



# Complications in Colorectal Surgery: Are they unavoidable? Are they your problem?

Ahmer A. Karimuddin  
General & Colorectal Surgery





- Screed:
  - A long speech, described as tedious
  - A whining rant



- Complication:
  - Any deviation from the normal post-operative course
  - Unexpected turns that can occur in medicine



- **Complication:**

*Clavien-Dindo Classification*

	Definitions
I	Any deviation from the normal postoperative course without the need for pharmacological treatment other than the “ <b>allowed therapeutic regimens</b> ”, or surgical, endoscopic and radiological interventions
II	Requiring <b>pharmacological</b> treatment with drugs beyond those allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included.
III	Requiring <b>surgical, endoscopic or radiological intervention.</b>
IV	<b>Life-threatening complication</b> requiring critical care management; CNS complications including brain haemorrhage and ischemic stroke (excluding TIA), sub-arachnoidal bleeding.
V	<b>Death</b> of a patient



# Colorectal Cancer: Complications

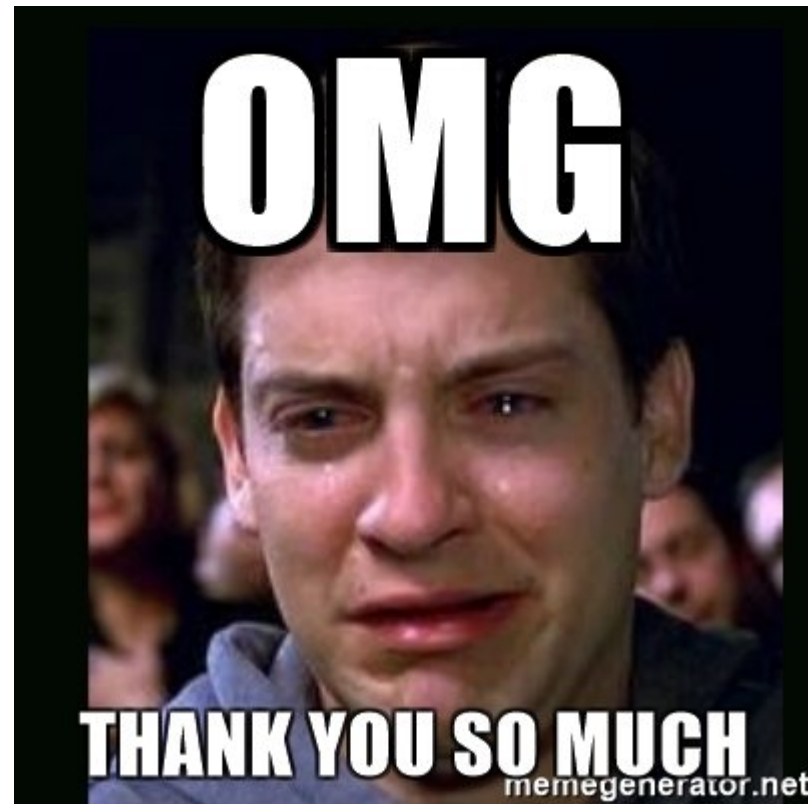
- Postoperative Complications
  - Scope
  - Impact
    - System
    - Patient
    - Oncologic



"85% RECOVER WITH NO COMPLICATIONS. 60% OF THE REMAINING 15% WILL HAVE A SLOWER RECOVERY RATE, AND THE REMAINING 40% OF THE 15% MAY NEED ADDITIONAL TREATMENT."

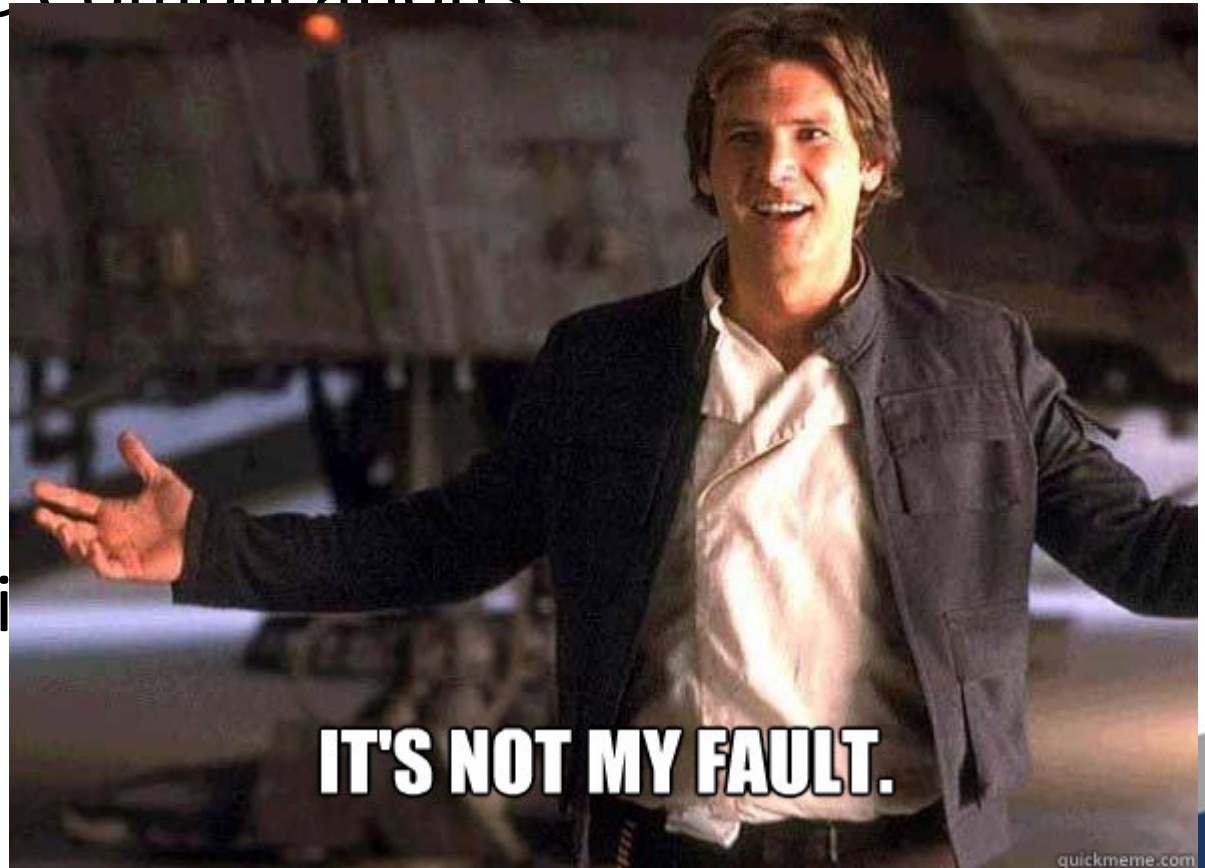
# Colorectal Cancer: Complications

- Postoperative Complications
  - Scope
  - Impact
    - System
    - Patient
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# Colorectal Cancer: Complications

- Postoperative Complications
  - Scope
  - Impact
    - System
    - Patient
    - Oncologist





# Colorectal Cancer: Complications

## Postoperative Complications

- Scope
- Impact
  - System
  - Patient
  - Oncologic
- Strategies
  - Data Measurement and Quality Improvement
  - Enhanced Recovery
  - Prevention of Anastomotic Leak
  - SSI Prevention
  - DVT/VTE Strategies
  - Provincial Strategies



# Colorectal Cancer: Scope

- Longo et al (DCR, 2000)

## Risk Factors for Morbidity and Mortality After Colectomy for Colon Cancer

Walter E. Longo, M.D.,\* Katherine S. Virgo, Ph.D.,\* Frank E. Johnson, M.D.,\*  
Charles A. Opryan, Ph.D.,† Anthony M. Vernava, M.D.,\* Terence P. Wade, M.D.,\*  
Maureen A. Phelan, M.S.,† William G. Henderson, Ph.D.,†  
Jennifer Daley, M.D.,† Charles F. Ethier, M.D.,†

**30% of patients had complications**  
**20% Major Morbidity**  
**(MI/PE/Reoperation/  
ventilation > 24 hours)**



# Colorectal Cancer: Scope

- Kirchhoff et al. (2010), Patient Saf Surg
  - Surgical Site Infection: 2-25% (Best estimate 10-15%)
  - Anastomotic Leak: 3-15%
  - Ileus: 8-12%
- Major risk factors:
  - Age
  - Male Gender
  - Malnutrition / Obesity
  - ASA Class
  - Cardiac Status
  - Anemia



# Colorectal Cancer: Scope

- Garfinkle et al (DCR, 2017)

## Is There a Role for Oral Antibiotic Preparation Alone Before Colorectal Surgery? ACS-NSQIP Analysis by Coarsened Exact Matching

Richard Garfinkle, M.D. • Jad Abou-Khalil, M.D., M.Sc. • Nancy Morin, M.D.  
Gabriela Ghitulescu, M.D. • Carol-Ann Vasilevsky, M.D. • Philip Gordon, M.D.  
Marie Demian,

Division of Colon and

27% of patients had complications

11% SSI rate

2.6% UTI

16% rate of major morbidity



# Colorectal Cancer: Impact

- System Impact of Complications
  - Greenblatt et al (Ann Surg, 2010)
    - 11% readmission rate at 30 days
  - Wick et al (DCR, 2011)
    - 29% readmission rate at 90 days
    - \$9000 per readmission
    - Repeat investigations, treatment costs



# Colorectal Cancer: Impact

Costs of complications after colorectal cancer surgery in the Netherlands: Building the business case for hospitals

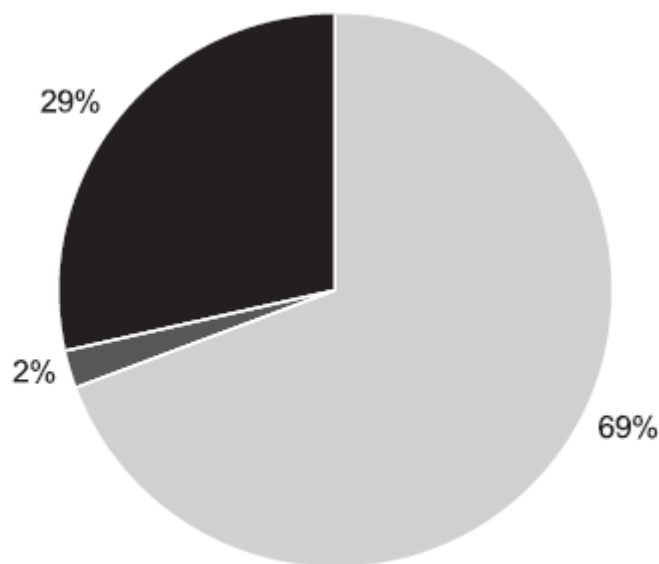
J.A. Govaert <sup>a,b,\*</sup>, M. Fiocco <sup>c,d</sup>, W.A. van Dijk <sup>e,f</sup>, A.C. Scheffer <sup>e</sup>,  
E.J.R. de Graaf <sup>g</sup>, R.A.E.M. Tollenaar <sup>a,i</sup>, M.W.J.M. Wouters <sup>a,h,i</sup>,  
On behalf of the Dutch Value Based Healthcare Study Group<sup>1</sup>



# Colorectal Cancer: Impact

Costs of complications after colorectal cancer surgery in the Netherlands: Building the business case for hospitals

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I. B. <sup>i</sup>, M.W.J.M. Wouters<sup>a,h,i</sup>,  
Healthcare Study Group<sup>1</sup>

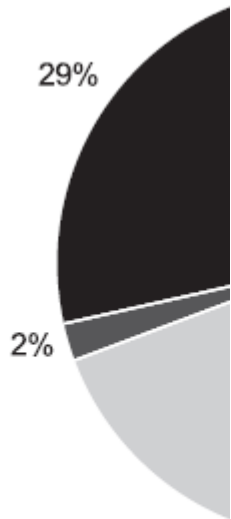


- Baseline cost of colorectal cancer care (all patients: n=6768)
- Additional costs of patients with mild complications (n=819)
- Additional costs of patients with severe complications (n=1426)

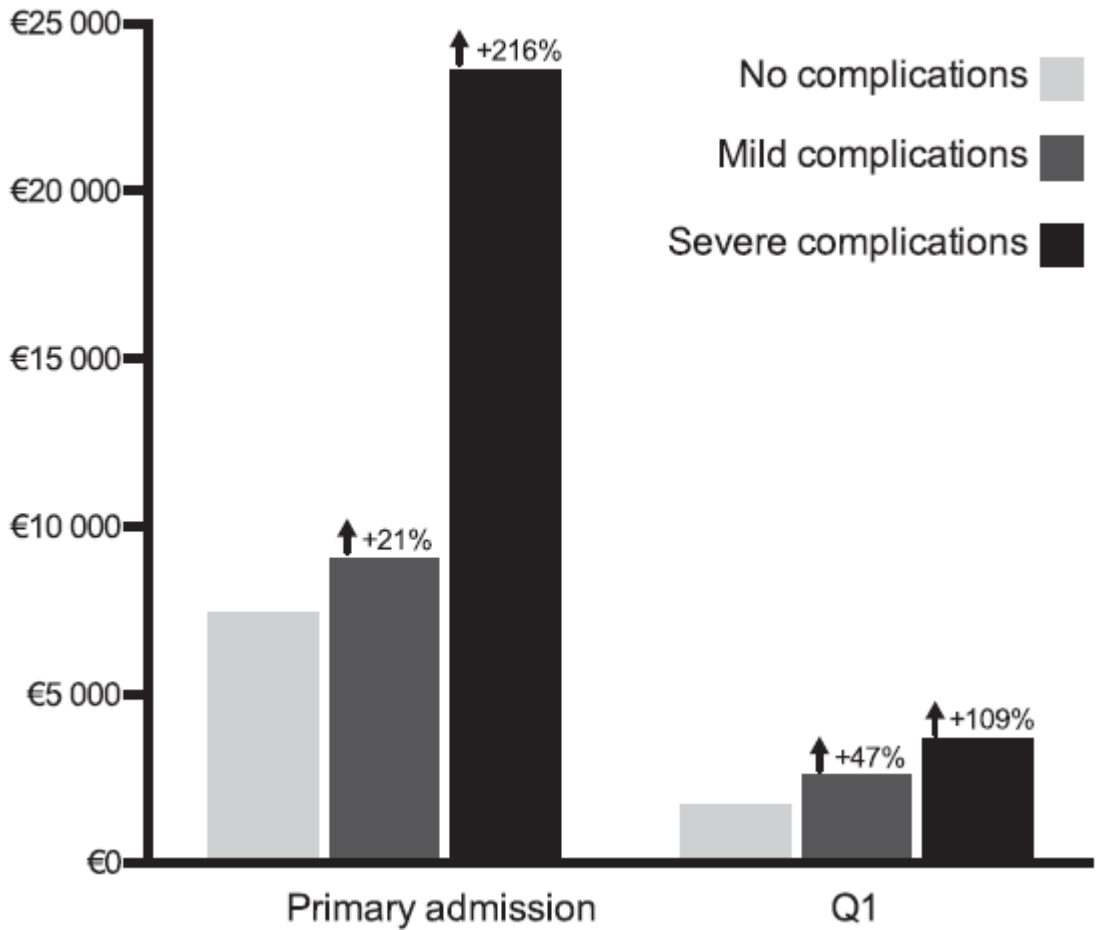
# Colorectal Cancer: Impact

## Costs of complications after colorectal cancer surgery in the Netherlands

J.A. Govaert <sup>a,b,\*</sup>,  
 F.P. de Creef <sup>g</sup>  
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Baseline cost of colorect  
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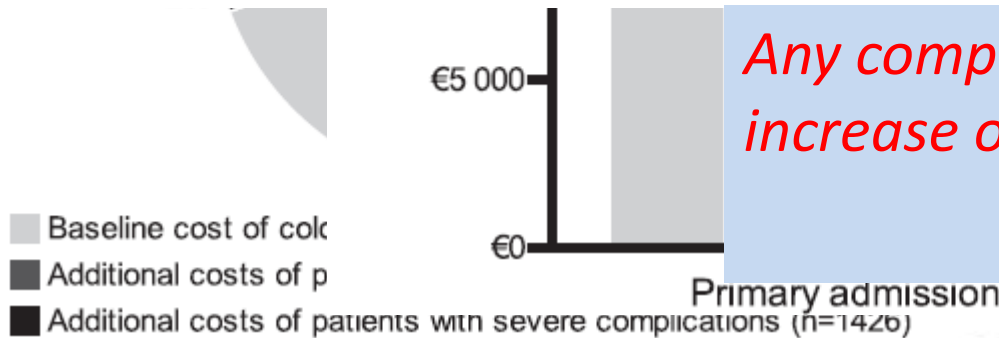
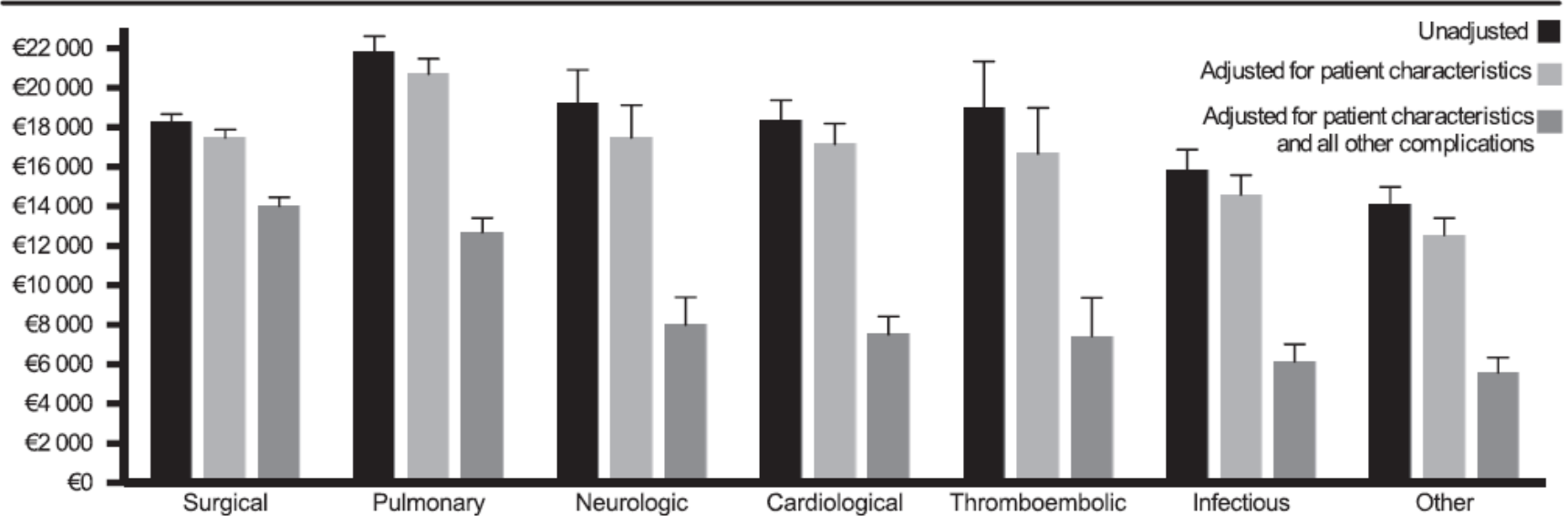




# Colorectal Cancer: Impact

## Costs of com

1



*Any complication leads to a minimum increase of costs of care by*

***Euro 4000***

# Colorectal Cancer: Impact

## The Personal Financial Burden of Complications After Colorectal Cancer Surgery

Scott E. Regenbogen, MD, MPH<sup>1,2</sup>; Christine M. Veenstra, MD<sup>3</sup>; Sarah T. Hawley, PhD, MPH<sup>4</sup>; Mousumi Banerjee, PhD<sup>1,5</sup>; Kevin C. Ward, PhD, MPH<sup>6</sup>; Ikuko Kato, PhD<sup>7,8</sup>; and Arden M. Morris, MD, MPH<sup>1,2,4</sup>

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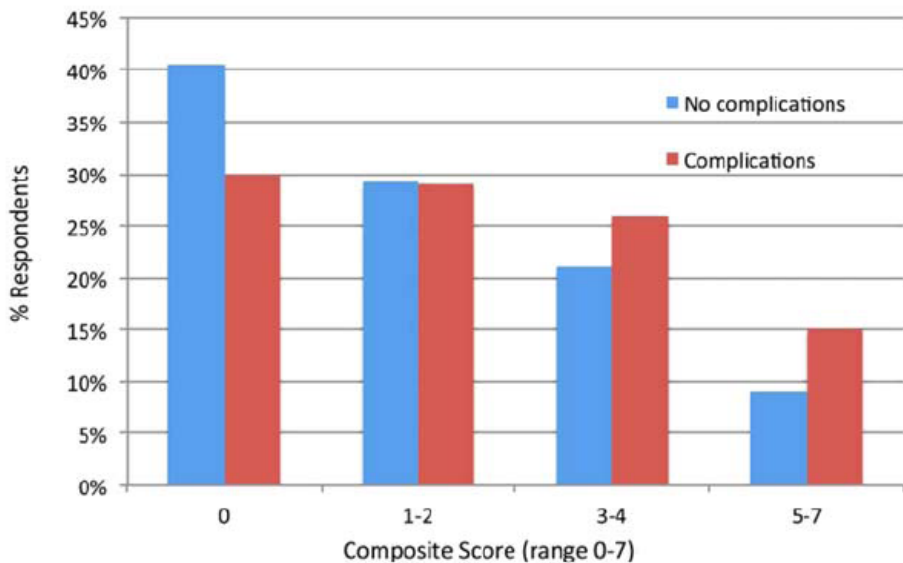
	No. of Patients (%)		
Characteristic	No Complications, N = 713 (76)	Complications, N = 224 (24)	<i>P</i> <sup>a</sup>

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# Colorectal Cancer: Impact

## The Personal Financial Burden of Complications After Surgery



Hawley, PhD, MPH<sup>4</sup>; Mousumi Banerjee, PhD<sup>1,5</sup>;  
Arden M. Morris, MD, MPH<sup>1,2,4</sup>

ts (%)

Complications,  
N = 224 (24) *P*<sup>a</sup>

**Figure 2.** Financial burden scores are illustrated according to reported postoperative complications. Patients who reported complications had significantly higher composite financial burden scores ( $P < .001$  for trend) and were less likely to report none of the elements of financial burden.

