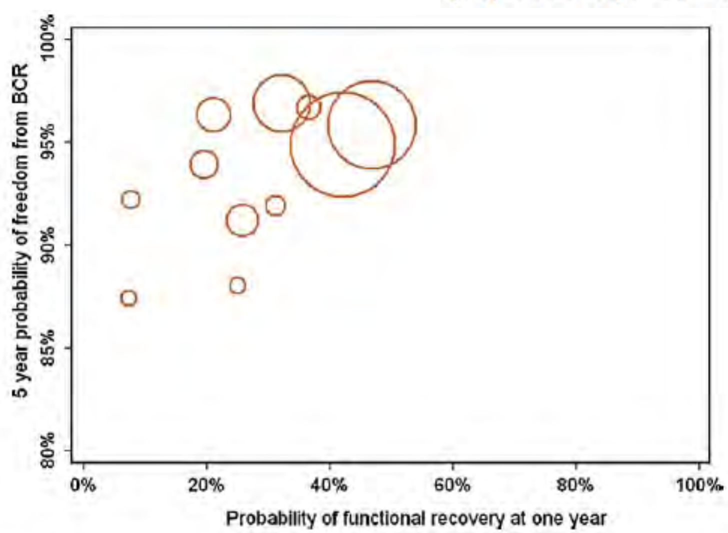


Fig. 4 – Scatter plot of adjusted biochemical recurrence (BCR) rates versus recovery of both urinary and erectile function at 12 mo. Each circle represents a single surgeon, and the size of the circle is in proportion to the number of patients treated by that surgeon.

Need Randomized Control Trial

HULTON/GETTY

Parachutes reduce the risk of injury after gravitational challenge, but their effectiveness has not been proved with randomised controlled trials

"Parachutes reduce the risk of injury after gravitational challenge, but their effectiveness has not been proven with randomized controlled trials."

BMJ 2003;327:1459

Study designs to evaluate new surgical technologies

- Randomized controlled trials limited by heterogeneity in surgeon technique vs. outcomes
- At what point along a surgeons experience is a RCT conducted?
- Surgeon experience vs. Technology
- Observational studies give population based averages

Comparative Effectiveness of Minimally Invasive vs Open Radical Prostatectomy

Jim C. Hu, MD, MPH
Xiangmei Gu, MS
Stuart R. Lipsitz, ScD
Michael J. Barry, MD
Anthony V. D'Amico, MD, PhD
Aaron C. Weinberg, MD
Nancy L. Keating, MD, MPH

Context Minimally invasive radical prostatectomy (MIRP) has diffused rapidly despite limited data on outcomes and greater costs compared with open retropubic radical prostatectomy (RRP).

Objective To determine the comparative effectiveness of MIRP vs RRP.

Design, Setting, and Patients Population-based observational cohort study using US Surveillance, Epidemiology, and End Results Medicare linked data from 2003 through 2007. We identified men with prostate cancer who underwent MIRP (n=1938) vs RRP (n=6899).

Main Outcome Measures We compared postoperative 30-day complications, anastomotic stricture 31 to 365 days postoperatively, long-term incontinence and erectile dysfunction more than 18 months postoperatively, and postoperative use of additional cancer therapies, a surrogate for cancer control.

Results Among men undergoing prostatectomy, use of MIRP increased from 9.2% (95% confidence interval [CI], 8.1%-10.5%) in 2003 to 43.2% (95% CI, 39.6%-46.9%) in 2006-2007. Men undergoing MIRP vs RRP were more likely to be recorded as Asian (6.1% vs 3.2%), less likely to be recorded as black (6.2% vs 7.8%) or Hispanic (5.6% vs 7.9%), and more likely to live in areas with at least 90% high school graduation rates (50.2% vs 41.0%) and with median incomes of at least $60 000 (35.8% vs 21.5%) (all $P<.001$). In propensity score–adjusted analyses, MIRP vs RRP was associated with shorter length of stay (median, 2.0 vs 3.0 days; $P<.001$) and lower rates of blood transfusions (2.7% vs 20.8%; $P<.001$), postoperative respiratory complications (4.3% vs 6.6%; $P=.004$), miscellaneous surgical complications (4.3% vs 5.6%; $P=.03$), and anastomotic stricture (5.8% vs 14.0%; $P<.001$). However, MIRP vs RRP was associated with an increased risk of genitourinary complications (4.7% vs 2.1%; $P=.001$) and diagnoses of incontinence (15.9 vs 12.2 per 100 person-years; $P=.02$) and erectile dysfunction (26.8 vs 19.2 per 100 person-years; $P=.009$). Rates of use of additional cancer therapies did not differ by surgical procedure (8.2 vs 6.9 per 100 person-years; $P=.35$).