# Colorectal Cancer: Impact

## The Personal Financial Burden of Complications After Colorectal Cancer Surgery

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**TABLE 2.** Association of Reported Complications With Financial Burden and Worry

Survey Item	No Complications, N = 713 (76%)	Complications, N = 224 (26%)	<i>P</i> <sup>a</sup>
"I had to use savings"	223 (31)	90 (40)	.01
"I had to borrow money or take out a loan"	81 (11)	41 (18)	.007
"I could not make payments on credit cards or other bills"	79 (11)	41 (18)	.005
"I cut down on spending for food and/or clothes"	191 (27)	86 (38)	.001
"I cut down on spending for health care for other family members"	34 (5)	15 (7)	.26
"I cut down on recreational activities"	237 (33)	92 (41)	.03
"I cut down on expenses in general"	336 (47)	115 (51)	.27

*Patients with complications experience significantly more personal financial burden*

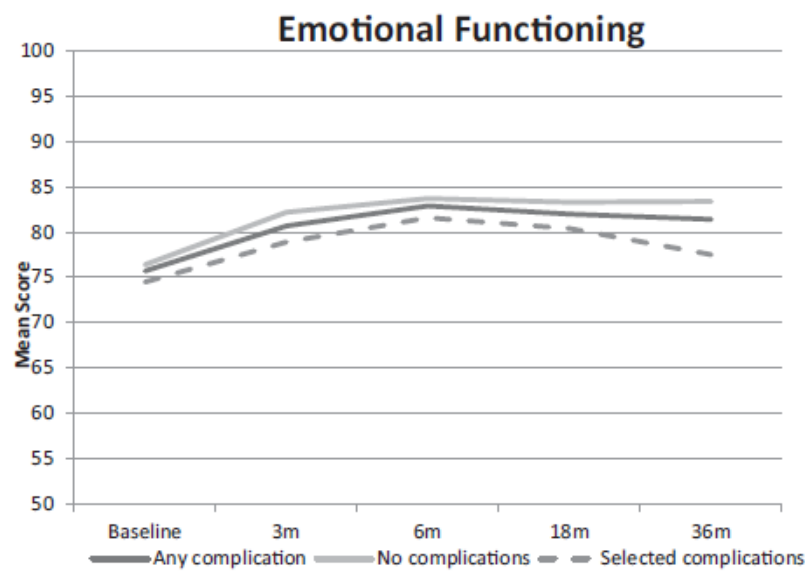
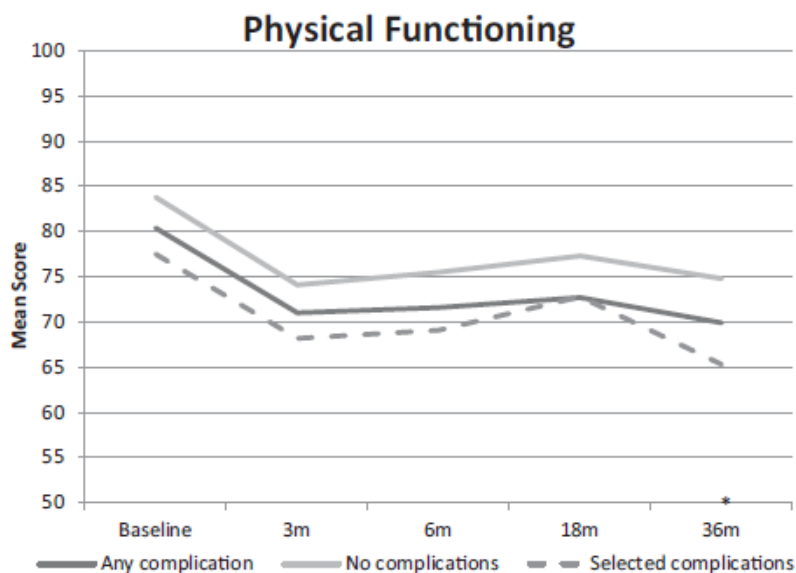


# Colorectal Cancer: Impact

## The Impact of Postoperative Complications on Long-term Quality of Life After Curative Colorectal Cancer Surgery

*Sarah R. Brown, PhD,\* Ronnie Mathew, MD,‡ Ada Keding, MSc,\* Helen C. Marshall, MSc,\* Julia M. Brown, MSc., and David G. Jayne, MD†*

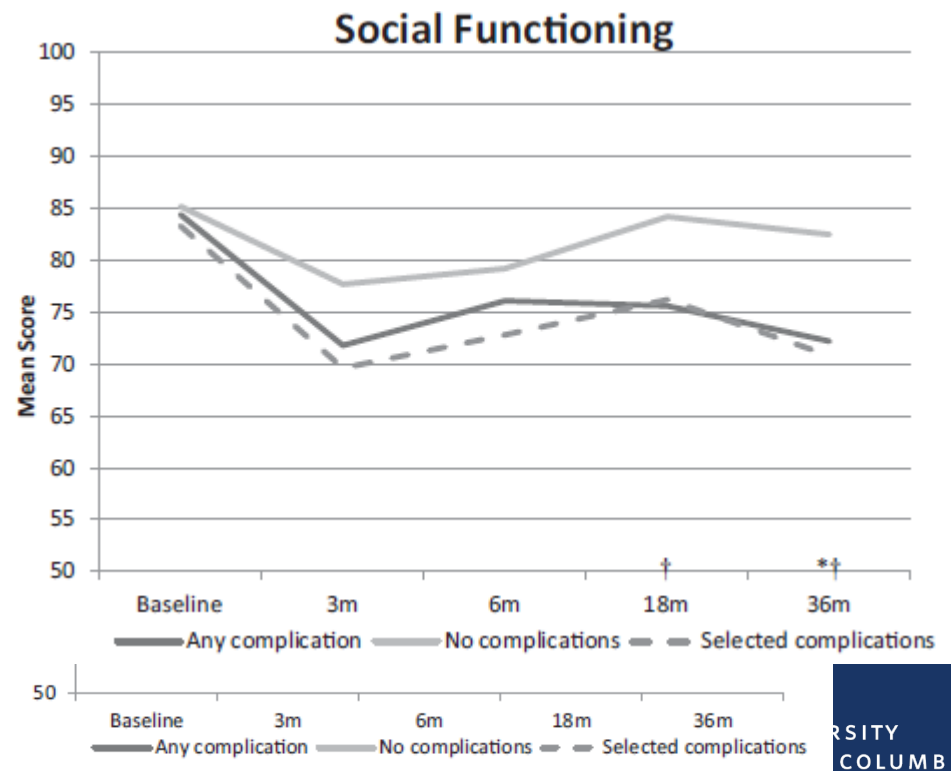
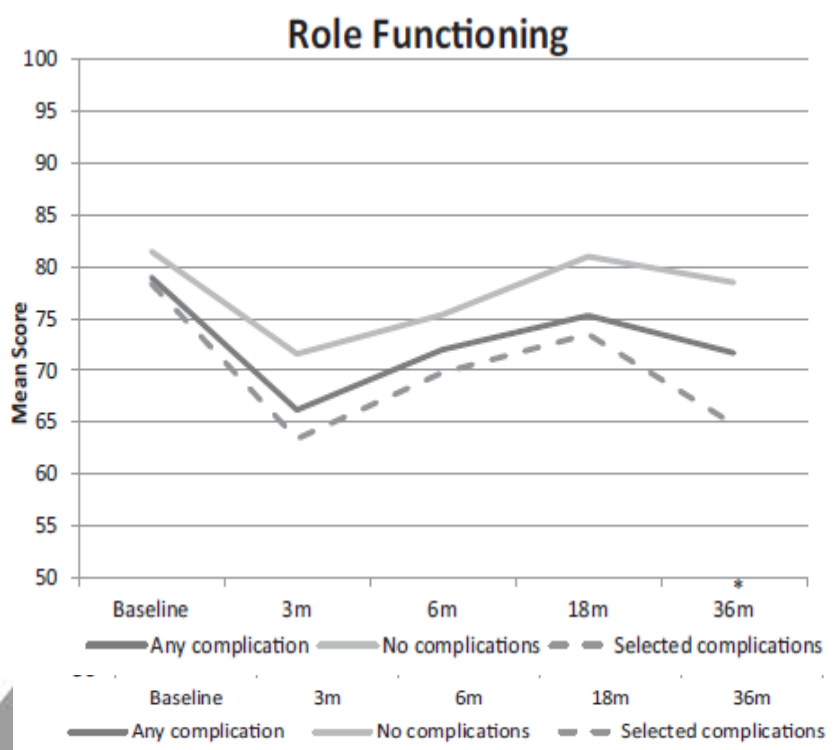
- Study based on MRC CLASICC trial



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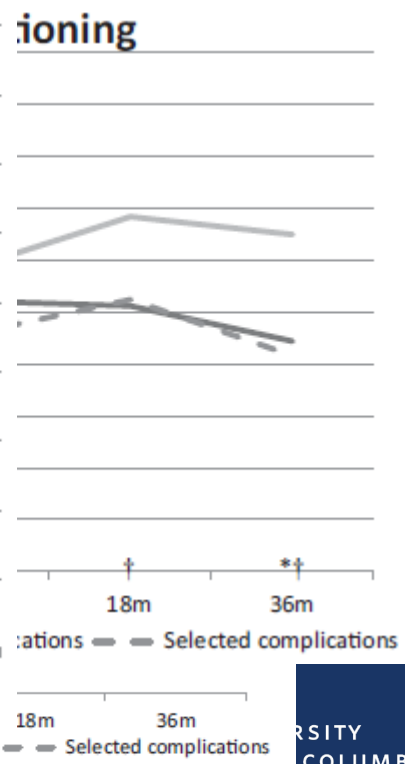
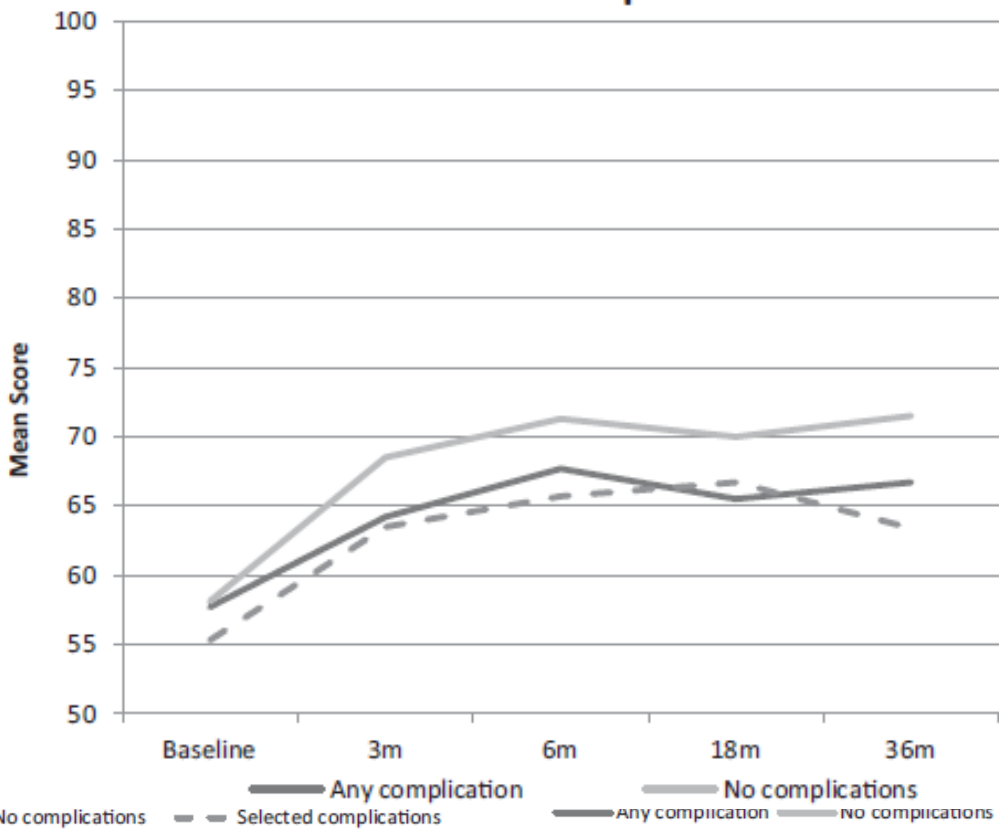
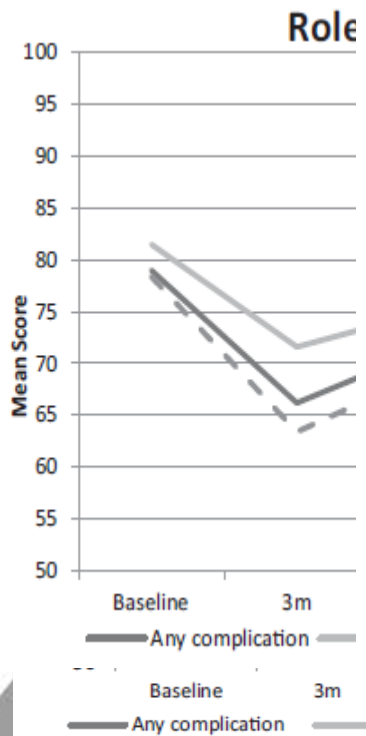
# Colorectal Cancer: Impact

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Sarah R. Brown, PhD,\*

Julia M. Brown, MSc.,

### Future Perspective



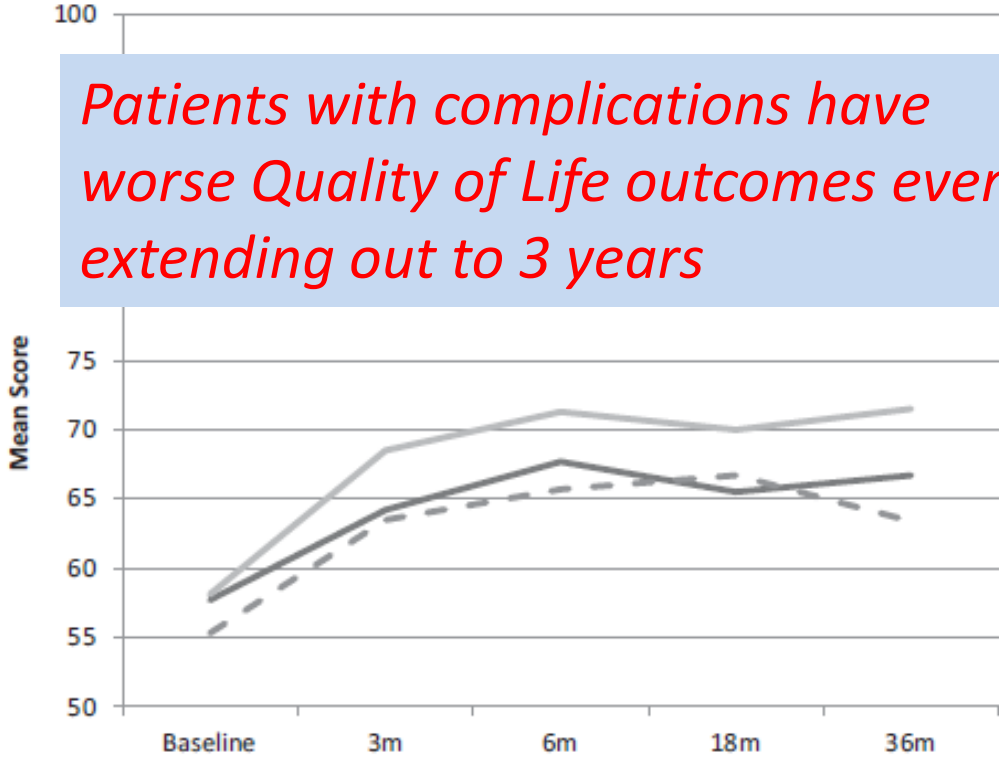
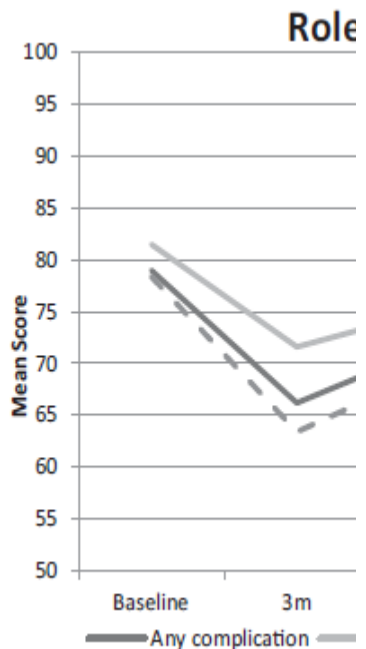
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Sarah R. Brown, PhD,\*

Julia M. Brown, MSc.,

### Future Perspective



*Patients with complications have worse Quality of Life outcomes even extending out to 3 years*



# Colorectal Cancer: Impact

- Hornbrook et al, Kaiser-Permanente, 2011
  - QoL indicators in 640 patients having undergone surgery for Colorectal Cancer
  - Even at 7 years out from surgery, early complications had one of the most significant impacts on QoL
    - More than the presence of an ostomy



# Colorectal Cancer: Impact

## Impact of postoperative complications on readmission and long-term survival in patients following surgery for colorectal cancer

Ksenija Slankamenac<sup>1,2</sup> • Maja Slankamenac<sup>1</sup> • Andrea Schlegel<sup>1</sup> • Antonio Nocito<sup>3</sup> •  
Andreas Rickenbacher<sup>1</sup> • Pierre-Alain Clavien<sup>1</sup> • Matthias Turina<sup>1</sup>

*The worse the complication,  
the worse the long term  
cancer survival*

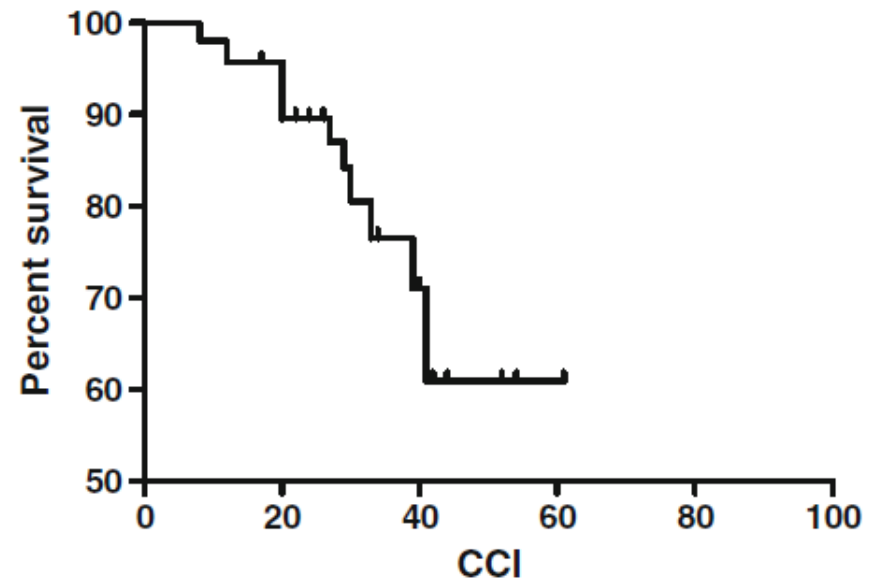


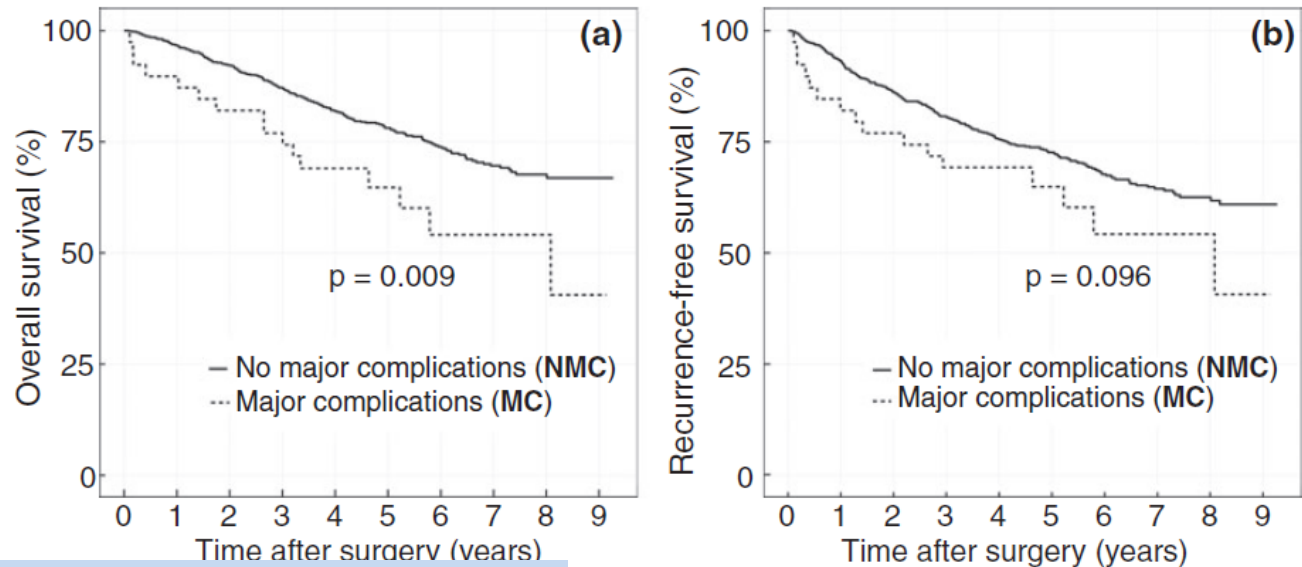
Fig. 1 Overall survival as a function of the comprehensive complication index (CCI)

# Colorectal Cancer: Impact

Major postoperative complications following elective resection for colorectal cancer decrease long-term survival but not the time to recurrence

M. Odermatt\*, D. Miskovic\*, K. Flashman†, J. Khan\*, A. Senapati†, D. O'Leary†, M. Thompson† and A. Parvaiz\*

\*Minimally Invasive Colorectal Unit, Queen Alexandra Hospital, Portsmouth, UK and †Colorectal Department, Queen Alexandra Hospital, Portsmouth, UK



*Recurrences occur at a similar interval, but have a worse prognosis*

# Colorectal Cancer: Impact

## Infectious Postoperative Complications Decrease Long-term Survival in Patients Undergoing Curative Surgery for Colorectal Cancer

*A Study of 12,075 Patients*

*Avo Artinyan, MD, MS,\*† Sonia T. Orcutt, MD,† Daniel A. Anaya, MD,\*†‡ Peter Richardson, PhD,‡§  
G. John Chen, MD, PhD, MPH,‡§ and David H. Berger, MD, MHCM\*†‡*

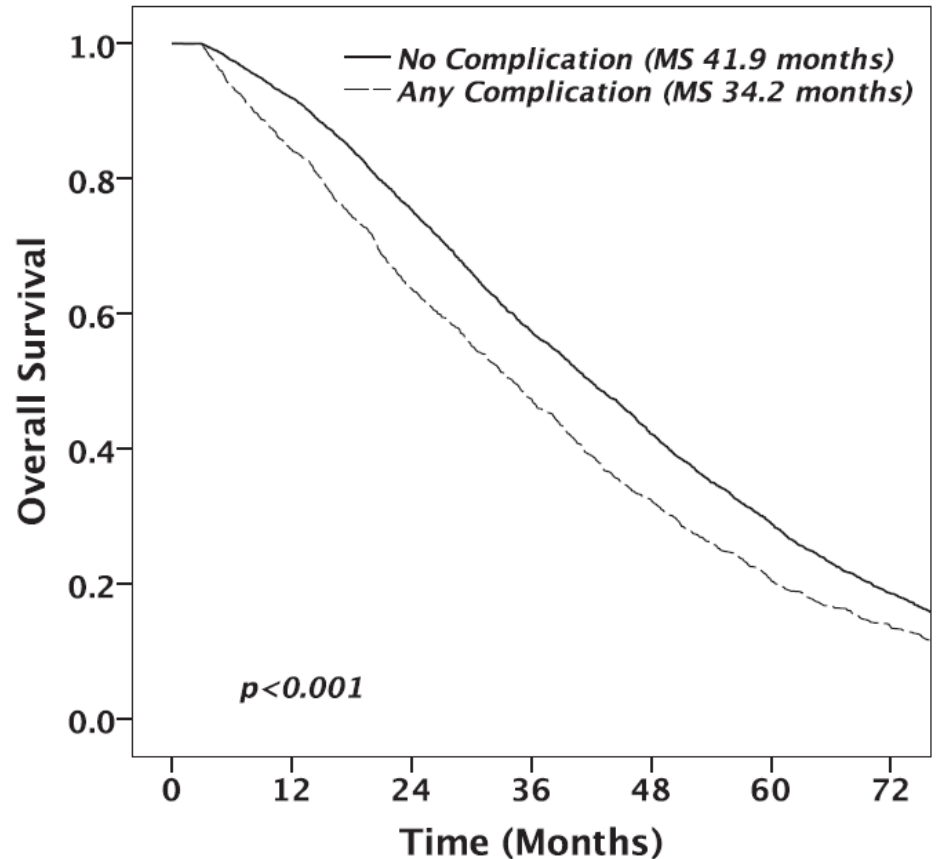


# Colorectal Cancer: Impact

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A Study of

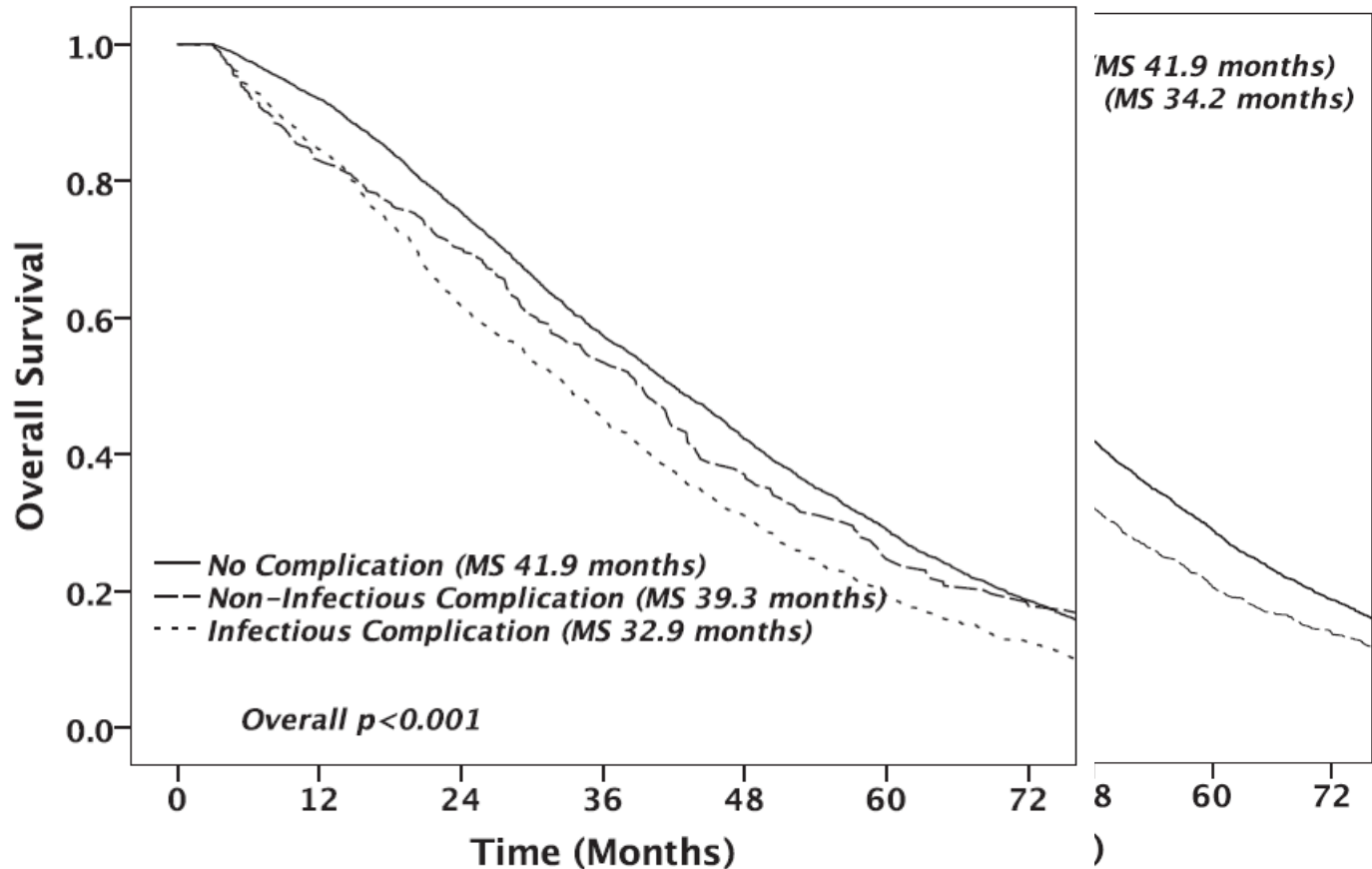
Avo Artinyan, MD, MS,\*† Sonia T. Orcutt, MD,†  
G. John Chen, MD, PhD, MPH,‡§



# Colorectal Cancer: Impact

Infectious Postoperative Complications Decrease Long-term Survival in Patients Undergoing Curative Surgery for Colorectal

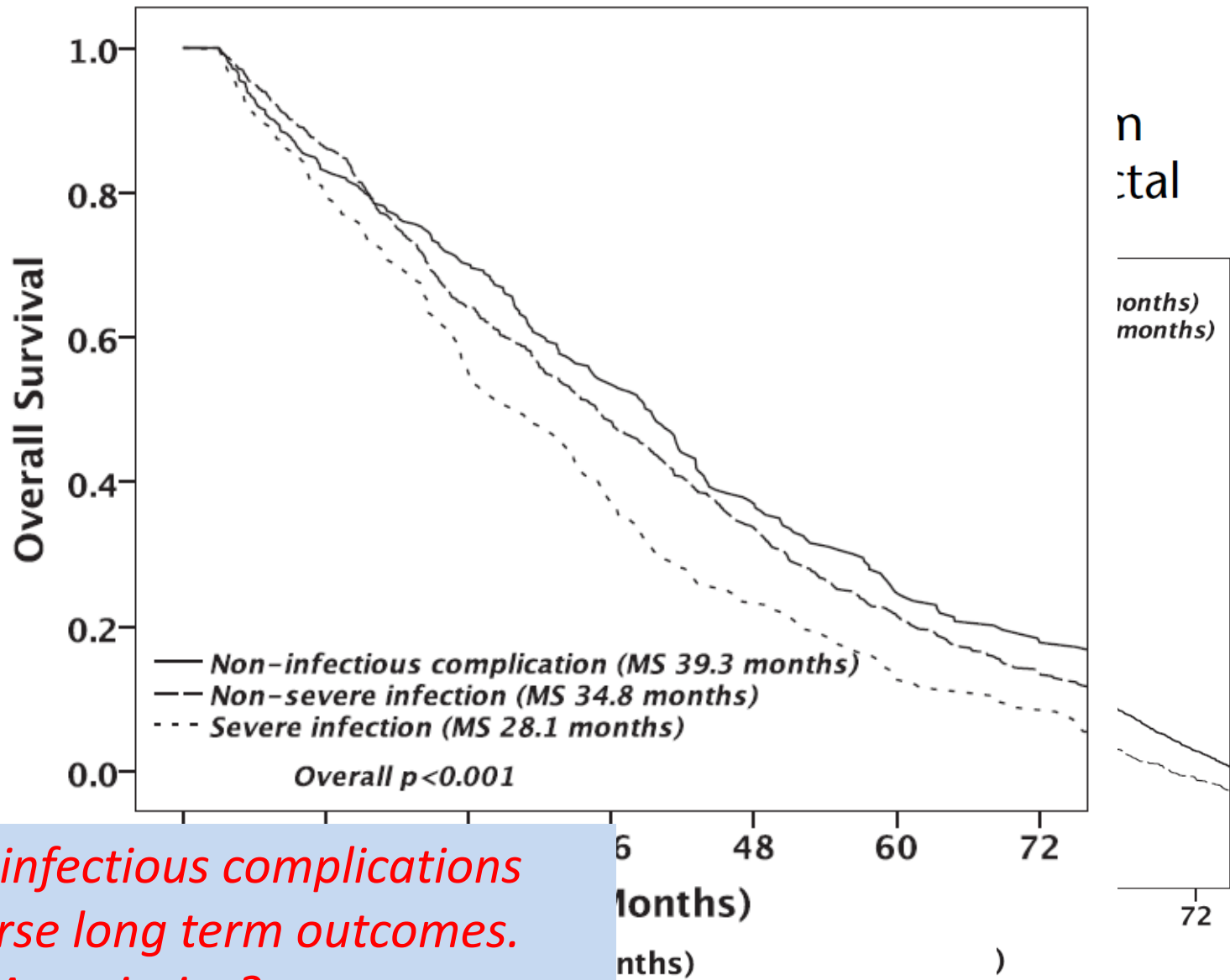
*Avo Artinyan, MD  
G.*



# Colorectal Cancer: Impact

Infection  
Survival in

*Avo Artiny*



*Even minor infectious complications indicate worse long term outcomes. Causative? Associative?*

# Colorectal Cancer: Impact

## Anastomotic Leak Is Not Associated With Oncologic Outcome in Patients Undergoing Low Anterior Resection for Rectal Cancer

*James D. Smith, MD, Philip B. Paty, MD, José G. Guillem, MD, Larissa K. Temple, MD, Martin R. Weiser, MD, and Garrett M. Nash, MD*

	<b>Tumor Recurrence, HR (95% CI)</b>	<b>Local Recurrence, HR (95% CI)</b>	<b>Disease-Specific Survival, HR (95% CI)</b>	<b>Overall Survival, HR (95% CI)</b>
Anastomotic leak	2.32 (0.74–7.28)	1.19 (0.29–4.93)	1.71 (0.42–6.91)	0.89 (0.46–1.75)
Distance from anal verge (cm)	1.01 (0.95–1.07)	0.98 (0.88–1.10)	0.99 (0.92–1.06)	1.02 (0.97–1.07)





# Colorectal Cancer: Impact

## Oncological outcome following anastomotic leak in rectal surgery

E. Espín<sup>1</sup>, M. A. Ciga<sup>3</sup>, M. Pera<sup>2</sup> and H. Ortiz<sup>4</sup> on behalf of the Spanish Rectal Cancer Project

This study showed that the development of AL after sphincter-saving surgery for rectal cancer did not affect the risk of local recurrence, overall recurrence, overall survival or cancer-specific survival. However, the presence of an AL was significantly associated with a higher postoperative mortality rate and need for reoperation. Although



# Colorectal Cancer: Complications

- Hendren et al (2010, DCR)
  - SEER Database review
  - 17,108 patients with stage 3 CRC
    - Median age 75
    - 18% of patients had a complication
    - Only 54% of patients with complications had chemotherapy vs 70% ( $p < 0.0001$ ) OR 1.76 (1.59-1.95)
    - Complications: OR 2.04 for initiation of ChT > 8 weeks after surgery



# Colorectal Cancer: Complications

- Des Guetz et al. (EJ Cancer, 2010)
  - Meta analysis
  - 13,158 patients
  - > 8 week delay of CT
    - Decreases OS (RR 1.2 (1.15-1.26))



# Colorectal Cancer: Complications

- Cheung et al. (DCR, 2009)
  - SEER database
  - Stage 2/3 Rectal Cancer
  - Median Interval of Surgery to ChT: 42 days
  - 12% of patients waited > 3 or more months
  - Median OS worse in those who waited > 12 weeks (54 vs 76 months,  $p < 0.01$ )
  - Post-operative Hospital stay single most important predictor of delay
    - (Age, Black)



# Colorectal Cancer: Complications

- Bayraktar et al, U of Miami, 2010
  - Chemotherapy started after 60 days post-op in 26% of patients
  - 70% due to post-operative issues, 30% due to administrative issues
  - OR 2.07 of decreased Overall Survival
- Lima et al, U of Alberta, 2011
  - 1053 patients
  - Stage 3 colon cancer
  - 40% started treatment after 4 months from surgery
  - Those who started chemotherapy after 3 months, had a 2.1 OR towards decreased Overall Survival



# Colorectal Cancer: Complications

## **Surgical complications and their implications for surgeons' well-being**

**A. Pinto, O. Faiz, C. Bicknell and C. Vincent**

Division of Surgery, Department of Surgery and Cancer, St Mary's Campus, Imperial College London, Norfolk Place, London W2 1PG, UK

*Correspondence to:* Dr A. Pinto (e-mail: [a.pinto@imperial.ac.uk](mailto:a.pinto@imperial.ac.uk))

## Collateral damage: The effect of patient complications on the surgeon's psyche

**Amit M. Patel, MD, Nichole K. Ingalls, MD, M. Ashraf Mansour, MD, Stanley Sherman, MD, Alan T. Davis, PhD, and Mathew H. Chung, MD, Grand Rapids, MI**



# Colorectal Cancer: Complications

## Surgical complications and their implications for surgeons' well-being

A. Pinto, O. Faiz, C. Bicknell

Division of Surgery, Department of Surgery

Correspondence to: Dr A. Pinto (e-mail: a.pinto@ubc.ca)

*60% felt it was difficult to handle emotional impact of complications*

*Complications can impact functioning for upto 3 weeks*

*70% of surgeons attribute complications to their own errors*

Collaborative  
patient  
psychology

G, UK

eon's

Amit M. Patel, MD, Nichole K. Ingalls, MD, M. Ashraf Mansour, MD, Stanley Sherman, MD, Alan T. Davis, PhD, and Mathew H. Chung, MD, Grand Rapids, MI



# Colorectal Cancer: Complications

- Complications Happen
  - 20-30% of patients
- Complications Matter
  - Costs
    - Financial, Oncological and Patient Recovery
- Complications can be Prevented





# Colorectal Cancer: Measurement



- Born from the VA Surgical Quality Improvement Program
- Non VA Hospitals brought on in 2005
- Now a Global Program
  - United States
  - Canada
  - Mexico
  - Saudi Arabia





- Data collected directly from patient charts
- Trained Surgical Clinical Reviewers/Abstracters
  - Specifically trained
  - Routinely audited
  - > 99% collection agreement rate





- ~ 135 variables
  - Demographics
  - Comorbidities
    - Risk stratification
  - Operative Information
  - 30 day outcomes
- Usually 1 in 5 case sampling





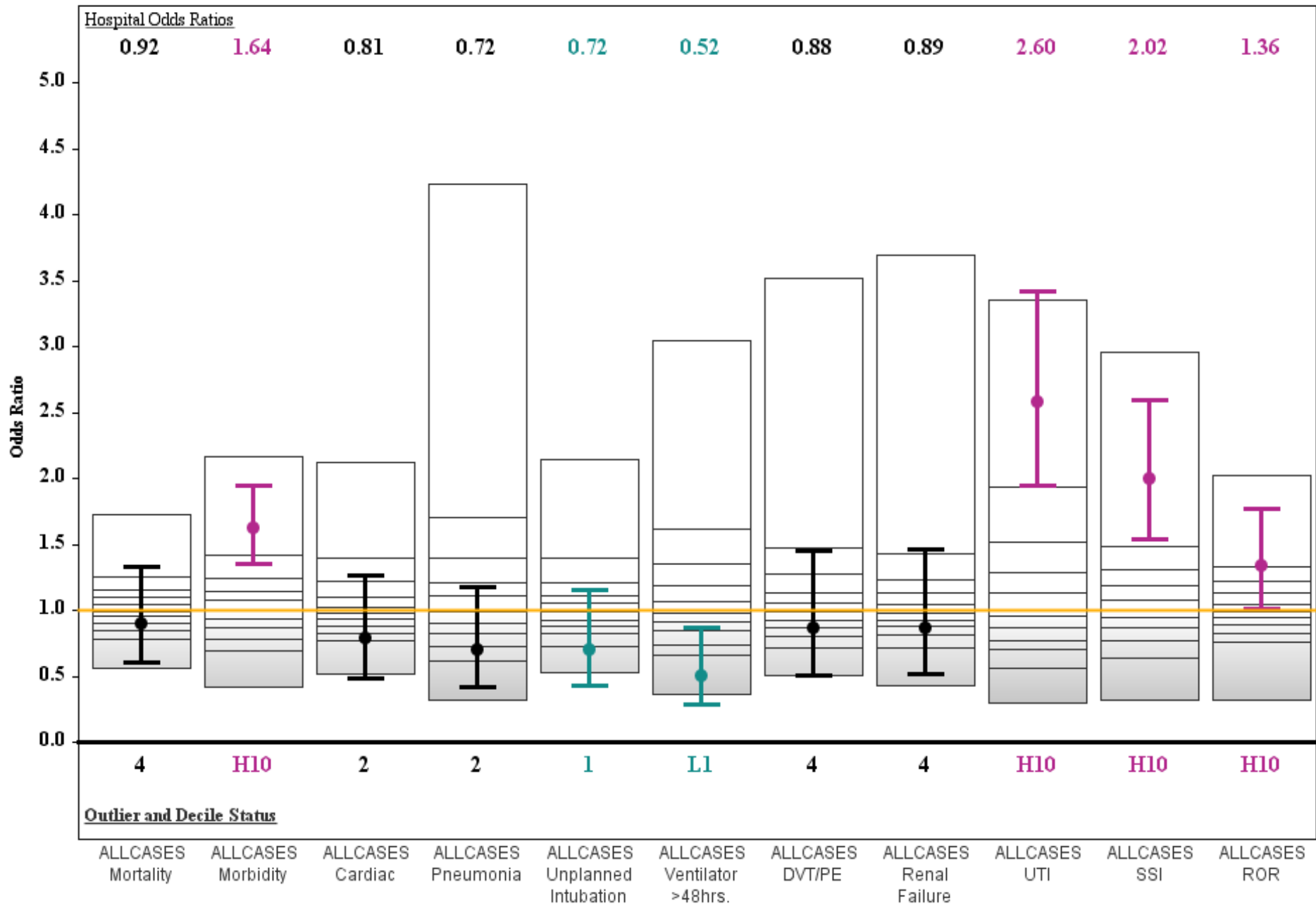
- NSQIP reports data back to hospitals.
- Hospitals act on their data.
- Hospitals monitor their interventions with ongoing data.



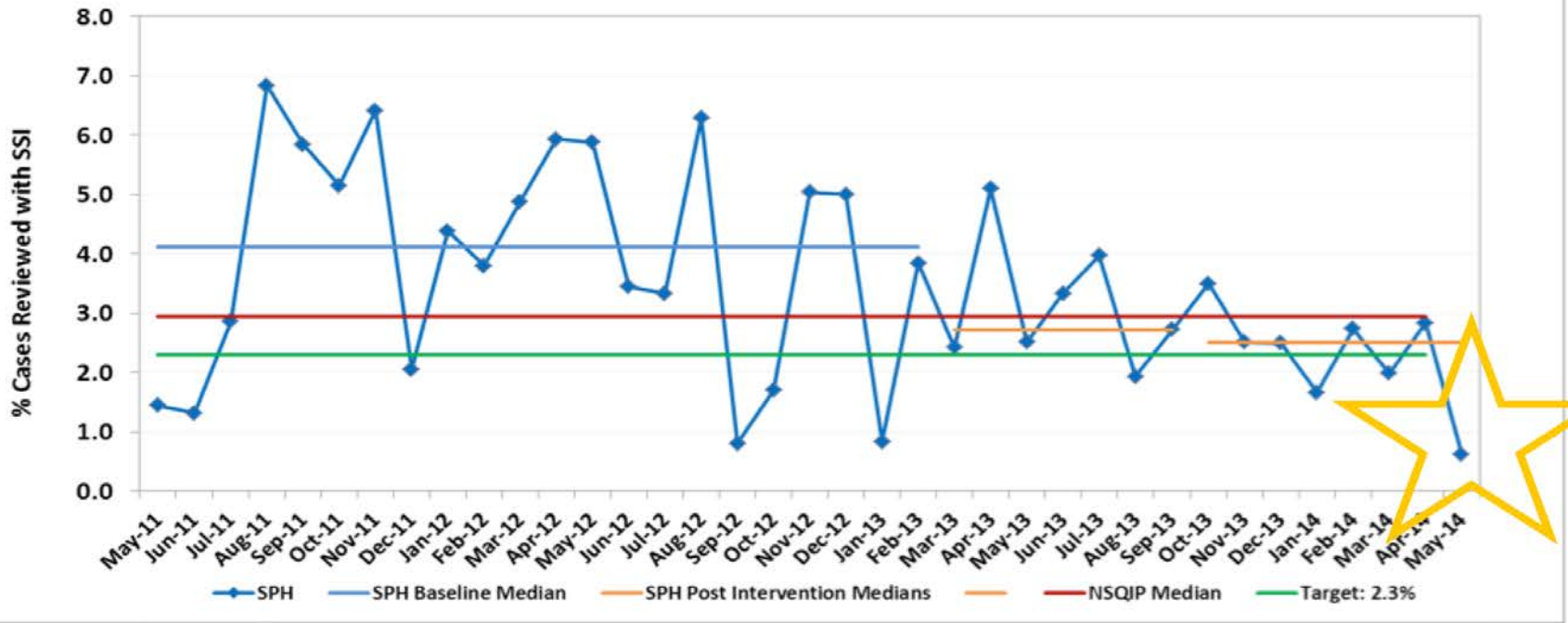


- Identify areas for quality improvement.
- Improve patient care and outcomes.
- Decrease institutional healthcare costs





### SPH Surgical Site Infection Unadjusted NSQIP Data



# NSQIP: Does it work?

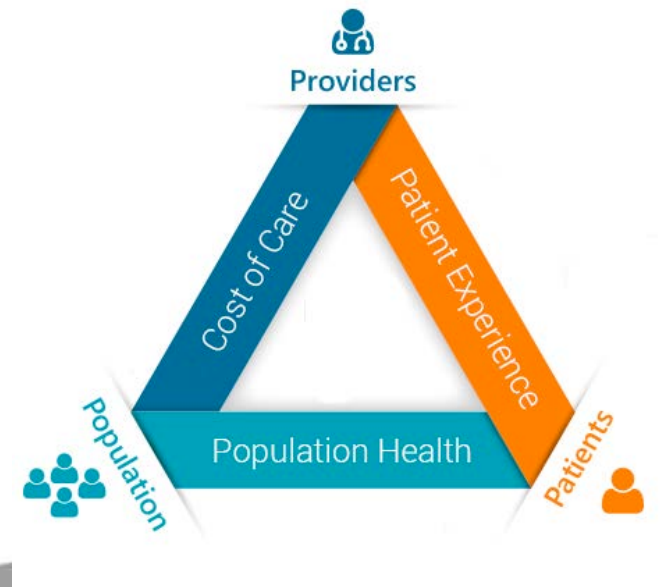
- Change in data management routines
- Hiring of new staff
  - Specific training
- > 150k per site enrolled
  
- Does it work?