Conclusion Men undergoing MIRP vs RRP experienced shorter length of stay, fewer respiratory and miscellaneous surgical complications and strictures, and similar postoperative use of additional cancer therapies but experienced more genitourinary complications, incontinence, and erectile dysfunction.

JAMA. 2009;302(14):1557-1564 www.jama.com

FOLLOWING THE DESCRIPTION OF consistently reproducible advantages of minimally invasive radical prostatectomy (MIRP) with and without robotic assistance in 2000-2001,[1,2] use of MIRP has surged.[3,4] In particular, use of robotic-assisted MIRP increased from 1% to 40% of all radical prostatectomies from 2001 to 2006.[5,6] Many patients intuitively perceive minimally invasive approaches to reduce complications compared with conventional open operations and prefer minimally invasive procedures because of smaller incisions requiring less analgesics and shorter hospital stays, even at greater cost.[7]

Moreover, the widespread direct-to-consumer advertising and marketed benefits of robotic-assisted MIRP in the United States may promote publication bias against studies that detail challenges and suboptimal outcomes early in the MIRP learning curve.[8] Until com-

Table 3. Propensity Model–Adjusted Outcomes by Surgical Approach[a]

Outcomes	MIRP	RRP	MIRP vs RRP, Ratio (95% Confidence Interval)[b]	*P* Value
Length of stay, median (IQR)[c]	2 (1-2)	3 (2-4)	0.67 (0.58-0.72)	<.001
Heterologous blood transfusion, %	2.7	20.8	0.11 (0.06-0.17)	<.001
30-Day complications, %				
Overall	22.2	23.2	0.95 (0.77-1.16)	.58
Cardiac	2.4	2.9	0.81 (0.49-1.33)	.37
Respiratory	4.3	6.6	0.63 (0.46-0.87)	.004
Genitourinary	4.7	2.1	2.28 (1.61-3.22)	.001
Wound	2	1.9	1.05 (0.61-1.82)	.86
Vascular	3.4	3.9	0.86 (0.55-1.35)	.50
Miscellaneous medical	10	8.5	1.19 (0.89-1.6)	.26
Miscellaneous surgical	4.3	5.6	0.75 (0.56-0.99)	.03