# NSQIP: Does it work?

- Does it work?
  - Improve clinical outcomes
  - Change practice if needed
  - Cost effective

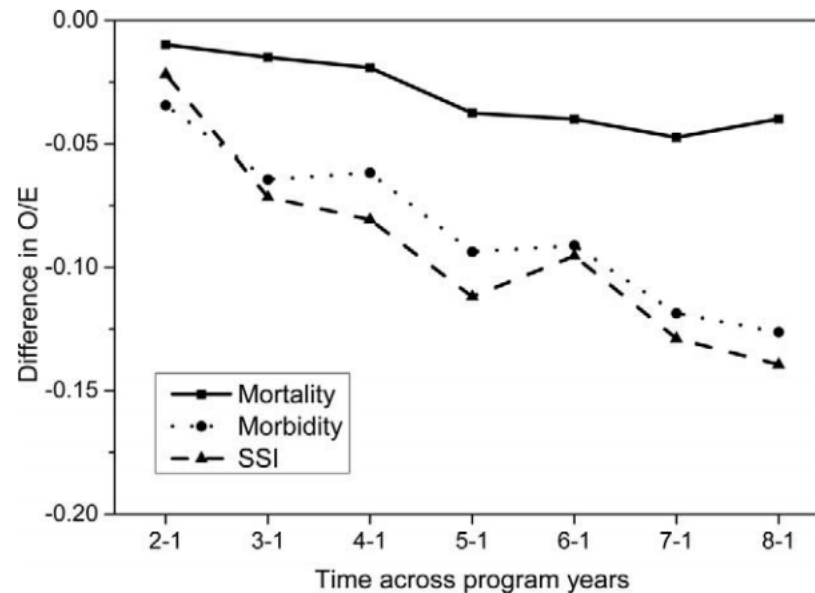


# NSQIP: Does it work?

## Improved Surgical Outcomes for ACS NSQIP Hospitals Over Time

*Evaluation of Hospital Cohorts With up to 8 Years of Participation*

*Mark E. Cohen, PhD,\* Yaoming Liu, PhD,\* Clifford Y. Ko, MD, MS, MSHS, FACS,\*†‡  
and Bruce L. Hall, MD, PhD, MBA, FACS\*§||¶*



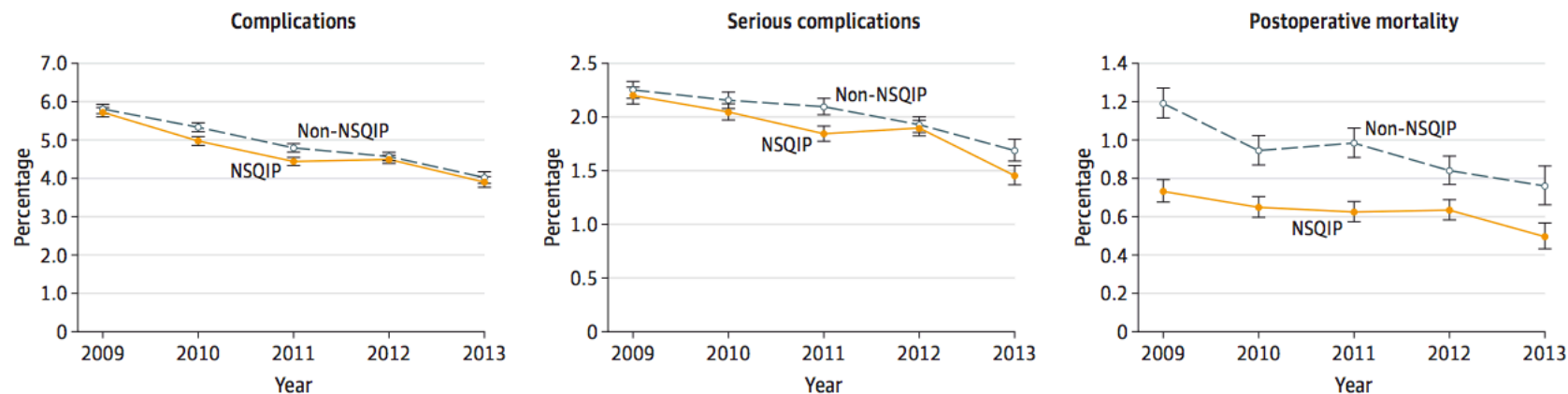
# NSQIP: Does it work?

## Original Investigation

### Association of Hospital Participation in a Surgical Outcomes Monitoring Program With Inpatient Complications and Mortality

David A. Etzioni, MD, MSHS; Nabil Wasif, MD, MPH; Amylou C. Dueck, PhD; Robert R. Cima, MD; Samuel F. Hohmann, PhD; James M. Naessens, ScD; Amit K. Mathur, MD, MS; Elizabeth B. Habermann, PhD, MPH

Figure 2. Adjusted Rates of Complications, Serious Complications, and Mortality by Hospital NSQIP Participation and Year



NSQIP, National Surgical Quality Improvement Program. Error bars indicate 95% CIs. Adjusted for patient comorbidity, operation type, age, and sex.

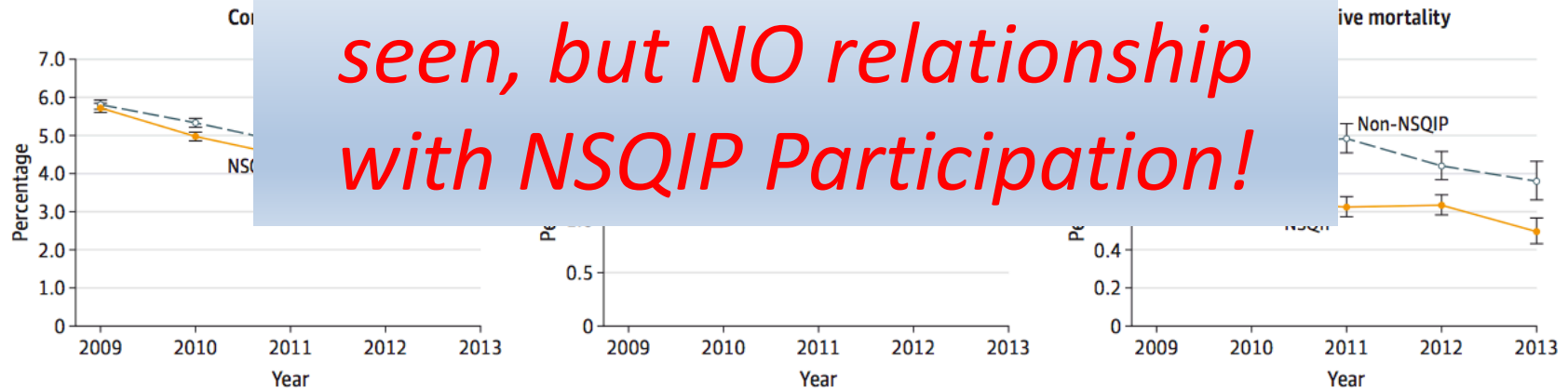
# NSQIP: Does it work?

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Figure 2. Adjusted Rate



NSQIP, National Surgical Quality Improvement Program. Error bars indicate 95% CIs. Adjusted for patient comorbidity, operation type, age, and sex.

# NSQIP: Does it work?

RESEARCH ARTICLE

## Change in Adverse Events After Enrollment in the National Surgical Quality Improvement Program: A Systematic Review and Meta-Analysis

**Joshua Montroy<sup>1</sup>, Rodney H. Breau<sup>1,3,4\*</sup>, Sonya Cnossen<sup>1</sup>, Kelsey Witiuk<sup>1</sup>, Andrew Binette<sup>2</sup>, Taylor Ferrier<sup>2</sup>, Luke T. Lavallée<sup>4</sup>, Dean A. Fergusson<sup>1,3</sup>, David Schramm<sup>1,3,5</sup>**



# NSQIP: Does it work?

RESEARCH ARTICLE

## Change in Adverse Events After Enrollment in the National Surgical Quality Improvement Program: A Systematic Review and Meta-Analysis

Joshua Montroy<sup>1</sup>, Rodney H. Breau<sup>1,3,4\*</sup>, Sonya Cnossen<sup>1</sup>, Kelsey Witiuk<sup>1</sup>, Andrew Binette<sup>2</sup>, Taylor Ferrier<sup>2</sup>, Luke T. Lavallée<sup>4</sup>, Dean A. Fergusson<sup>1,3</sup>, David Schramm<sup>1,3,5</sup>

*Focused on Intervention vs  
Passive Observation*



# NSQIP: Does it work?

RESEARCH /

Change  
the No  
Progr  
Analy

Joshua Mor  
Andrew Bin  
David Schra

Study name

Risk ratio and 95% CI

No Intervention

Guillamondegui, 2012

Pooled estimate

Intervention

Bliss, 2012

Ceppa, 2013

Cima, 2013

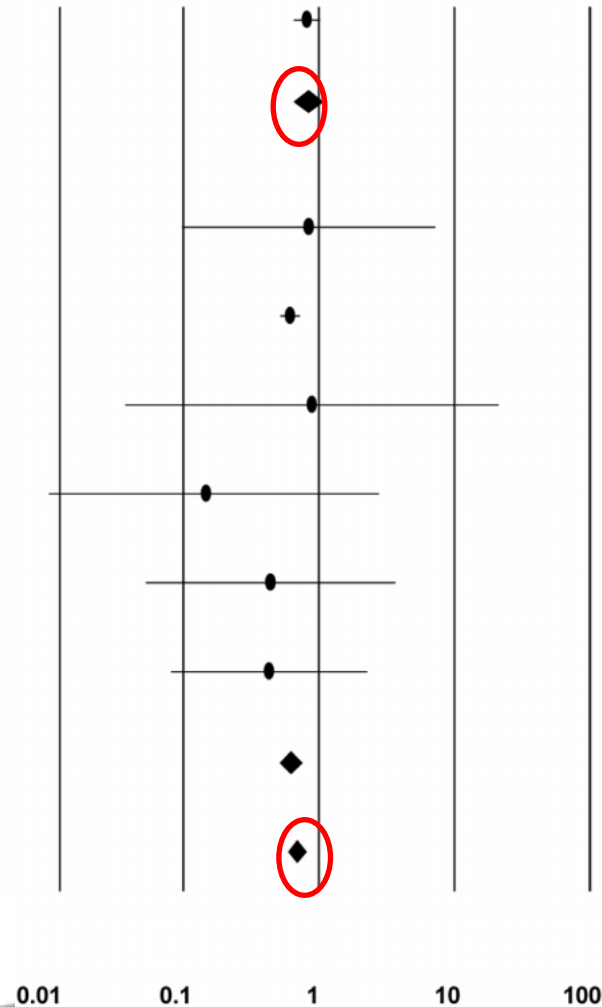
Compoginis, 2011

Lutfiyya, 2012

Wick, 2012

Pooled estimate

Overall pooled estimate



ent in  
ent  
1-

*Data is important, but its what you do with it*



# NSQIP: Does it work?

## Quality improvement in gastrointestinal surgical oncology with American College of Surgeons National Surgical Quality Improvement Program

Donald J. Lucas, MD, MPH,<sup>a</sup> and Timothy M. Pawlik, MD, MPH, PhD,<sup>b</sup> *Bethesda and Baltimore, MD*



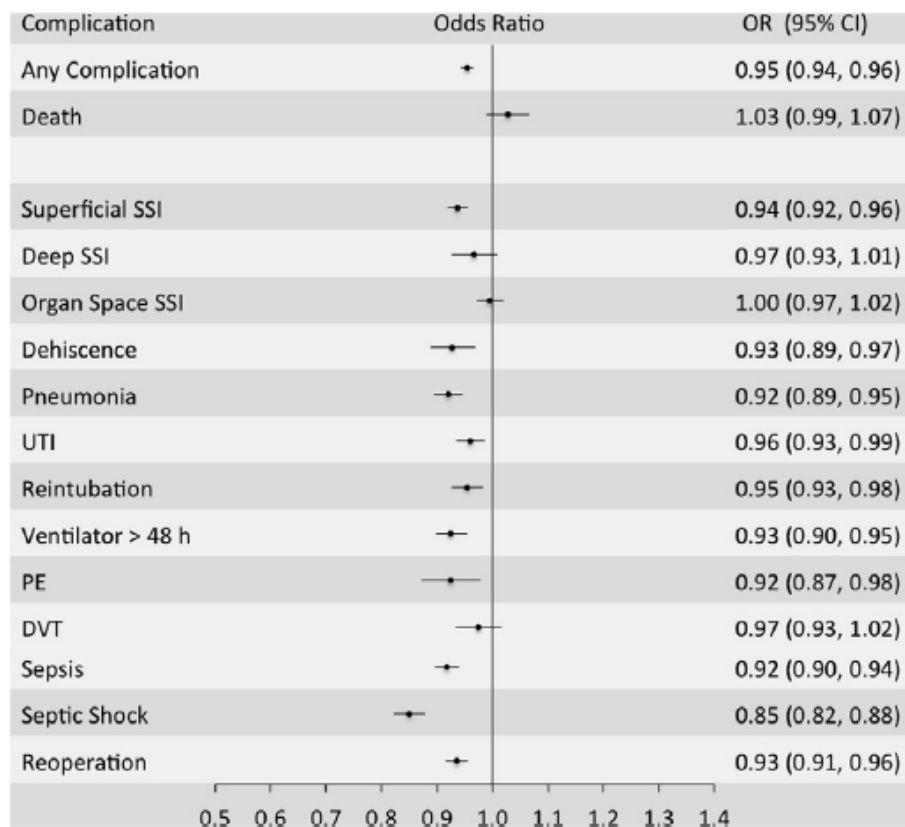


# NSQIP: Does it work?

## Quality improvement in gastrointestinal surgical oncology with American College of Surgeons

### National Surgical Quality Improvement Program

Donald J. Lucas, MD, MPH,<sup>a</sup> and Timothy M. Pawli



# NSQIP: Does it work?

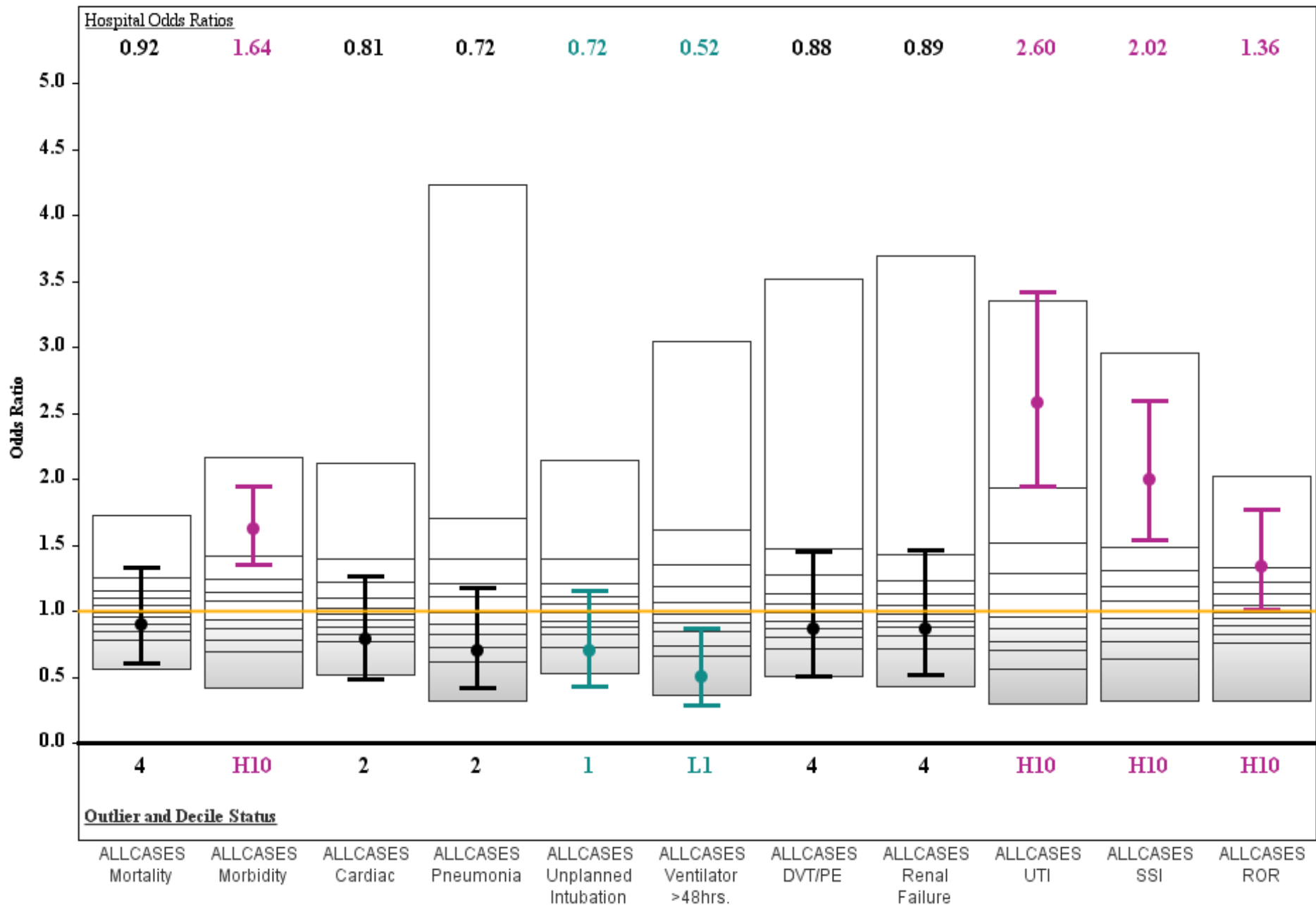
- Cost effective?
  - Short answer: We don't know.
  - Cost per adverse event is \$12000 in Canada
    - 10-15 fewer adverse events pays for investment
  - If adverse events decrease, cost avoidance could be seen
  - Guillamondequi et al (2008-2010):
    - 2 million USD per 10,000 General Surgery cases
  - Unanswered question



# NSQIP: How was it used at St Paul's?

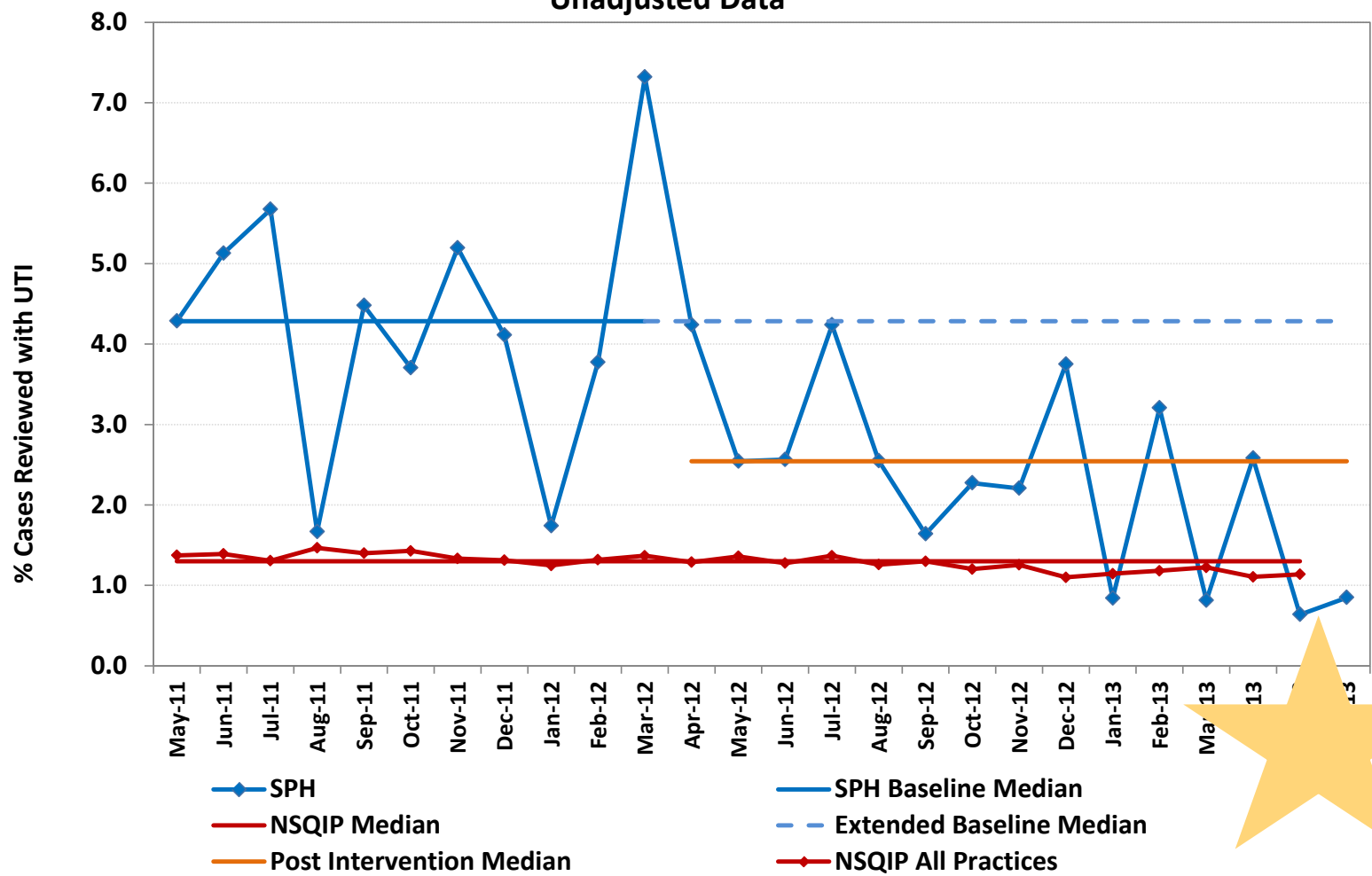
- St Paul's Hospital
  - Urban, downtown hospital
  - Mission to serve the downtown East side population
  - Quaternary Care/Provincial Referral site for:
    - HIV, Renal Diseases
    - Heart and Lung
    - Hematological Problems
    - Colorectal Surgery





# NSQIP: St Paul's and UTIs

Urinary Tract Infection  
SPH vs All NSQIP  
Unadjusted Data



# NSQIP: St Paul's and UTIs

- What are we doing for Catheters?
  - Colon Cases (non-pelvic dissection)
    - Catheters are not placed, or removed in the OR
    - If left in, standing order for catheters to be removed on POD 1



# NSQIP: St Paul's and UTIs

- What are we doing for Catheters?
  - Rectal cases (Pelvic dissection)
    - Standing order for catheters to be removed on POD 2

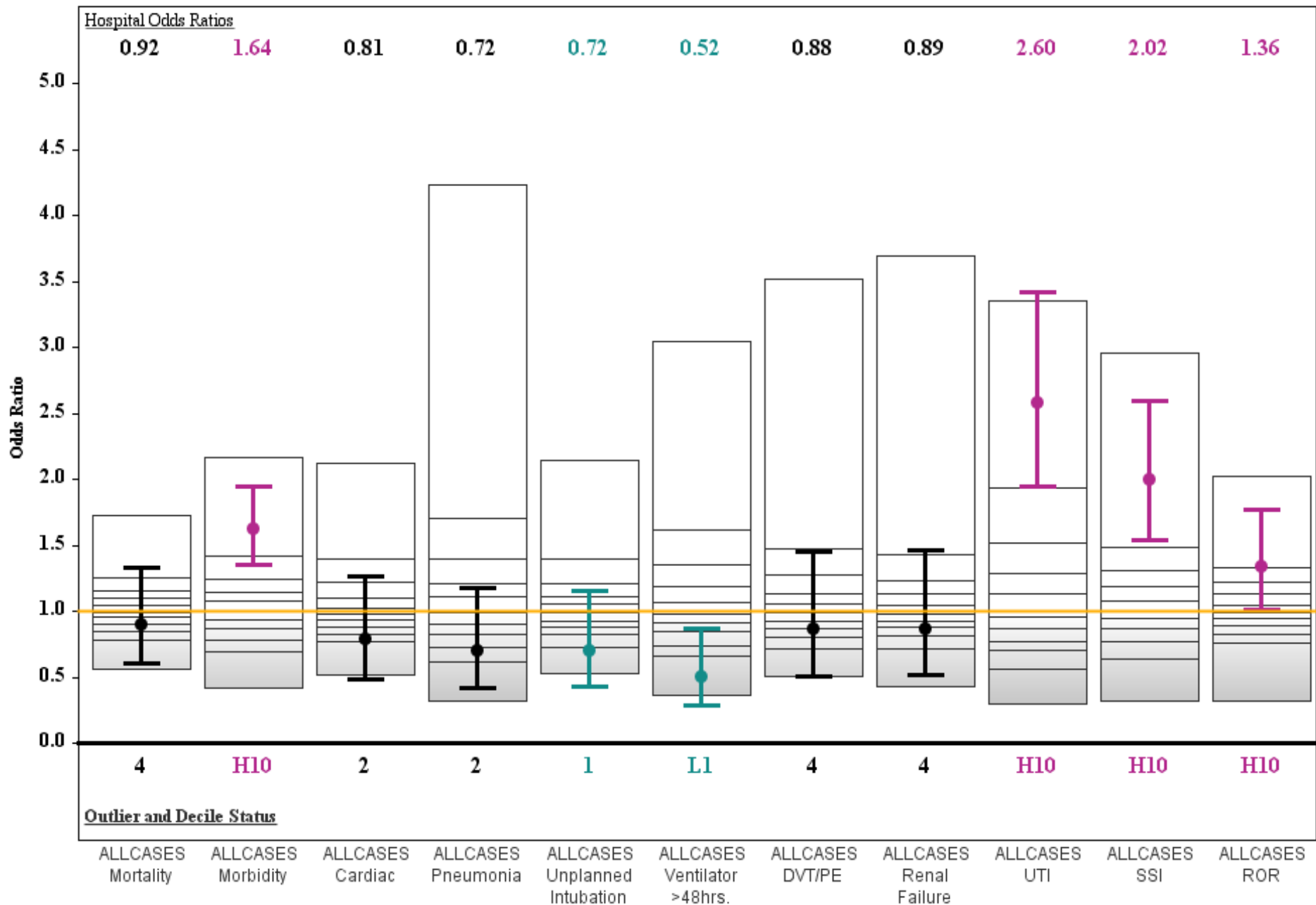


# NSQIP: St Paul's and UTIs

- Since 2016
  - Tamsulosin (Flomax) starting on pre Op Day 3 till discharge
  - Men, > 50
- In early days, no impact on change in UR rates, but still trying!







# NSQIP: St Paul's and SSIs

## Multiple impact points

- Surgical offices
- Pre Admission Clinic
- Pre-op Int Medicine consultations
- Check in at Day Care
- Anesthetic Induction
- Intra-operative
- Recovery Room
- Ward

Reduce SSI rates\*\*\*



### PHC Colorectal Surgery FOCUS SSI Reduction Care Bundle Focused Opportunities of Care Utilizing Standards of care

#### Pre-operative FOCUS

1. Smoking cessation
  - Quit Now Package (Handout from surgeon office/OPD Clinic)
2. Pre-operative antiseptic cleanse
  - SAGE Wipes or chlorhexidine scrub
3. Pre-operative glucose control\*\*
4. Pre-operative Oral Antibiotics\*\*

#### Surgical Daycare / Pre-OP FOCUS

1. Remove surgical site hair with clippers at time of marking patient
  - Clippers in daycare and pre-OP areas
2. Pre-operative warming initiated
  - Warm blankets
  - In patients with warmers
3. Antibiotic **START**
  - S** - Selection
  - T** - Timing
  - A** - Administration Dose
  - R** - Re-dosing
  - T** - Termination post-operatively

#### Intra-operative FOCUS

1. Antibiotic **START**
  - S** - Selection
  - T** - Timing
  - A** - Administration Dose
  - R** - Re-dosing
  - T** - Termination post-operatively
2. Maintain normothermia
  - Warmer on patient
  - Warm room for patient arrival
  - Room comfortable during operative time
  - Warm room on closure and patient emergence from anaesthetic



## **Surgical Site Infection Rates Following Implementation of a Colorectal Closure Bundle in Elective Colorectal Surgeries**

Amandeep Ghuman, M.D.<sup>1</sup> • Tiffany Chan, M.D.<sup>1</sup>

Ahmer A. Karimuddin, M.D., F.R.C.S.C.<sup>2</sup>

Carl J. Brown, M.D., F.R.C.S.C.<sup>2</sup> • Manoj J. Raval, M.D., F.R.C.S.C.<sup>2</sup>

P. Terry Phang, M.D., F.R.C.S.C.<sup>2</sup>



# NSQIP: St Paul's and SSIs

## Surgical Site Infection Rates Following Implementation of a Colorectal Closure Bundle in Elective Colorectal Surgeries

**TABLE 2.** Surgical site infection rates

	<i>Preintervention</i>	<i>Postintervention</i>	<i>p</i>
	<i>(n = 111)</i>	<i>(n = 94)</i>	
A A C P Overall SSI, % (absolute)	25.2 (28)	26.6 (25)	0.82
Superficial, % (absolute)	14.4 (16)	14.9 (14)	0.92
Deep and organ space, % (absolute)	10.8 (12)	11.7 (11)	0.84

SSI = surgical site infection.



# NSQIP: St Paul's and SSIs



ACS  
NSQIP®

## Procedure Targeted

The ACS NSQIP Procedure Targeted option allows hospitals to collect data on more than 30 high-risk, high-cost procedures.



THE UNIVERSITY  
OF BRITISH COLUMBIA

# NSQIP: St Paul's and SSIs



## Alexis®

Wound Protectors/Retractors



360° Wound Protection  
360° Atraumatic Retraction

- Maximizes exposure, minimizes incision size
- Offers ultimate versatility

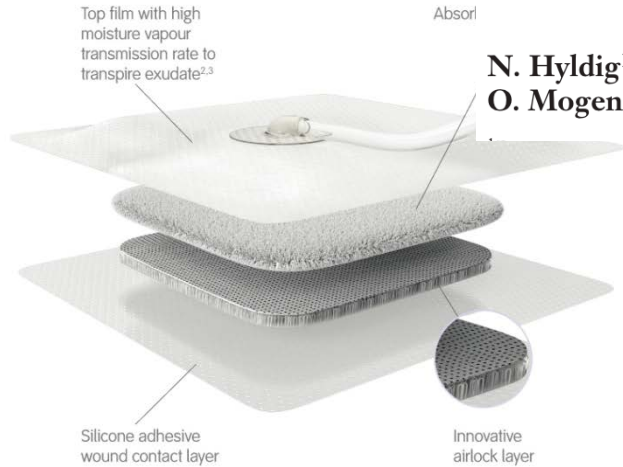
Applied  
Medical



# NSQIP: St Paul's and SSIs

## Meta-analysis of negative-pressure wound therapy for closed surgical incisions

N. Hyldig<sup>1,2</sup>, H. Birke-Sorensen<sup>4</sup>, M. Kruse<sup>3</sup>, C. Vinter<sup>2</sup>, J. S. Joergensen<sup>2</sup>, J. A. Sorensen<sup>1</sup>, O. Mogensen<sup>2</sup>, R. F. Lamont<sup>2,5</sup> and C. Bille<sup>1</sup>



*Number Needed to Treat:*

**10**



*Cost*

**\$180**



# NSQIP: St Paul's and SSIs

Alexis®

Wound Protectors/Retractors



RESEARCH ARTICLE

## Wound Edge Protectors in Open Abdominal Surgery to Reduce Surgical Site Infections: A Systematic Review and Meta-Analysis

André L. Mihaljevic<sup>1</sup>, Tara C. Müller<sup>1</sup>, Victoria Kehl<sup>2</sup>, Helmut Friess<sup>1</sup>, Jörg Kleeff<sup>1\*</sup>

<sup>1</sup> Department of Surgery, Klinikum rechts der Isar, Technische Universität München, Ismaninger Strasse 22, 81675 Munich, Germany, <sup>2</sup> Institute for Medical Statistics and Epidemiology, Klinikum rechts der Isar, Technische Universität München, Ismaninger Strasse 22, 81675 Munich, Germany

*Number Needed to Treat:*

8

*Cost*

**\$170**

360° Wound Protection  
360° Atraumatic Retraction

- Maximizes exposure, minimizes incision size
- Offers ultimate versatility



THE UNIVERSITY  
OF BRITISH COLUMBIA



# NSQIP: St Paul's and SSIs

- All patients receive Mechanical Bowel Prep and Oral Antibiotics pre-op
- All patients are given Chlorhexidine based scrubs to be used pre-operatively
- Chlorhexidine prep is used in the OR
- Alexis Wound Retractor is used for all cases (Open and MIS)
- All wounds > 5 cm have PICO dressing applied

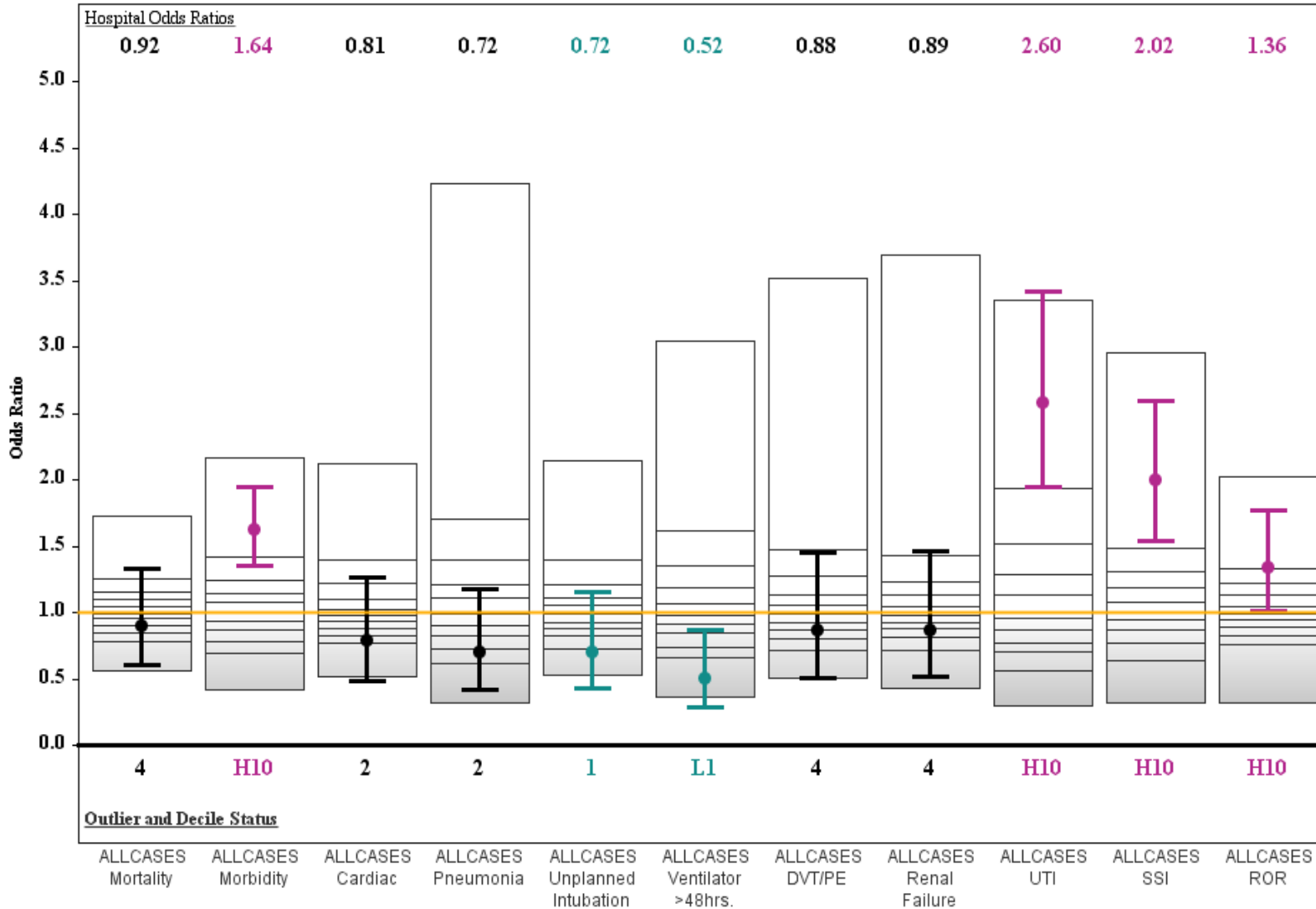


# NSQIP: St Paul's and VTE

All Cases

07/01/11 - 06/30/12

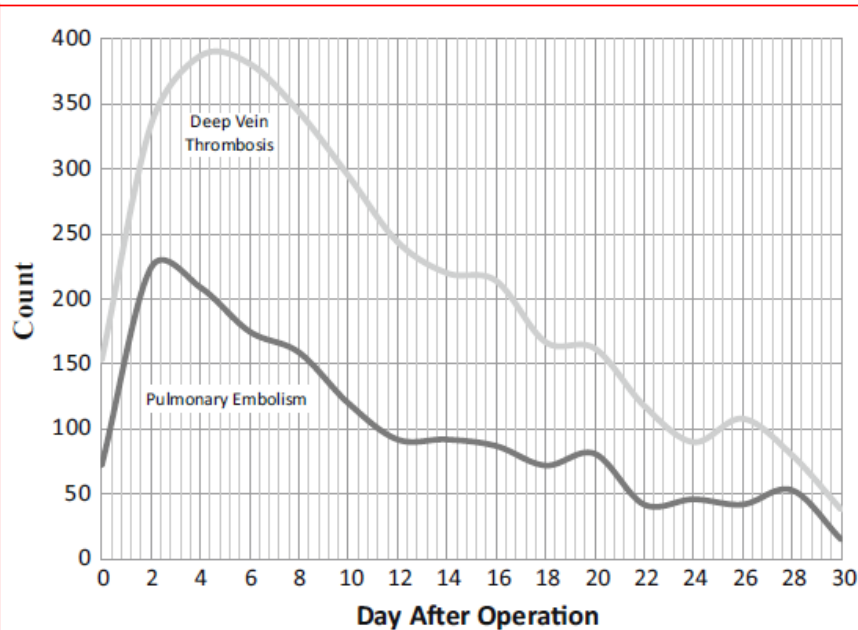
Report/Site: 5625 / 0444



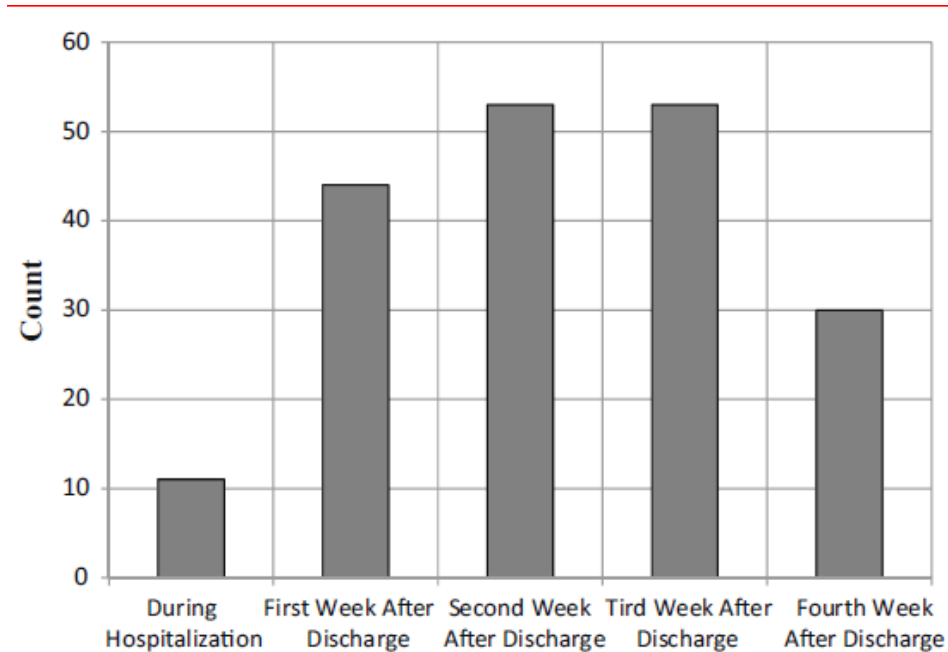
# NSQIP: St Paul's and VTE

## Post-Hospital Discharge Venous Thromboembolism in Colorectal Surgery

Zhobin Moghadamyeghaneh<sup>1</sup> · Reza Fazl Alizadeh<sup>1</sup> · Mark H. Hanna<sup>1</sup> ·  
Grace Hwang<sup>1</sup> · Joseph C. Carmichael<sup>1</sup> · Steven Mills<sup>1</sup> · Alessio Pigazzi<sup>1</sup> ·  
Michael J. Stamos<sup>1,2</sup>



**Fig. 1** Timing of postoperative deep vein thrombosis and pulmonary embolism after operation in colorectal surgery



**Fig. 3** Timing of venous thromboembolism in patients who were discharged from hospital within 4 days after colorectal operations

# NSQIP: St Paul's and VTE

## Post-Hospital Discharge Venous Thromboembolism in Colorectal Surgery

Zhobin Moghadamyeghaneh<sup>1</sup> • Reza Ezzl Alizadeh<sup>1</sup> • Mark H. Hanna<sup>1</sup> •  
Grace Hwang<sup>1</sup> • Joseph C. *Most DVT and PE occur*  
Michael J. Stamos<sup>1,2</sup> *AFTER discharge*

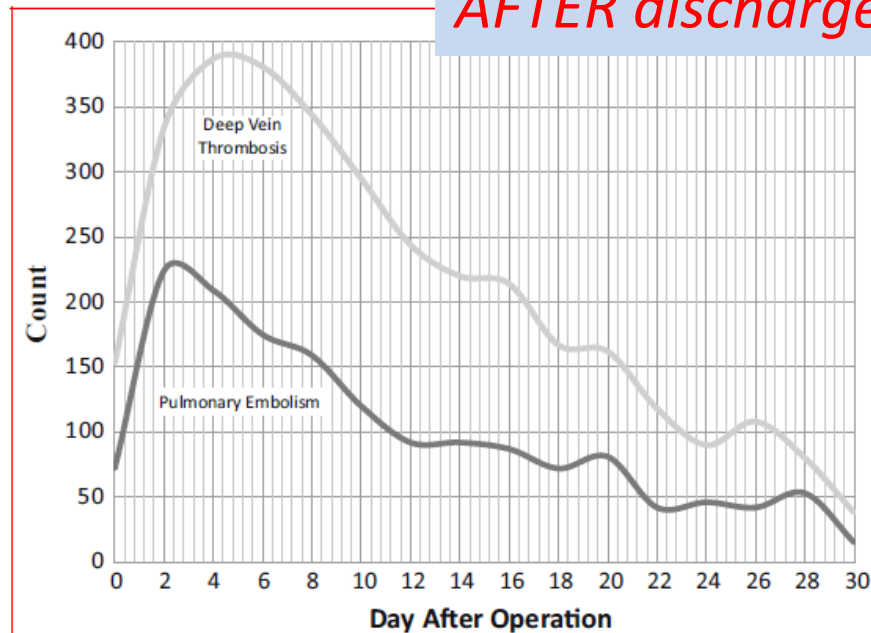


Fig. 1 Timing of postoperative deep vein thrombosis and pulmonary embolism after operation in colorectal surgery

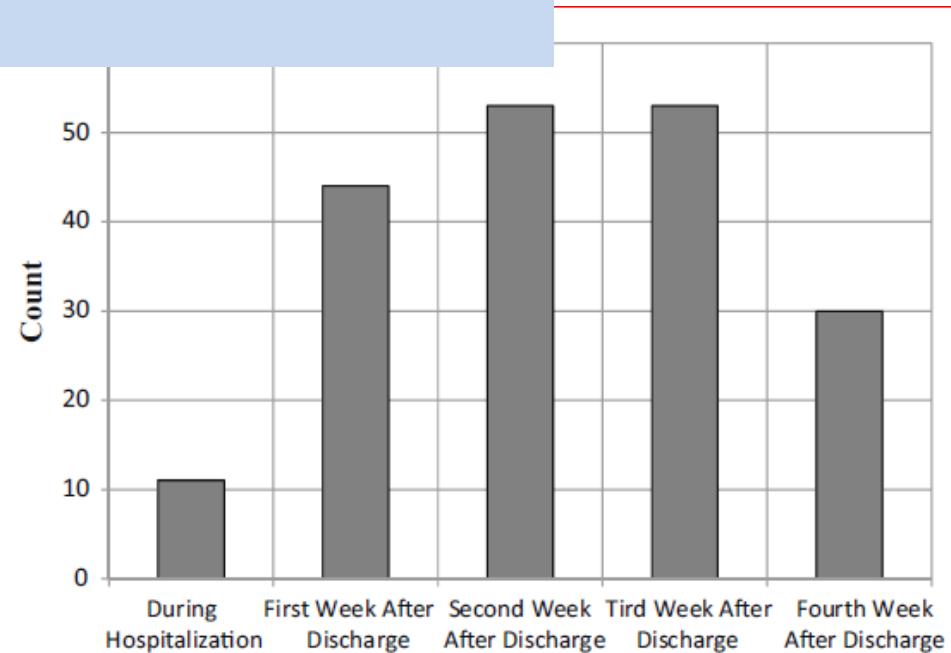


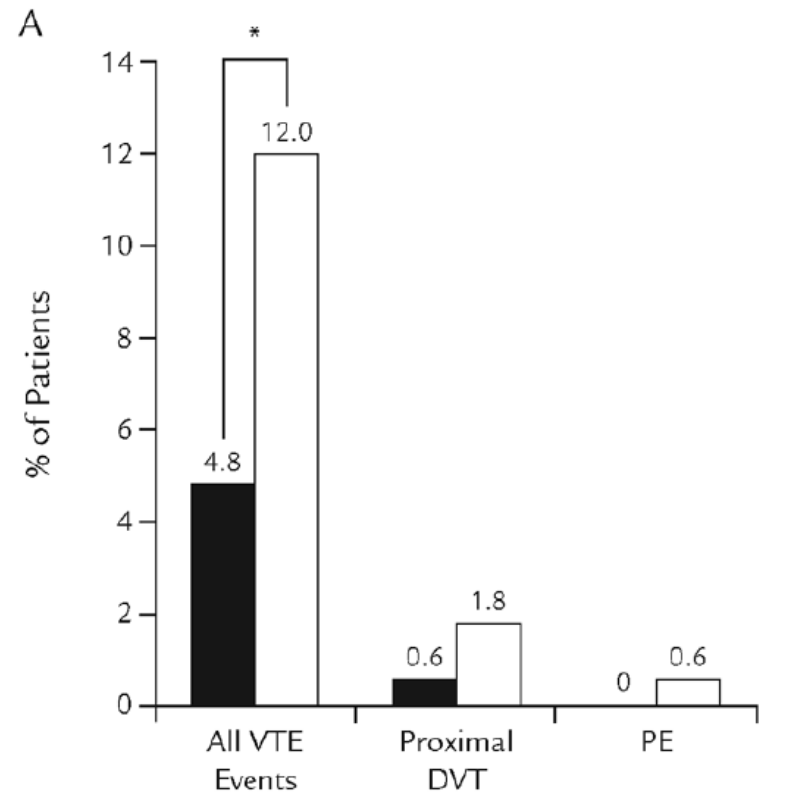
Fig. 3 Timing of venous thromboembolism in patients who were discharged from hospital within 4 days after colorectal operations