Death	0.1	0.2	0.31 (0.07-1.28)	.05
Anastomotic stricture, %[d]	5.8	14.0	0.38 (0.28-0.52)	<.001
Incontinence per 100 person-years[e]				
Diagnosis	15.9	12.2	1.3 (1.05-1.61)	.02
Procedures	7.8	8.9	0.87 (0.69-1.1)	.24
Erectile dysfunction per 100 person-years[e]				
Diagnosis	26.8	19.2	1.40 (1.14-1.72)	.009
Procedure	2.3	2.2	1.05 (0.74-1.51)	.78
Additional cancer therapy per 100 person-years				
Overall	8.2	6.9	1.19 (0.84-1.69)	.35
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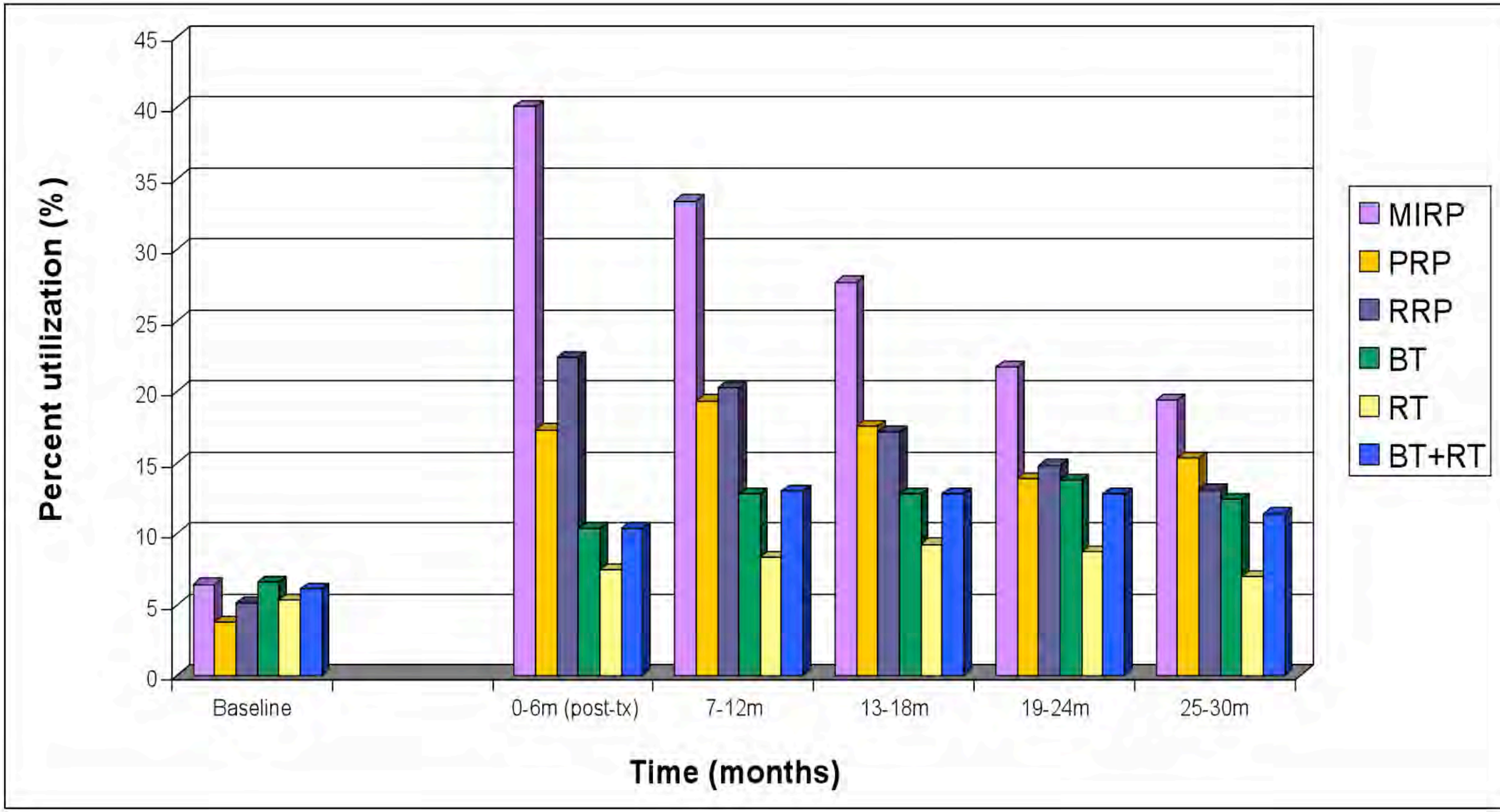
Utilization of phosphodiesterase-5 inhibitors before and after therapies for prostate cancer. Baseline denotes a period up to three months prior to treatment



Prasad M, J Sex Med 2010

Administrative Data Limitations

- Absence of granularity
  - Patient
  - Surgeon
  - Technique
- Absence of patient reported outcomes
- Absence of PSA recurrence outcomes

EDITORIAL

Robotic radical prostatectomy: Fools rush in, or the early bird gets the worm?

Laurence Klotz

Editor-in-Chief
CUAJ

Robotic prostatectomy seems to be here to stay. Currently, over 50% of radical prostatectomies (RPs) in the United States are done robotically. The article by Dr. Chin and colleagues[1] provides a perspective on this trend. Robotic technology represents a challenge to our Canadian system, yet it has rapidly spread throughout the US (where there are over 350 robots).

- Average US urologist performs <10 radical prostatectomies a year
- A few robots (perhaps 5–10) should be purchased by acknowledged centres of excellence across the country, where a limited number of surgeons would maintain a high volume of cases and quickly develop expertise.
- Further dispersion of the robot beyond these centres should await solid data showing improvement in clinically significant oncologic and quality of life related outcomes.