# NSQIP: St Paul's and VTE

## Extended Thromboprophylaxis With Low-Molecular-Weight Heparins After Hospital Discharge in High-Risk Surgical and Medical Patients: A Review

Michael H. Huo, MD<sup>1</sup>; and James Muntz, MD<sup>2</sup>

*Extended prophylaxis can prevent VTE after major abdominal surgery*



## Prevention of VTE in Nonorthopedic Surgical Patients

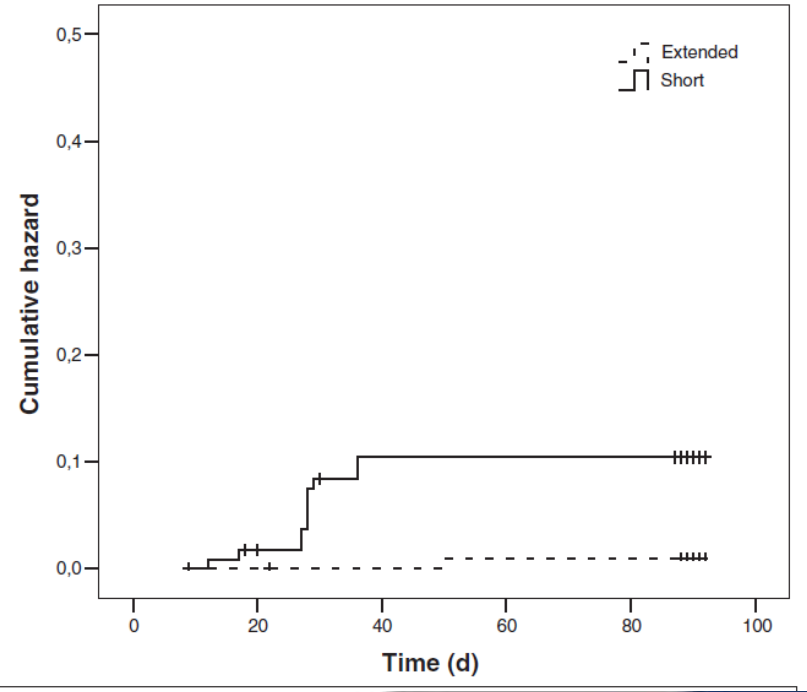
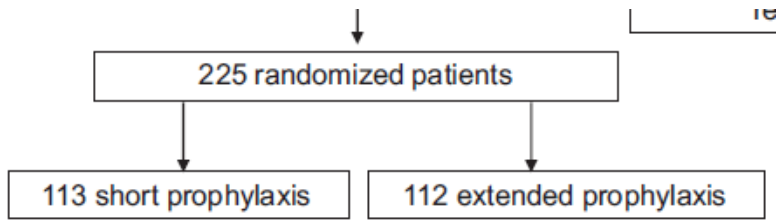
**Antithrombotic Therapy and Prevention of Thrombosis,  
9th ed: American College of Chest Physicians  
Evidence-Based Clinical Practice Guidelines**

**3.6.6. For high-VTE-risk patients undergoing abdominal or pelvic surgery for cancer who are not otherwise at high risk for major bleeding complications, we recommend extended-duration pharmacologic prophylaxis (4 weeks) with LMWH over limited-duration prophylaxis (Grade 1B).**



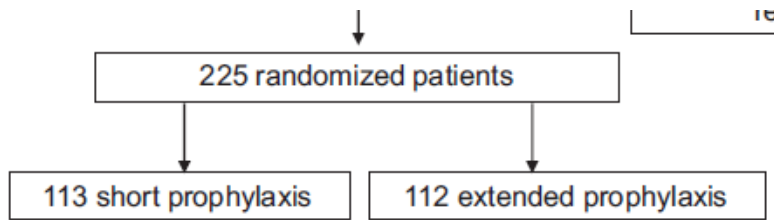
# NSQIP: St Paul's and VTE

## A Randomized Study on 1-Week Versus 4-Week Prophylaxis for Venous Thromboembolism After Laparoscopic Surgery for Colorectal Cancer

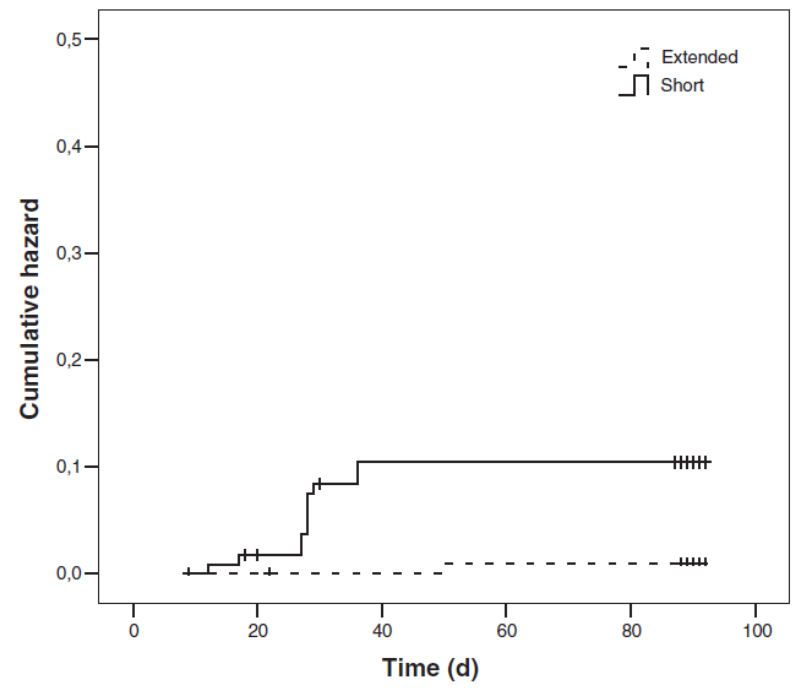


# NSQIP: St Paul's and VTE

## A Randomized Study on 1-Week Versus 4-Week Prophylaxis for Venous Thromboembolism After Laparoscopic Surgery for Colorectal Cancer



*Even after MIS resections, extended prophylaxis reduces DVTs/PE*





# NSQIP: St Paul's and VTE

- All patients after colorectal cancer surgery, leave the hospital with 28 days of extended LMWH Prophylaxis
- Requires filling out of an exemption form to ensure coverage
  - Pharmacist on the ward helps with that



# NSQIP: Postoperative Ileus

## Postoperative Ileus—More than Just Prolonged Length of Stay?

Sarah E. Tevis<sup>1</sup> • Evie H. Carchman<sup>1</sup> • Eugene F. Foley<sup>1</sup> • Bruce A. Harms<sup>1</sup> •  
Charles P. Heise<sup>1</sup> • Gregory D. Kennedy<sup>1</sup>

## Risk factors for prolonged ileus following colon surgery

Zhobin Moghadamyeghaneh<sup>1</sup> • Grace S. Hwang<sup>1</sup> • Mark H. Hanna<sup>1</sup> •  
Michael Phelan<sup>2</sup> • Joseph C. Carmichael<sup>1</sup> • Steven Mills<sup>1</sup> • Alessio Pigazzi<sup>1</sup> •  
Michael J. Stamos<sup>1,3</sup>

*NSQIP 2012-2013*

*14% rate of POI*

*MIS Surgery protective*

*Rights >> Lefts*



# NSQIP: Postoperative Ileus

## CLINICAL PRACTICE GUIDELINES

### Clinical Practice Guidelines for Enhanced Recovery After Colon and Rectal Surgery From the American Society of Colon and Rectal Surgeons and Society of American Gastrointestinal and Endoscopic Surgeons

Joseph C. Carmichael, M.D.<sup>1</sup> • Deborah S. Keller, M.S., M.D.<sup>2</sup> • Gabriele Baldini, M.D.<sup>3</sup>  
Liliana Bordeianou, M.D.<sup>4</sup> • Eric Weiss, M.D.<sup>5</sup> • Lawrence Lee, M.D., Ph.D.<sup>6</sup>  
Marylise Boutros, M.D.<sup>6</sup> • James McClane, M.D.<sup>7</sup> • Liane S. Feldman, M.D.<sup>6</sup>  
Scott R. Steele, M.D.<sup>8</sup>



# NSQIP: Postoperative Ileus

## CLINICAL PRACTICE GUIDELINES

### Clinical Practice Guidelines for Enhanced Recovery After Colon and Rectal Surgery From the American Society of Colon and Rectal Surgeons and Society of American Gastrointestinal and Endoscopic Surgeons

- Minimally Invasive Surgery (1A)*
- Regular Food Postoperatively ASAP (1B)*
- Sham feeding/Chewing Gum (1B)*
- Prevent excessive IV fluids (1B)*
- Alvimopan (1B)*

ele Baldini, M.D.<sup>3</sup>  
Ph.D.<sup>6</sup>  
M.D.<sup>6</sup>



# NSQIP: Postoperative Ileus

## Early versus Traditional Postoperative Oral Feeding in Patients Undergoing Elective Colorectal Surgery: A Meta-Analysis of Randomized Clinical Trials

Cheng-Le Zhuang<sup>a</sup> Xing-Zhao Ye<sup>a</sup> Chang-Jing Zhang<sup>a</sup> Qian-Tong Dong<sup>a</sup>  
Bi-Cheng Chen<sup>b</sup> Zhen Yu<sup>a</sup>

***Decreases Ileus***

***NO increase in vomiting, aspiration or  
NG tube use! (None, NADA)***



# NSQIP: Postoperative Ileus

## A Meta-analysis on the Effect of Sham Feeding Following Colectomy: Should Gum Chewing Be Included in Enhanced Recovery After Surgery Protocols?

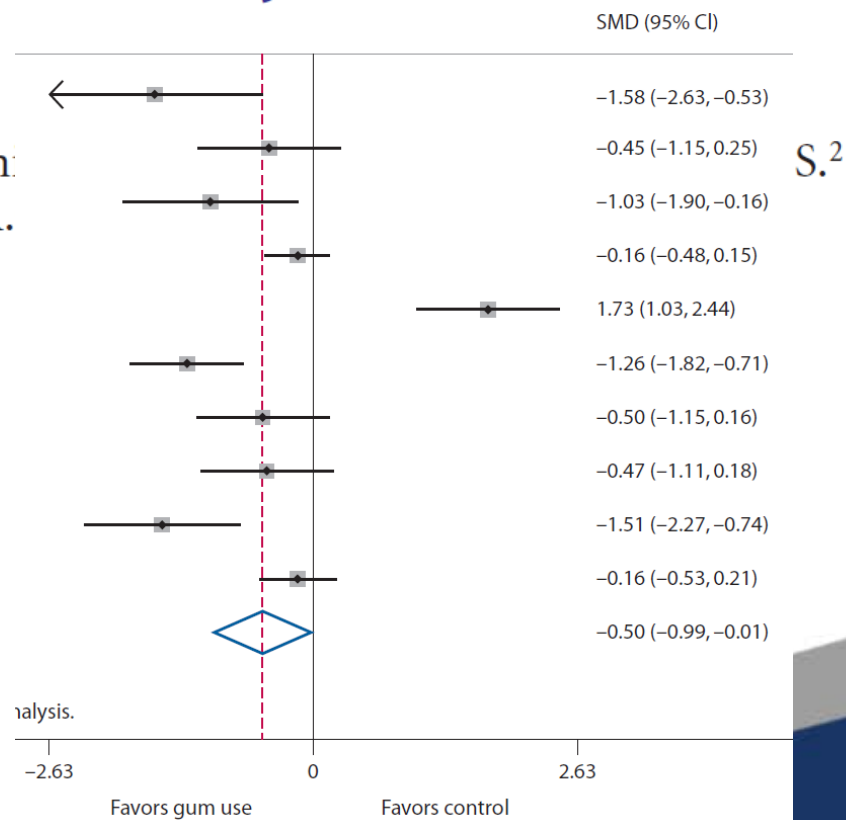
Yiu M. Ho, M.B.B.S.<sup>1</sup> • Stephen R. Smith, F.R.A.C.S.<sup>1,2</sup> • Peter Pockney, F.R.A.C.S.<sup>2</sup>  
Patrick Lim, B.M.<sup>1</sup> • John Attia, F.R.A.C.P.<sup>2,3</sup>



# NSQIP: Postoperative Ileus

## A Meta-analysis on the Effect of Sham Feeding Following Colectomy: Should Gum Chewing Be Included in Enhanced Recovery After Surgery Protocols?

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# NSQIP: Postoperative Ileus

## CLINICAL PRACTICE GUIDELINES

### Clinical Practice Guidelines for Enhanced Recovery After Colon and Rectal Surgery From the American Society of Colon and Rectal Surgeons and Society of American Gastrointestinal and Endoscopic Surgeons

Josej  
Lilia  
Mar  
Scot

Based on these considerations, a maintenance infusion of 1.5 - 2 mL/kg/h of balanced crystalloid solution is sufficient to cover the needs derived from salt–water homeostasis during major abdominal surgery<sup>206,207</sup> while limiting substantial post-operative weight gain (>2.5 kg/d), which is associated with increased morbidity and prolonged hospital stay.<sup>208</sup>





# NSQIP: Postoperative Ileus

## CLINICAL PRACTICE GUIDELINES

### Clinical Practice Guidelines for Enhanced Recovery After Colon and Rectal Surgery From the American Society of Colon and Rectal Surgeons and Society of American Gastrointestinal and Endoscopic Surgeons

Josej  
Lilia  
Mar  
Scot

Based on these considerations, a maintenance infusion of 1.5 - 2 mL/kg/h of balanced crystalloid solution is sufficient to cover the needs derived from salt-water homeostasis during

**3. In high-risk patients and in patients undergoing major colorectal surgery associated with significant intravascular losses, the use of goal-directed fluid therapy is recommended. Grade of recommendation: strong recommendation based on moderate-quality evidence, 1B.**



# NSQIP: Postoperative Ileus

## **A Meta-analysis of the Effectiveness of the Opioid Receptor Antagonist Alvimopan in Reducing Hospital Length of Stay and Time to GI Recovery in Patients Enrolled in a Standardized Accelerated Recovery Program After Abdominal Surgery**

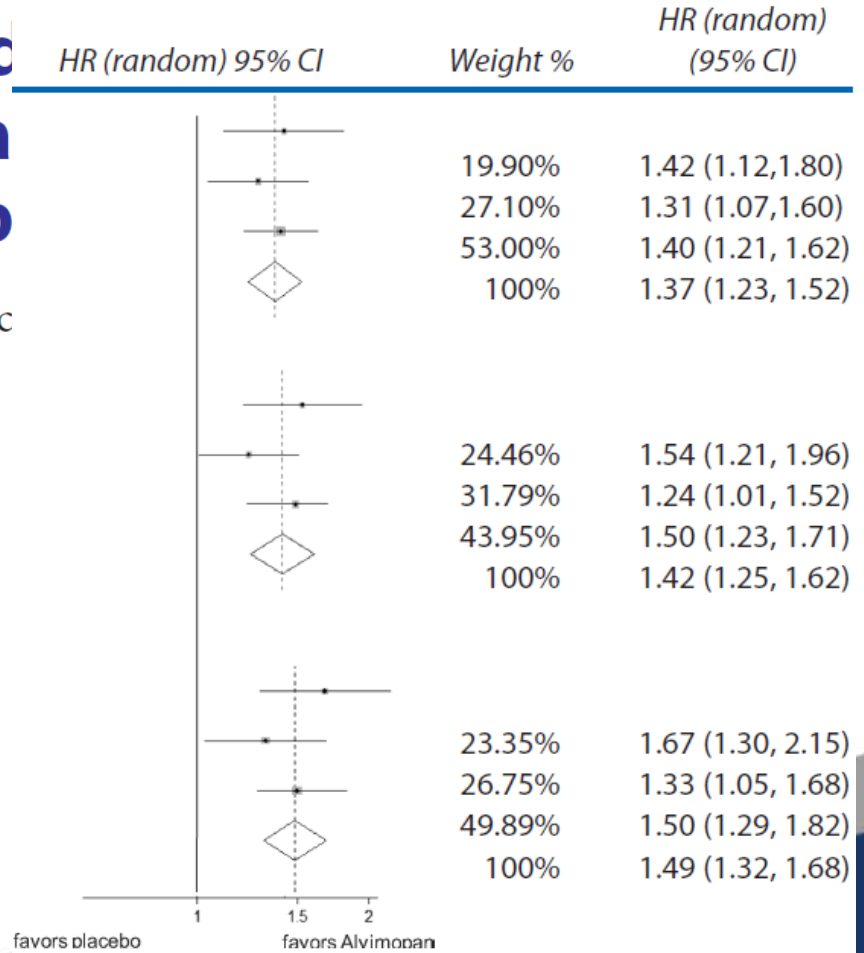
P. G. Vaughan-Shaw, M.B.Ch.B. • I. C. Fecher, M.Sc. • S. Harris, M.Sc. • J. S. Knight, M.B.B.S.



# NSQIP: Postoperative Ileus

## A Meta-analysis of the Effectiveness of the Opioid Receptor Antagonist Alvimopan in Reducing Hospital Length of Stay and in Patients Enrolled in a Standardized Postoperative Recovery Program After Abdominal Surgery

P. G. Vaughan-Shaw, M.B.Ch.B. • I. C. Fec

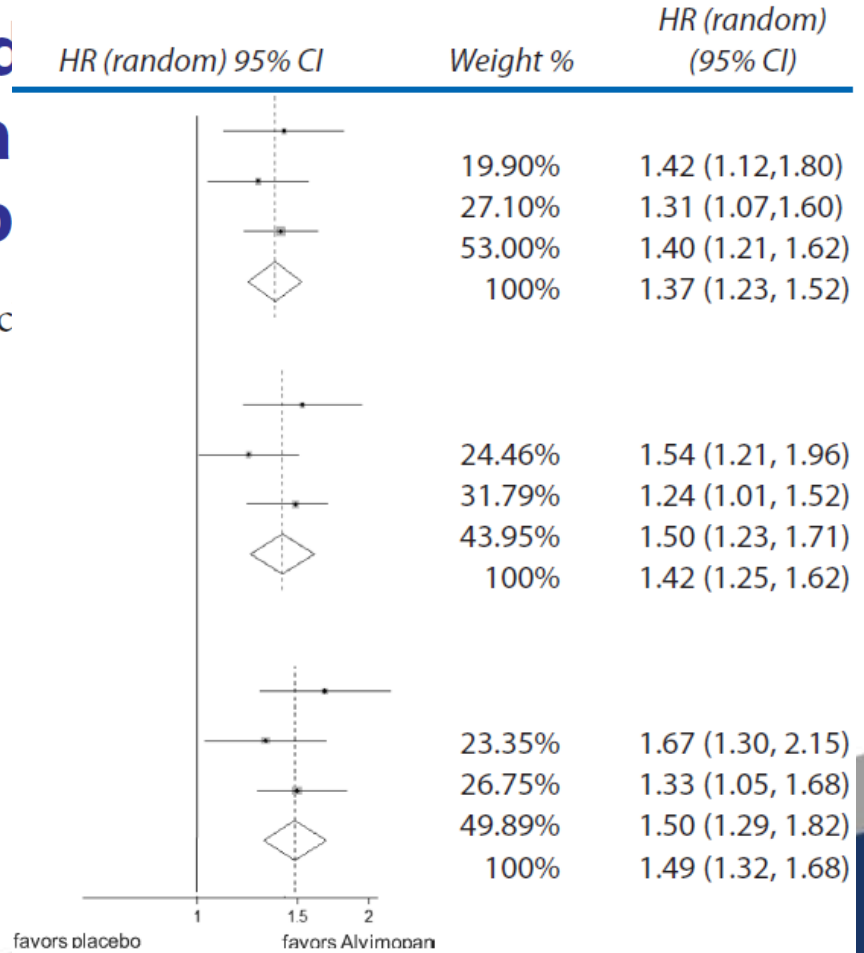


# NSQIP: Postoperative Ileus

## A Meta-analysis of the Effectiveness of the Opioid Receptor Antagonist Alvimopan in Reducing Hospital Length of Stay and in Patients Enrolled in a Standardized Postoperative Recovery Program After Abdominal Surgery

P. G. Vaughan-Shaw, M.B.Ch.B. • I. C. Fec

**Decreases Ileus, May reduce LoS  
\$600 USD per patient cost!  
Not available for us in BC**



# NSQIP: ERAS and BC

- Enhanced Recovery After Surgery Pathways
  - Initially developed and popularized in Denmark by Henrik Kehlet
  - Summarized by Lassen & ERAS Study Group, 2009
    - Laparoscopic Surgery
    - Keep patients warm, and reduce peri-operative crystalloid usage
    - Do not place drains
    - Lots of Tylenol (minimize narcotics)
    - Feed ASAP
    - Mobilize effectively and early



# NSQIP: ERAS and BC

- Enhanced Recovery After Surgery Pathways
  - Does it work?
  - 3 Meta-Analyses
    - Varadhan et al. (Nottingham), Eskicioglu et al. (Toronto) & Gouvas et al. (Imperial College)
    - 2 days less mean stay
    - Fewer peri-operative complications (RR of 0.61)
    - \$7000/patient cost-savings



# NSQIP: ERAS and BC

## The Better Colectomy Project

### *Association of Evidence-Based Best-Practice Adherence Rates to Outcomes in Colorectal Surgery*

*Alexander F. Arriaga, MD,\*† Robert T. Lancaster, MD, MPH,\*‡ William R. Berry, MD, MPH, MPA,\*  
Scott E. Regenbogen, MD, MPH,\*‡ Stuart R. Lipsitz, ScD,† Haytham M. A. Kaafarani, MD, MPH,\*§  
Andrew W. Elbardissi, MD, MPH,\*† Priya Desai, MPH,\*† Stephen J. Ferzoco, MD,¶ Ronald Bleday, MD,†  
Elizabeth Breen, MD,† William V. Kastrinakis, MD,|| Marc S. Rubin, MD,|| and Atul A. Gawande, MD, MPH\*†*

- Study performed at Brigham Young Womens, Mass General & Faulkner Hospital in Boston
- Identified, by consensus, 15 Key practices, and 22 Best practices
- 370 patients were assessed for compliance



## The Better Colectomy Project

### *Association of Evidence-Based Best-Practice Adherence Rates to Outcomes in Colorectal Surgery*

**TABLE 1.** Description of Evidence-Based Best-Practices Tracked for the Better Colectomy Project\*

#### Key Best Practices

##### Infection prevention

1. Removal of intraoperative Foley catheter within 72 hour postoperatively or within 24 hour after removal of intraoperative epidural catheter (if epidural catheter present)
2. Administration and continuation of appropriate prophylactic antibiotics as recommended by the Surgical Care Improvement Project (SCIP)<sup>11</sup>
3. Intraoperative application of warming device for patients with an intraoperative temperature less than 97.8 F (36.6°C)
4. Removal of central venous catheter unless daily documented reason for continuing
5. Red blood cell transfusions held for patients with hematocrit >21%, no hemodynamic instability and no history of coronary artery disease
6. Intraoperative anastomotic testing or fecal diversion for
  - a. Anastomoses above 5 cm from the anal verge and below the peritoneal reflection, or
  - b. Stapled transanal end-to-end anastomosis, or
  - c. Nondiverted anastomosis within 5 cm of the anal verge
7. Fecal diversion for anastomosis within 5 cm of the anal verge

##### Thromboembolism prophylaxis

8. Mechanical and chemical prophylaxis for deep venous thrombosis administered/applied before operation
9. Mechanical and chemical prophylaxis for deep venous thrombosis administered/applied postoperatively

##### Preoperative assessment and optimization

10. Ostomy nurse consulted preoperatively for low anterior resections or planned ostomy
11. Beta blocker therapy given (unless contraindication present) for patients with serum creatinine >2, mg/dL, age >65 yr, current tobacco use, history of angina, history of coronary artery disease, hypertension, congestive heart failure, high cholesterol, stroke, or diabetes
12. Anti-platelet medications held for at least 7 days preoperatively, unless documented contraindication present
13. Warfarin held for at least 4 days preoperatively, unless documented contraindication present
14. Cardiology or hospitalist consult obtained if critical preoperative abnormality present (as listed in Supplemental Digital Content 1), unless documented reason for no consultation
15. Central venous catheter or 2 peripheral intravenous lines (at least one 18 gauge or larger) placed for cases with estimated blood loss greater than 500 mL.



# NSQIP: ERAS and BC

## The Better Colectomy Project

*Association of Evidence-Based Best-Practice Adherence Rates to Outcomes in Colorectal Surgery*

- Only 14% of patients had perfect adherence to Best Practice
- 11 of 37 practices were adhered to <60% of the time
- 25% of patients had catheters left in too long
- 50% were transfused without good reason
- 59% were not worked up adequately for fever
- 90% had CVL left in too long
- 70% of patients did not comply with DVT guidelines



# NSQIP: ERAS and BC

## The Better Colectomy Project

### *Association of Evidence-Based Best-Practice Adherence Rates to Outcomes in Colorectal Surgery*

**TABLE 5.** Association Between Key Processes Missed and the Proportion of Patients With Postoperative Complications\*

No. Key Processes Missed (Out of 15)	0	1	2	3	4+
Percentage of patients with one or more complications	6.9% (2/29)	15.3% (11/72)	21.3% (13/61)	29.2% (7/24)	41.7% (5/12)

\*Mantel-Haenszel  $\chi^2$  test for trend,  $P = 0.002$ .

**TABLE 7.** Multivariate Analysis Testing the Association Between Key Processes Missed and the Proportion of Patients With One or More Complications, Adjusting for Age, and Comorbid Status\*

Variable	Odds Ratio	95% Confidence Interval	<i>P</i>
No. key processes missed	1.442	1.03–2.01	0.0316
Comorbidity score	1.246	0.957–1.622	0.1029
Age >65 yr	1.373	0.605–3.115	0.4480

\*Hospital-to-hospital variation adjusted for as a fixed effect in logistic regression.



# NSQIP: ERAS and BC

- Enhanced Recovery After Surgery Pathways
  - Do we need it with Laparoscopy?

Laparoscopy in Combination with Fast Track Multimodal Management is the Best Perioperative Strategy in Patients Undergoing Colonic Surgery

*A Randomized Clinical Trial (LAFA-study)*



# NSQIP: ERAS and BC

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*A Randomized Clinical Trial (LAFA-study)*

	Laparoscopy and Fast Track (n = 100)	Open and Fast Track (n = 93)	Laparoscopy and Standard care (n = 109)	Open and Standard care (n = 98)	<i>P</i>
Total hospital stay, median (IQR), days	5 (4–8)	7 (5–11)	6 (4.5–9.5)	7 (6–13)	<0.001*†
Postoperative hospital stay, median (IQR), days	5 (4–7)	6 (4.5–10)	6 (4–8.5)	7 (6–10.5)	<0.001*‡

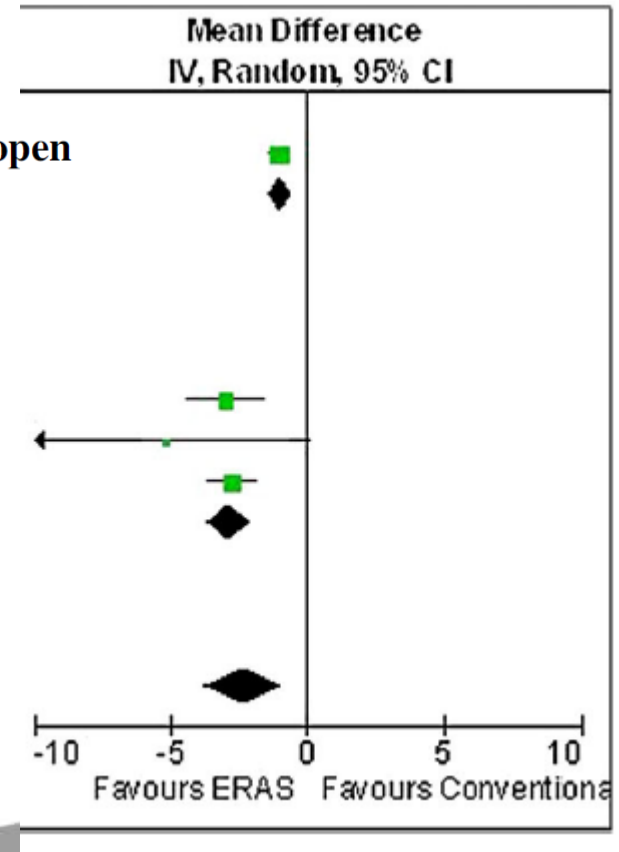


# NSQIP: ERAS and BC

- Enhanced Recovery After Surgery Pathways
  - Do we need it with Laparoscopy?

**Systematic review and meta-analysis for laparoscopic versus open colon surgery with or without an ERAS programme**

W. R. Spanjersberg<sup>1</sup> · J. D. P. van Sambeek<sup>1</sup> · A. Bremers<sup>1</sup> · C. Rosman<sup>2</sup> · C. J. H. M. van Laarhoven<sup>1</sup>



# NSQIP: ERAS and BC

- Enhanced Recovery After Surgery Pathways
  - *It gets patients out of hospital faster, but does nothing for complications!*

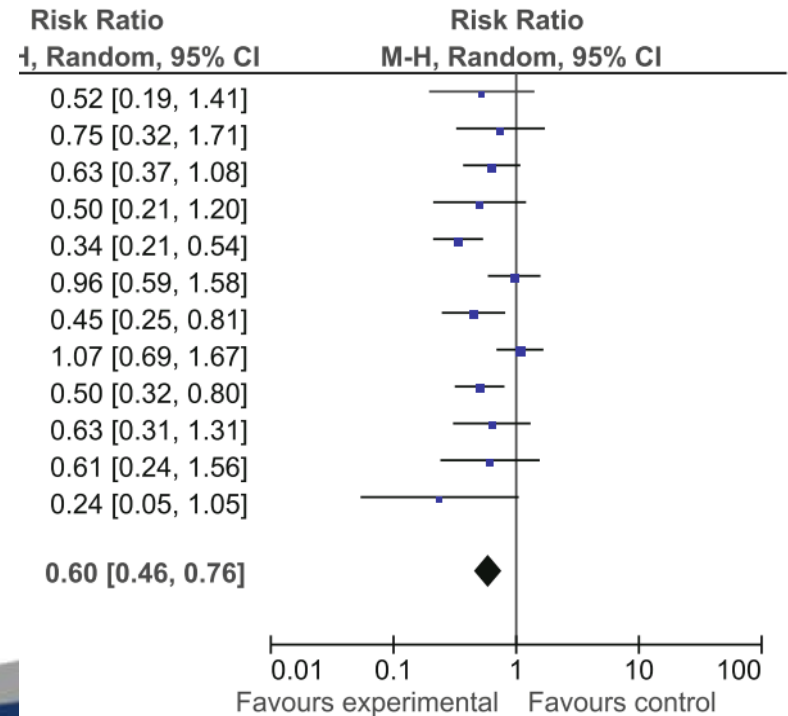


# NSQIP: ERAS and BC

- Enhanced Recovery After Surgery Pathways
  - It gets patients out of hospital faster, but does

## Enhanced Recovery Program in Colorectal Surgery: A Meta-analysis of Randomized Controlled Trials

Massimiliano Greco · Giovanni Capretti ·  
Luigi Beretta · Marco Gemma · Nicolò Pecorelli ·  
Marco Braga





# NSQIP: ERAS and BC

- Enhanced Recovery After Surgery Pathways
  - It gets patients out of hospital faster, but does nothing for complications!

## **Enhanced Recovery After Surgery Program Implementation in 2 Surgical Populations in an Integrated Health Care Delivery System**

*3800 patients undergoing elective colorectal surgery*

*Staggered implementation*

*Same surgeons, but different institutions*



# NSQIP: ERAS and BC

- Enhanced Recovery After Surgery Pathways
  - It gets patients out of hospital faster, but does nothing for complications!

## **Enhanced Recovery After Surgery Program Implementation in 2 Surgical Populations in an Integrated Health Care Delivery System**

*In the Kaiser-Permanente system, implementation lead to a 32% decrease in complications*



# NSQIP: ERAS and BC

Active Patient Involvement		
<i>Pre-operative</i>	<i>Intra-operative</i>	<i>Post-operative</i>
Pre-admission education	Active warming	Early oral nutrition
Early discharge planning	Opioid-sparing technique	Early ambulation
Reduced fasting duration	Surgical techniques	Early catheter removal
Carbohydrate loading	Avoidance of prophylactic NG tubes & drains	Use of chewing gum
No-selective bowel prep	Goal-directed perioperative fluid management	
Venous thromboembolism prophylaxis	Pain and nausea management	
Antibiotic prophylaxis		
Pre-warming		
Audit of processes & outcomes		
Multi-disciplinary Team Involvement		



# NSQIP: ERAS and BC

Sponsor: SSC

Co-Chairs:  
Anesthesia, Surgery,  
Nursing/QI

Advisory Panel:  
Anesthesia, Surgery,  
Nursing/Admin  
members from 6  
regional HAs

BC Hip  
Arthroplasty  
Collaborative

2 Patient  
Partners

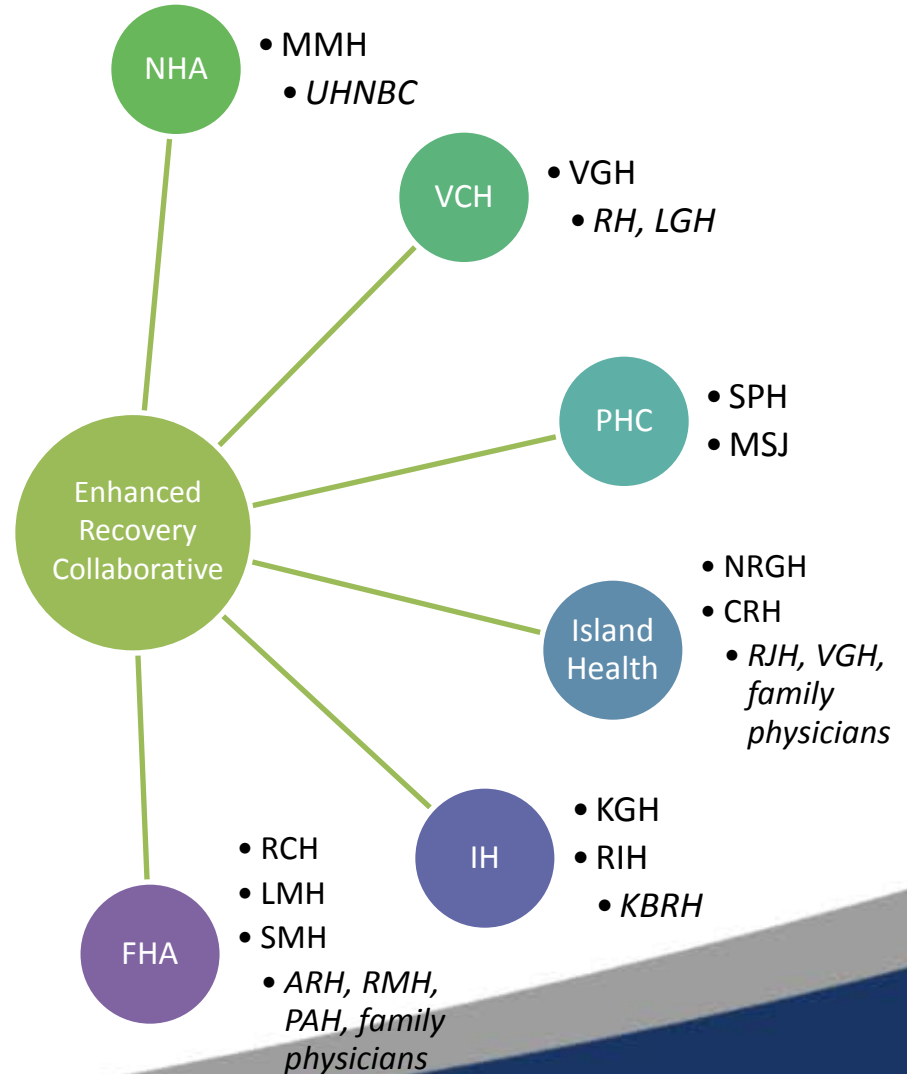
Organizational  
Partner:  
BC Patient Safety &  
Quality Council

Anesthesia  
COP

Surgery  
COP

Nutrition  
COP

Nursing  
COP



# NSQIP: ERAS and BC

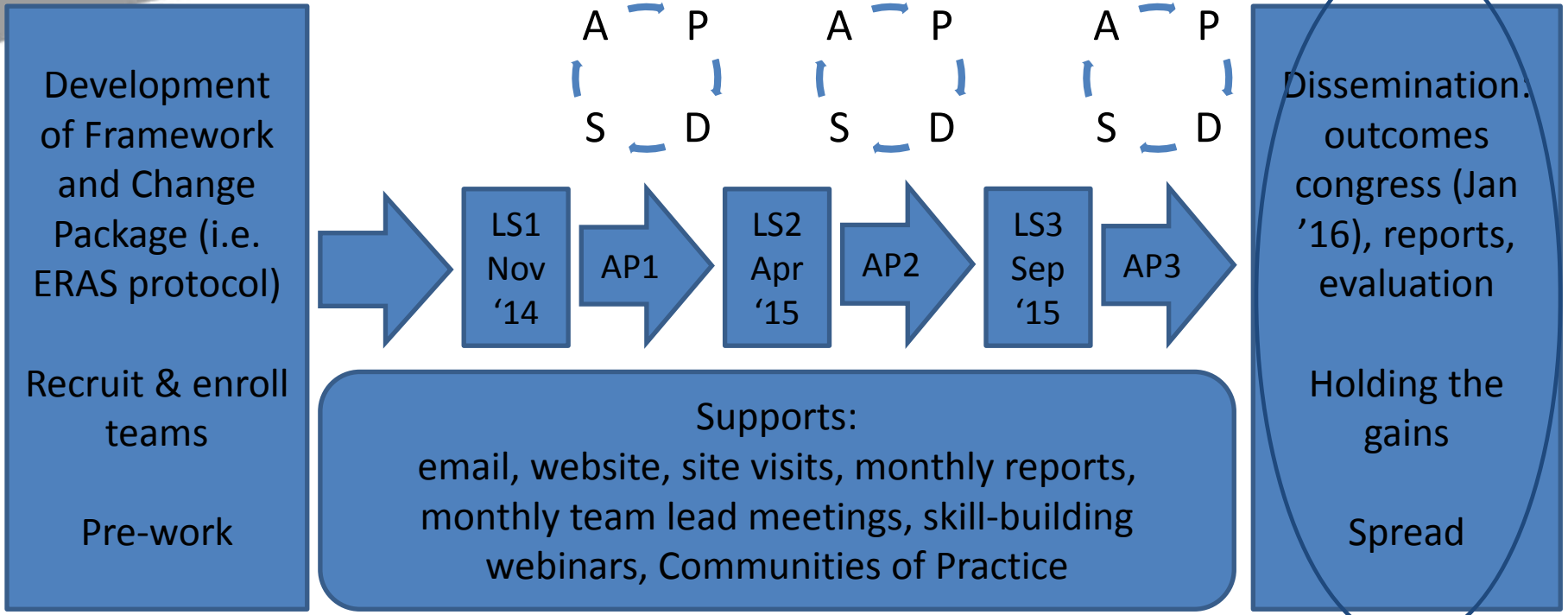
## Collaborative Goals

- 80% compliance on all pathway elements
- 50% reduction in complication rates
- Decrease hospital LOS
- No significant change to readmission rates