ANNALS OF MEDICINE

PERSONAL BEST

Top athletes and singers have coaches. Should you?

by Atul Gawande

OCTOBER 3, 2011

Collaborative Feedback

- Mechanism to improve outcomes among surgeons

Original Contributions

A Regional Intervention to Improve the Hospital Mortality Associated With Coronary Artery Bypass Graft Surgery

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Objective.—To determine whether an organized intervention including data feedback, training in continuous quality improvement techniques, and site visits to other medical centers could improve the hospital mortality rates associated with coronary artery bypass graft (CABG) surgery.

Design.—Regional intervention study. Patient demographic and historical data, body surface area, cardiac catheterization results, priority of surgery, comorbidity, and status at hospital discharge were collected on CABG patients in Northern New England between July 1, 1987, and July 31, 1993.

Setting.—This study included all 23 cardiothoracic surgeons practicing in Maine, New Hampshire, and Vermont during the study period.

Patients.—Data were collected on 15 095 consecutive patients undergoing isolated CABG procedures in Maine, New Hampshire, and Vermont during the study period.

Interventions.—A three-component intervention aimed at reducing CABG mortality was fielded in 1990 and 1991. The interventions included feedback of outcome data, training in continuous quality improvement techniques, and site visits to other medical centers.

Main Outcome Measure.—A comparison of the observed and expected hospital mortality rates during the postintervention period.

Results.—During the postintervention period, we observed the outcomes for 6488 consecutive cases of CABG surgery. There were 74 fewer deaths than would have been expected. This 24% reduction in the hospital mortality rate was statistically significant (P=.001). This reduction in mortality rate was relatively consistent across patient subgroups and was temporally associated with the interventions.

Conclusion.—We conclude that a multi-institutional, regional model for the continuous improvement of surgical care is feasible and effective. This model may have applications in other settings.

(*JAMA*. 1996;275:841-846)

THE PROFESSIONALISM intrinsic to health care, along with increasing demands from health care policymakers and consumers, has drawn increased attention to the study of the outcomes of medical and surgical treatment.[1] Few medical or surgical interventions have received such intense scrutiny as coronary artery bypass graft (CABG) surgery. Between 1987 and 1993, the Health Care Financing Administration (HCFA) published annual studies of mortality rates by hospital.[2] New York State and Pennsylvania routinely release adjusted operative mortality rates that identify heart surgery programs and individual clinicians.[3,4] Invariably, these studies have shown variations in mortality outcomes. These observed differences, which are independent of patient case mix, suggest that improvement in the outcomes of CABG surgery are possible.

For editorial comment see p 877.

Attempts to improve the provision of clinical care face several challenges. The insular nature of clinical medicine and the lack of detailed information on current clinical practice make it difficult to

- Intervention:
- feedback of outcome data
- training in continuous quality improvement,
- site visit to other centers

- 24% reduction in hospital mortality

O'Connor, JAMA 1991

Rapid Implementation of a Robot-Assisted Prostatectomy Program in a Large Health Maintenance Organization Setting

Eric O. Kwon, M.D., Tricia C. Bautista, Jeremy M. Blumberg, M.D.,
Howard Jung, M.D., Kirk Tamaddon, M.D., Sherif R. Aboseif, M.D.,
Stephen G. Williams, M.D., and Gary W. Chien, M.D.