Period: November 2015 – December 2015



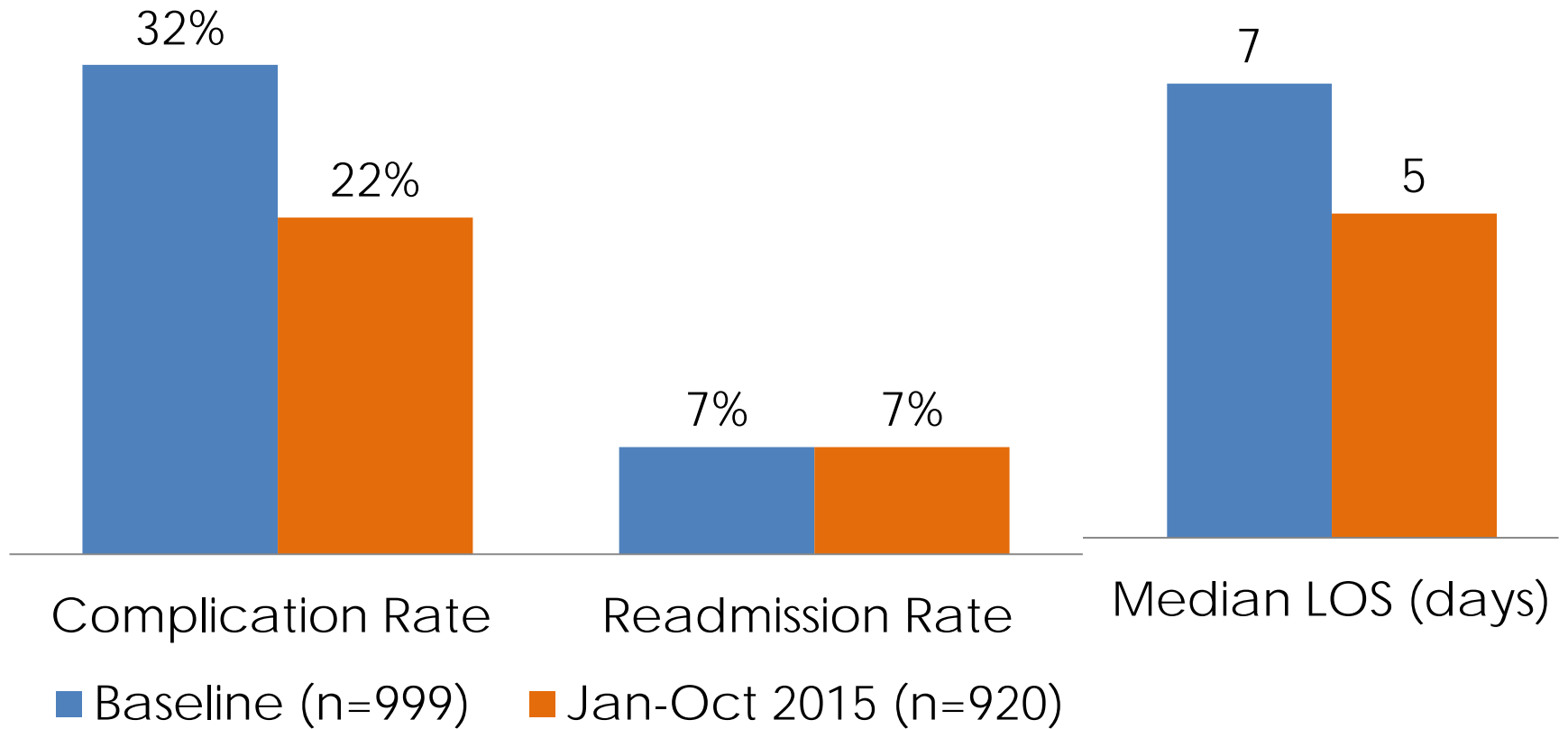
# NSQIP: ERAS and BC



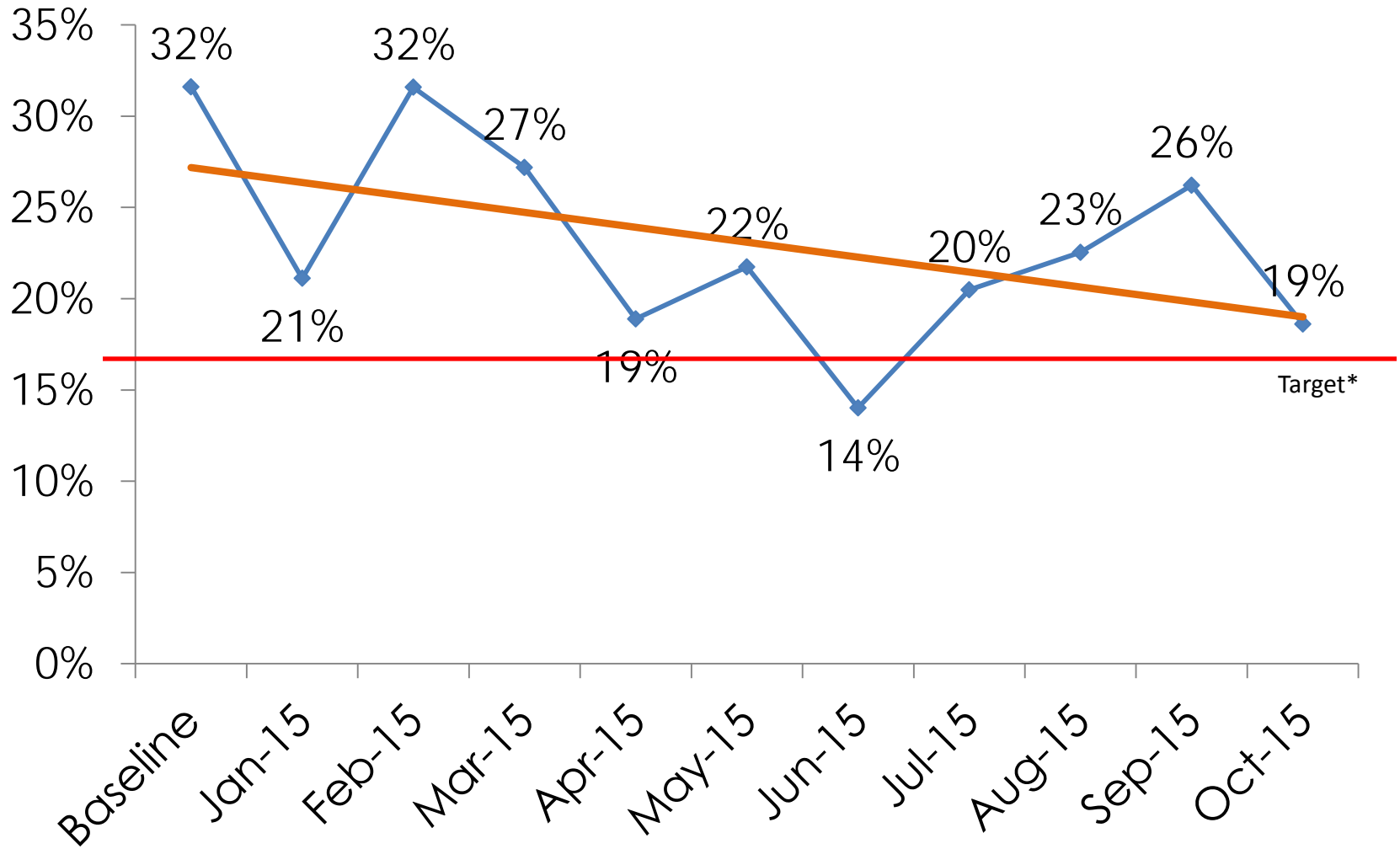
Based on IHI Breakthrough Series Model



# Outcomes: Snapshot



# Complication rate



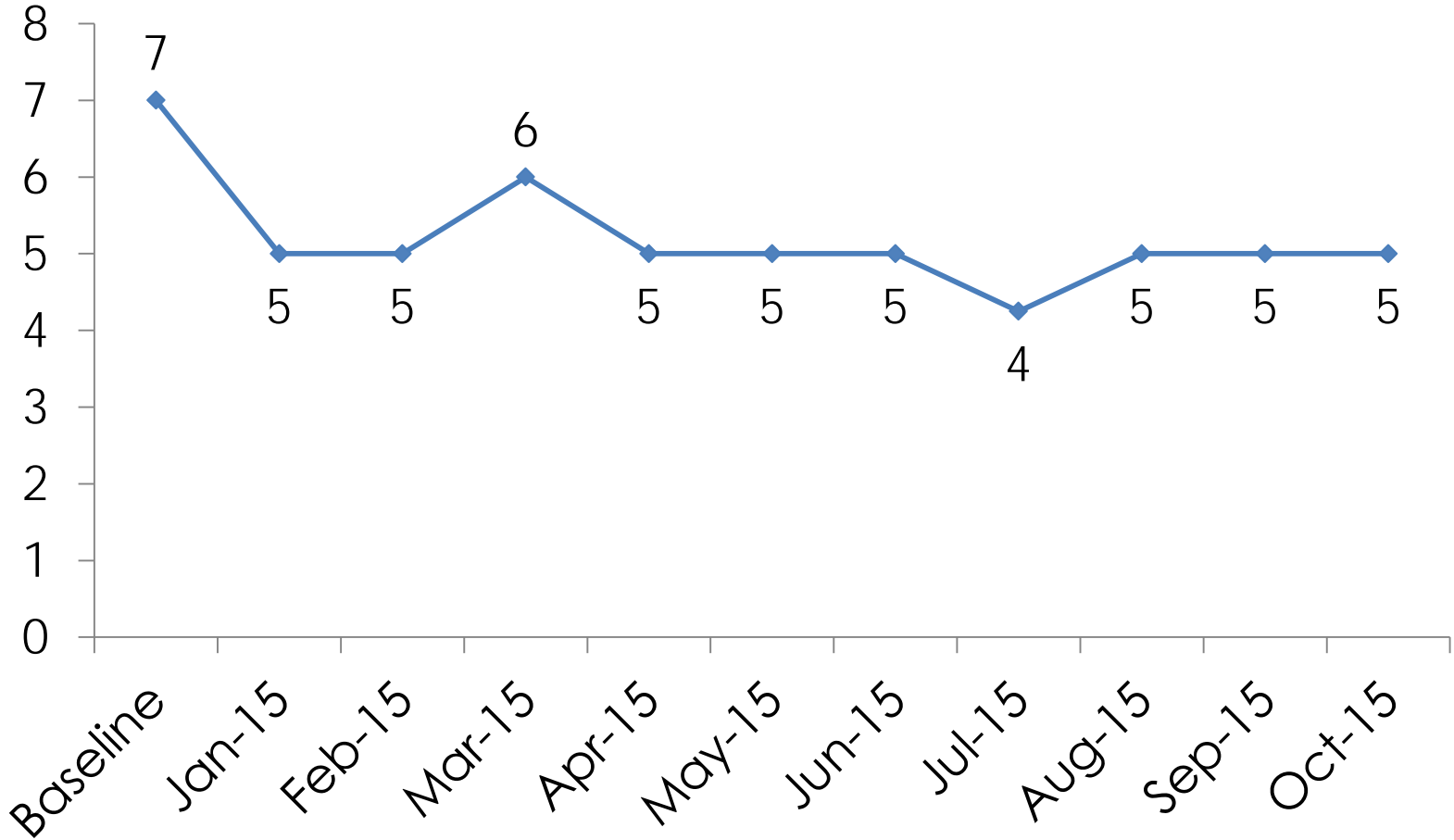
\*Target = 50% reduction from baseline (16% complication rate)

Jan-Oct N=936

Baseline N=999

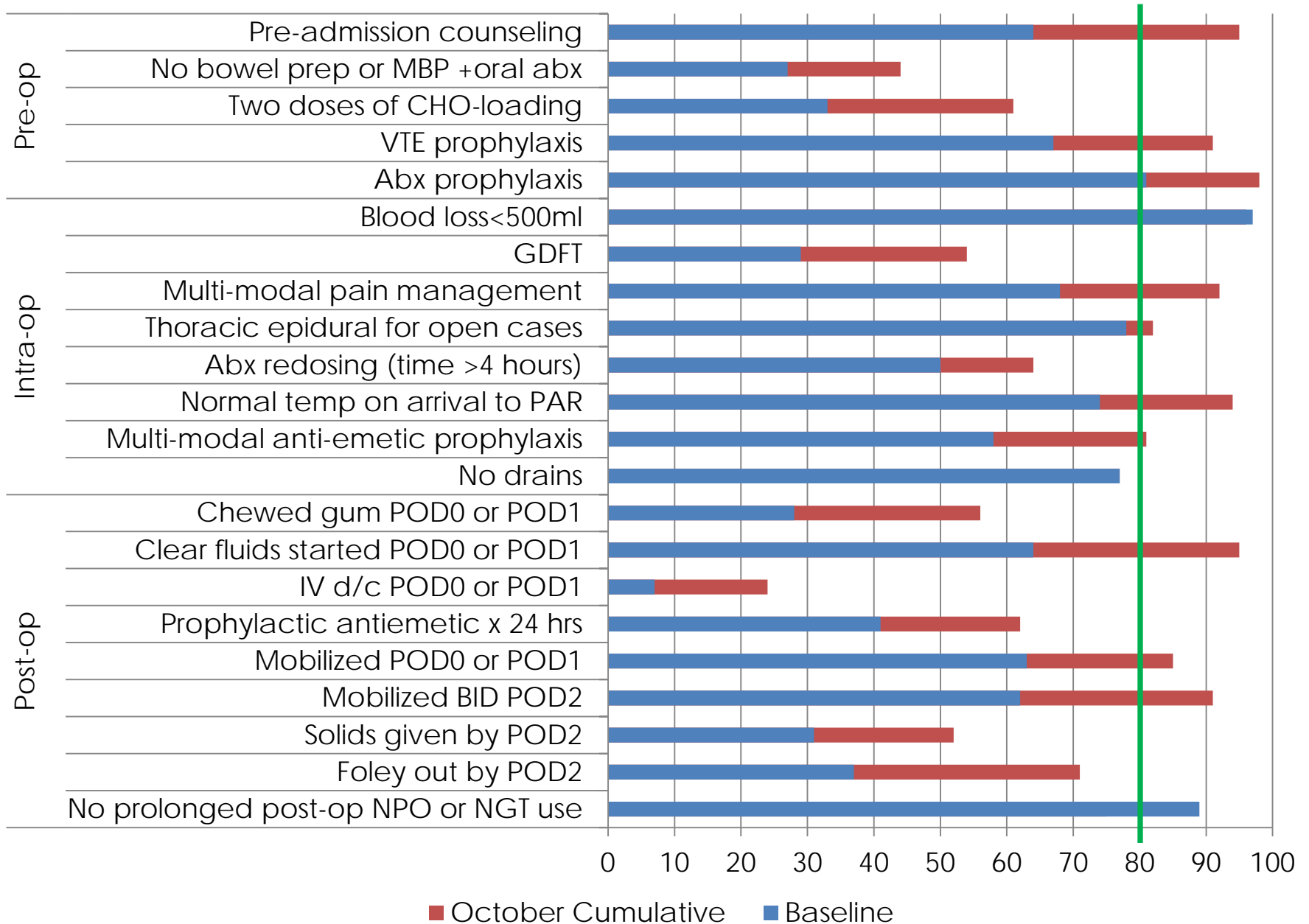


# Median LOS (days)

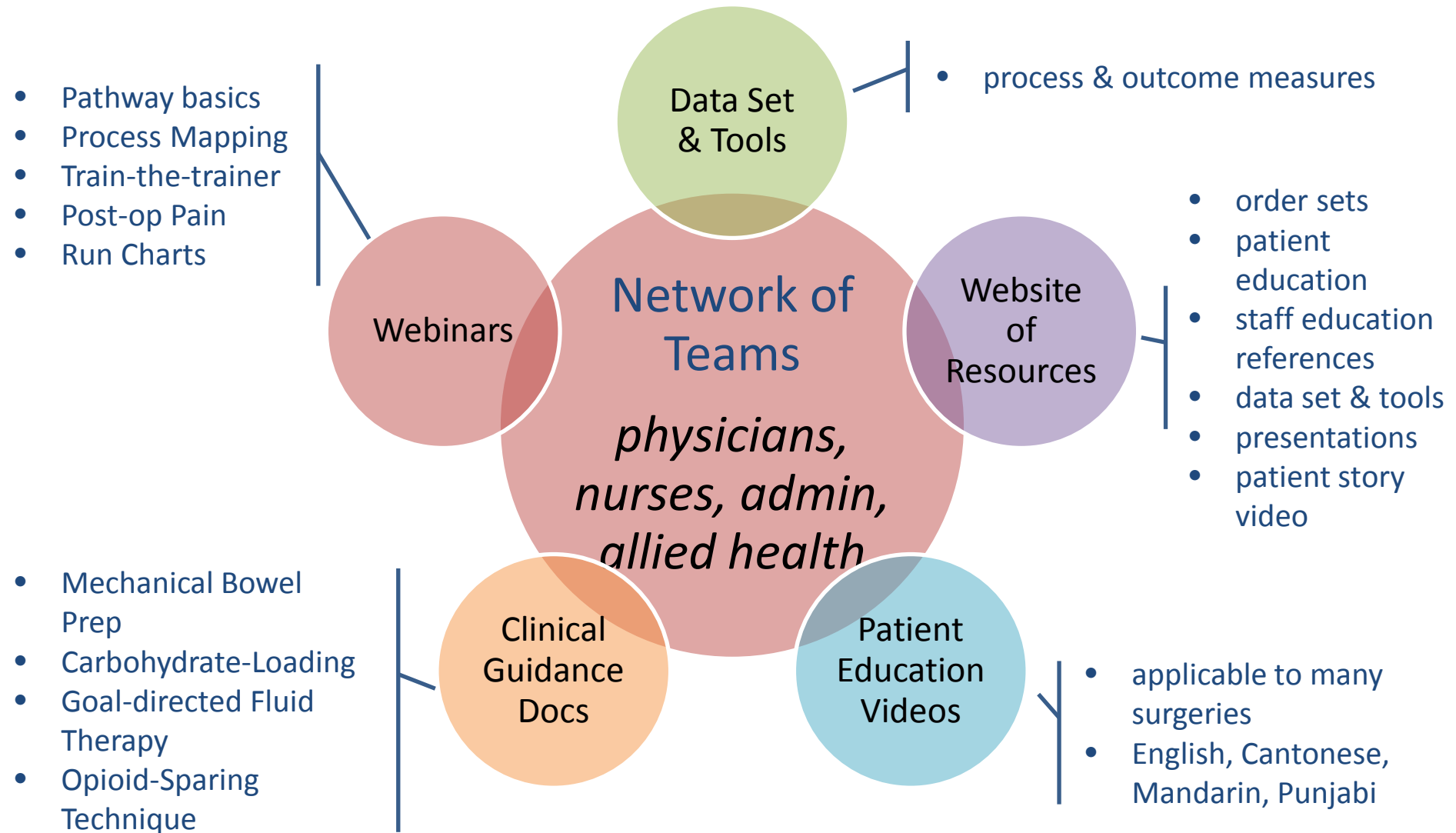


Jan-Oct N=936  
Baseline N=999

# Pathway Adherence Changes (%) January-October 2015 n=936



# Resources for Spread and Sustainability



# ERAS: What's new in BC and Providence?

- Nutrition
  - Pre-operative assessment for at risk patients
    - Rapid weight loss and morbidly obese patients
  - Carbohydrate loading
  - Early Feeding
    - Since January 2017, patients get a transitional diet and advised to eat as per their appetite
      - Solids, Clears and Full



# ERAS: What's new in BC and Providence?

- Intra-operative
  - Intravenous Fluids (Goal directed)
    - Fluid monitoring techniques
    - Fluids on a pump
  - Redosing of Antibiotics at 4 hours



# ERAS: What's new in BC and Providence?

- Royal Columbian Hospital
  - Anemia treatment with Iron infusions
- Vancouver Coastal Health and Providence Health
  - Geriatric Assessment of frail and at risk patients > 75



# ERAS: What's new in BC and Providence?

- Prehabilitation / Pre-operative Optimization Trial
  - Exercise Counseling
  - Dietary Counseling
  - Relaxation/Anxiety Treatment (Music Therapy)



# The QI Landscape in BC

- 2006: New negotiated Physician Master Agreement
  - Hard dollars committed to Facilities based Quality Improvement and Physician Engagement





# The QI Landscape in BC

- Facility Based Physician Engagement
- Quality and Innovation Projects
  - ERAS Collaborative
  - Hip Fracture Redesign
- Regional Quality Improvement
  - QI Education
  - Regional QI Networks
  - Support for time spent



# The QI Landscape in BC

- Costs
  - Process Changes
    - Physician Engagement
    - Physician Time
    - Change to work of Nursing
      - CNS
      - CNLs and CNEs



# Conclusions

- Complications in Colorectal Cancer Surgery come at a cost
  - System, patients and oncological
- Complications can be measured and potentially reduced
- A care pathway, like ERAS, definitively reduces complications
- There are opportunities available to you for assessment and implementation of quality improvement



# Colorectal Cancer: Complications

*Doctors and scientists are now being asked to accept a new understanding of what great medicine requires. It is not just the focus of an individual artisan-specialist, however skilled and caring. And it is not just the discovery of a new drug or operation, however effective it may seem in an isolated trial. Great medicine requires the innovation of entire packages of care—with medicines and technologies and clinicians designed to fit together seamlessly, monitored carefully, adjusted perpetually, and shown to produce ever better service and results for people at the lowest possible cost for society.*

- *Gawande, Stanford Commencement, 2010*





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# NSQIP: Anastomotic Leaks

- Prevention is better than cure



# NSQIP: Anastomotic Leaks

- Oral Antibiotics

**Systematic review of perioperative selective decontamination of the digestive tract in elective gastrointestinal surgery**

D. Roos<sup>1</sup>, L. M. Dijkstra<sup>2</sup>, J. G. Tijssen<sup>3</sup>, D. J. Gouma<sup>4</sup>, M. F. Gerhards<sup>5</sup> and H. M. Oudemans-van Straaten<sup>6</sup>

***Oral Antibiotics decrease  
Anastomotic Leak rates***



# NSQIP: Anastomotic Leaks

- Oral Antibiotics + Mechanical Bowel Prep

Combined Preoperative Mechanical Bowel Preparation With Oral Antibiotics Significantly Reduces Surgical Site Infection, Anastomotic Leak, and Ileus After Colorectal Surgery

*Ravi Pokala Kiran, MBBS, MS, FRCS, FACS, MSc (EBM), FASCRS,\*† Alice C. A. Murray, BSc, MBBS, MRCS,\*  
Cody Chiuzan, PhD,† David Estrada, MD,\* and Kenneth Forde, MD\**

Combined Mechanical and Oral Antibiotic Bowel Preparation Reduces Incisional Surgical Site Infection and Anastomotic Leak Rates After Elective Colorectal Resection

*An Analysis of Colectomy-Targeted ACS NSQIP*

*John E. Scarborough, MD, Christopher R. Mantyh, MD, PhD, Zhifei Sun, MD, and John Migaly, MD*





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**Oral Antibiotics with Mechanical Bowel Preparation decreases Anastomotic Leak rates!**

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# NSQIP: Anastomotic Leaks

- Routine Diversion?



**Cochrane  
Library**

Cochrane Database of Systematic Reviews

**Covering ileo- or colostomy in anterior resection for rectal carcinoma (Review)**

Montedori A, Cirocchi R, Farinella E, Sciannameo F, Abraha I

***Decreased Anastomotic Leak (RR 0.33)  
Less Return to OR (RR 0.23)***

***Divert all high risk colorectal  
anastomoses***



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# NSQIP: Anastomotic Leaks

- Fluorescence Imaging
  - Ensure anastomotic sites are well vascularized



# NSQIP: Anastomotic Leaks

- Fluorescence Imaging

## **Perfusion Assessment in Laparoscopic Left-Sided/Anterior Resection (PILLAR II): A Multi-Institutional Study**



- 147 Patients
- Resection margin changed in 10 patients
- 4 leaks (2 clinical, 2 radiological)



# PILLAR III

- Randomized, controlled, parallel, multicenter study
- Determine the reduction in anastomotic leak rate LAR using PINPOINT or SPY Elite compared to standard surgical practice alone



# PILLAR III

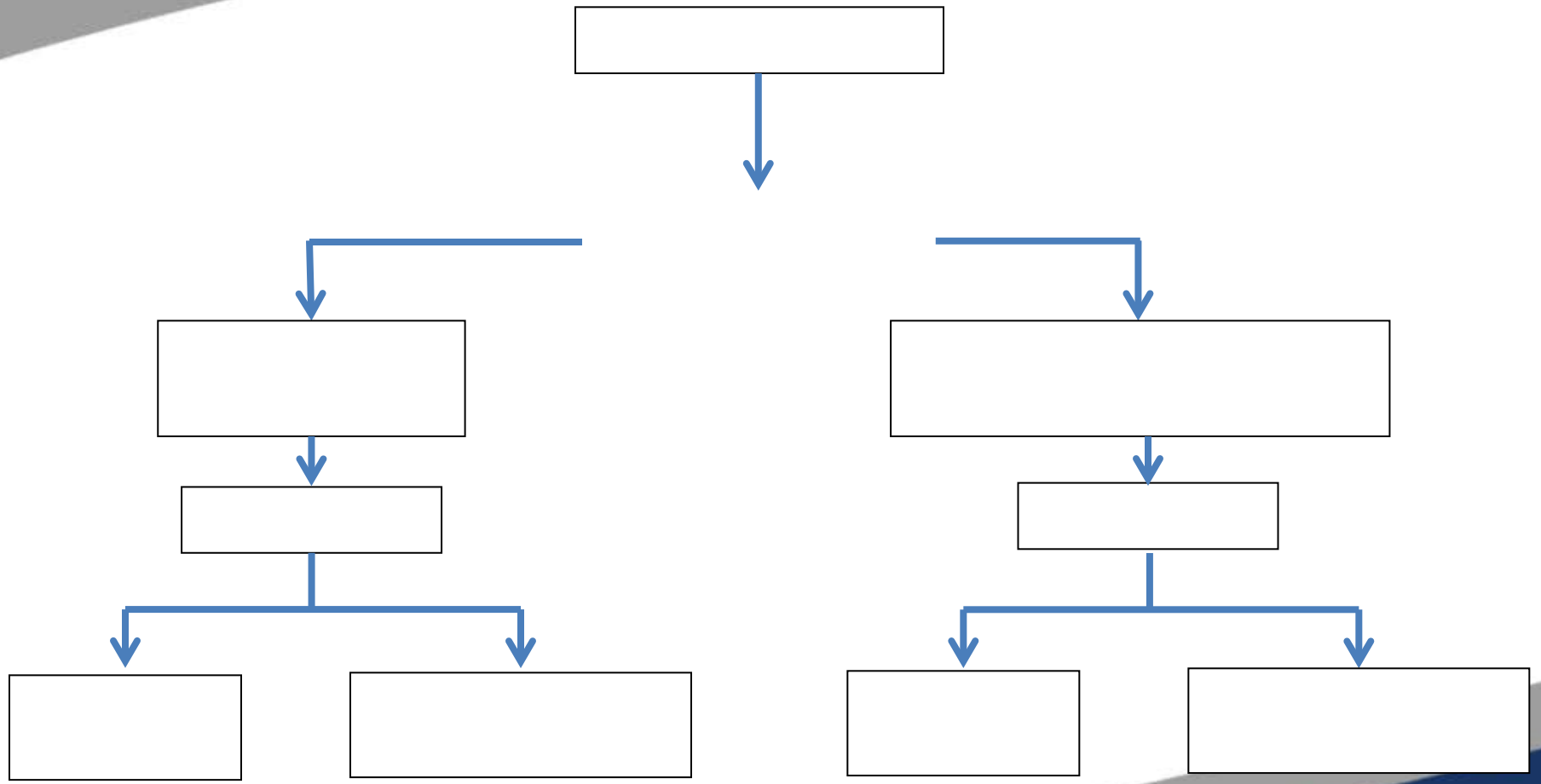
## Inclusion criteria

- Open or minimally invasive low anterior , coloanal resection for a rectal or rectosigmoid neoplasm
- Planned anastomosis 10 cm or less from the anal verge



# Subject Randomization

Sample size calculation: 550 patients



# PILLAR III

## Primary Endpoints

- To demonstrate an improvement in post-operative anastomotic leak rate in low anterior resection procedures where colon and rectal tissue perfusion is evaluated
  - PINPOINT or SPY vs standard surgical practice alone





# Phase II European trial PINPOINT in colorectal surgery

- Multi-centered, phase II prospective trial
- Geneva/Oxford/Dublin
- 375 elective colorectal resections
- Indications
  - Colorectal cancer - 65%
  - Diverticular disease - 18%
  - Crohn's disease - 9%
  - Ulcerative colitis – 3%
  - Other – 5%

# Phase II European trial PINPOINT in colorectal surgery

## Type of surgery

# Phase II European trial PINPOINT in colorectal surgery

- Technique
  - Laparoscopy – 90%
  - Open – 10%
  - Conversion – 6%
- PINPOINT possible in 100% of cases
- Added procedure time
  - 4 min (0.2-20 min)
  - 2 assessments
- Time for ICG to reach anastomosis: 30 sec.(10-107s)

# Phase II European trial PINPOINT in colorectal surgery

- Alteration in surgical resection margin: 6% (24 patients)
  - 18 patients at first image acquisition
- Change in resection margin: 0.5-2.0cm
- 6 patients required 2<sup>nd</sup> injection of ICG
  - 5 patients – no diverting stoma due to perfusion
- No anastomotic leaks in patients with altered resection margin

# Phase II European trial PINPOINT in colorectal surgery

- Anastomotic leak rate – 2.4% (9/375)
- Stratified data
  - 3 – Right hemicolectomy
    - Treated with ileostomy
  - 3 - (2) High anterior resection and (1)Hartman reversal
    - Treated with creation of end-colostomy after anastomosis takedown
  - 3 – Low anterior resection
    - Treated with EUA and transanal drainage leading to salvage

# Phase II European trial PINPOINT in colorectal surgery

- No ICG allergic reaction
- No Mortality
- Complications
  - Grade III-IV complication 8%
  - Grade II complication: 9%
  - No complication: 73%
- Re-operation 14

# NSQIP: Anastomotic Leaks

- Fluorescence Imaging
  - May have some potential