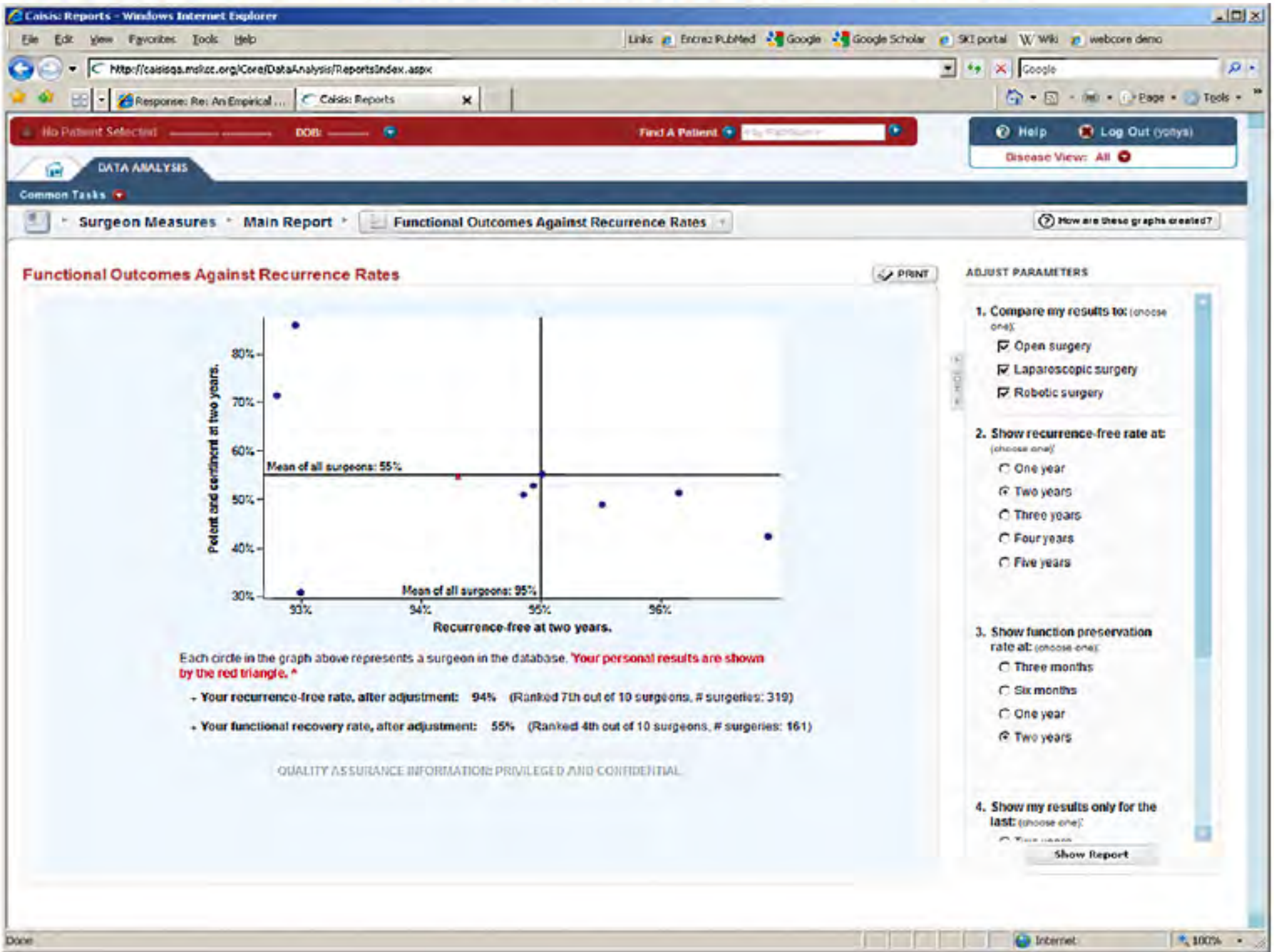
TABLE 1. MENTORSHIP SCHEDULE FOR EACH PARTICIPATING UROLOGIST

	Monday	*Tuesday*	*Wednesday*	*Thursday*	*Friday*
Week 1				1 case (assistant)	1 case (assistant)
Week 2	1 case (console)	2 cases (console)	2 cases (console)	1 case (proctor)	1 case (proctor)

Assigned mentorship in the absence of eat what you treat

How Do You Know If You Are Any Good? A Surgeon Performance Feedback System for the Outcomes of Radical Prostatectomy

Andrew J. Vickers *, *Daniel Sjoberg, Ethan Basch, Frank Sculli, Marwan Shouery, Vincent Laudone, Karim Touijer, James Eastham, Peter T. Scardino*



Opportunites for Policy

- Need entry of competitors to offset monopoly
- Regionalization of new technology
- Limit / censor DTCA
- Surgeon collaborative feedback / coaching
- Health plans provide informed decision making literature and administer health literacy tests prior to paying for health care
- Encourage high growth/high cost hospitals to behave like low growth/low cost hospitals
- Accountable care organization – drive down utilization of surgery to those with the best outcomes at lowest cost