

ERAS

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Pancreatic Cancer: Perspective

- 4th leading cause of cancer deaths in men and women in the United States.
- Disproportionally affects the elderly¹
 - 80% of pancreatic cancer patients are over age 60.
- Historically, pancreatic surgery is considered highest risk.
 - Morbidity rates remain high, exceeding 30% in some studies²⁻⁴

1. Adv Surg. 2009; 43: 233–249.

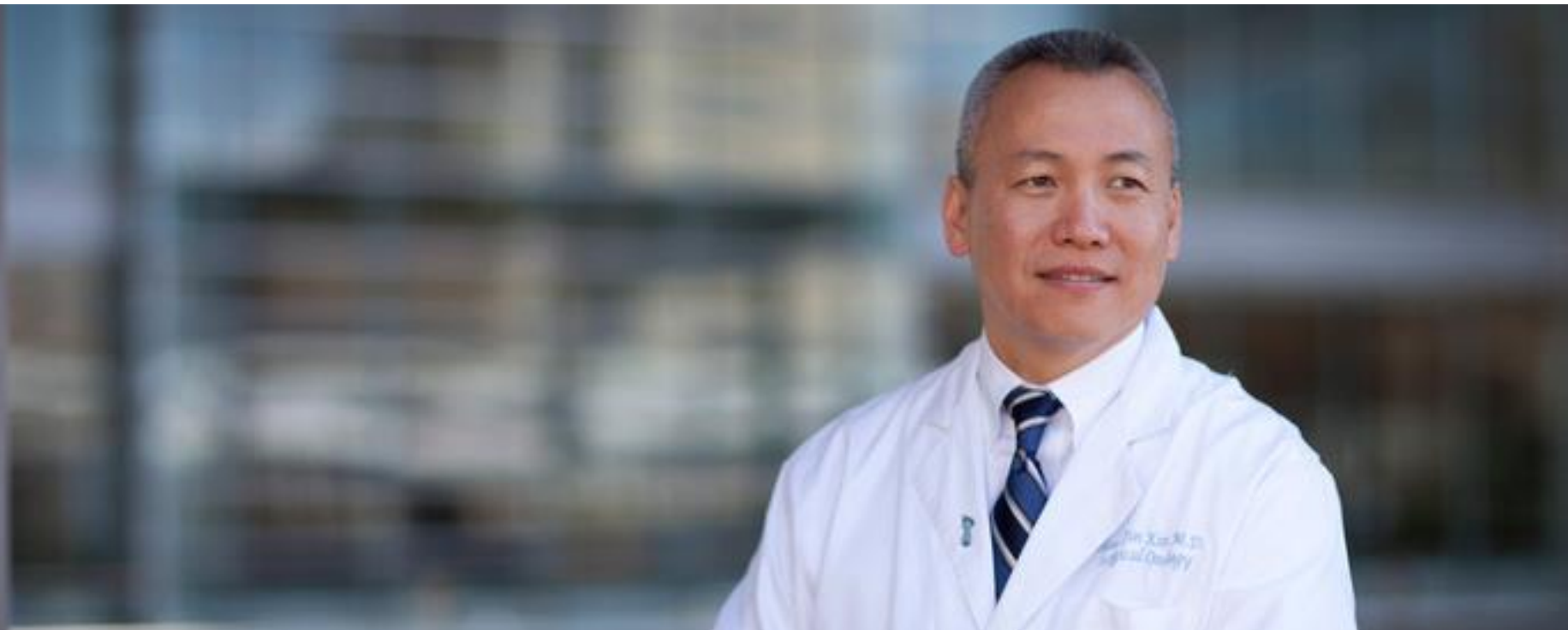
2. Arch Surg. 2001 Apr;136(4):391–398

3. Gastrointest Surg. 2006 Nov;10(9):1243–1252

4. J Gastrointest Surg. 2006 Nov;10(9):1199–1210

Pancreatic Surgery: Perspective

- UNC Health Care:
 - One of the national leaders in pancreatic surgery (top 10% of total volume of cases)



The Problem(s): Defined

- Variability in the quality of care delivered
- Inconsistent patient outcomes
- Variable lengths of stay
- Suboptimal pain control
- Inappropriate transfusion of blood
- Numerous unanticipated ICU admissions for resuscitation or diuresis

Project Aim

- Achieve greater than 30% compliance with all components on an evidence-based ERAS clinical pathway for patients undergoing major pancreatic surgery within one year.

What is ERAS?

- **E**nhanced **R**ecovery **A**fter **S**urgery
- Evidence-based recommendations for preoperative, intraoperative, and postoperative care of patients undergoing a variety of major surgeries.

Why should we use ERAS clinical pathways?

- Evidence-based standardization of care has demonstrated:
 - Decreased perioperative morbidity and mortality
 - Decreased length of hospital stay

ERAS: A Paradigm Shift

- ERAS serves to evaluate traditional practices and make evidence-based recommendations for improvement.
- “The immediate challenge to improving the quality of surgical care is not discovering new knowledge....

.... **but rather how to integrate what we already know into practice.”**

ERAS: Core Components

PREOPERATIVE	INTRAOPERATIVE	POSTOPERATIVE
Patient education	Defined blood pressure goals	Extubation in operating room
Identification of baseline blood pressure and ideal body weight	Antibiotic prophylaxis (per SCIP guidelines)	Thoracic epidural analgesia, avoidance of systemic opiates
Consumption of 240 ml (8.1 oz) carbohydrate drink	Standardized anesthetic approach	Multimodal analgesia
Low thoracic epidural	Thoracic epidural management strategy, avoidance of systemic opiates	Daily ambulation goals
Preoperative crystalloid bolus	Goal-directed fluid therapy algorithm	Early removal of nasogastric tube
Multimodal analgesia	Mechanical Ventilation Strategy	Early removal of urinary (Foley) catheter
VTE Prophylaxis	Transfusion Guidelines	

Preoperative ERAS Components

- Consumption of 8 oz of clear carbohydrate beverage (Clearfast) 2 hours prior to surgery



ERAS: Outcomes

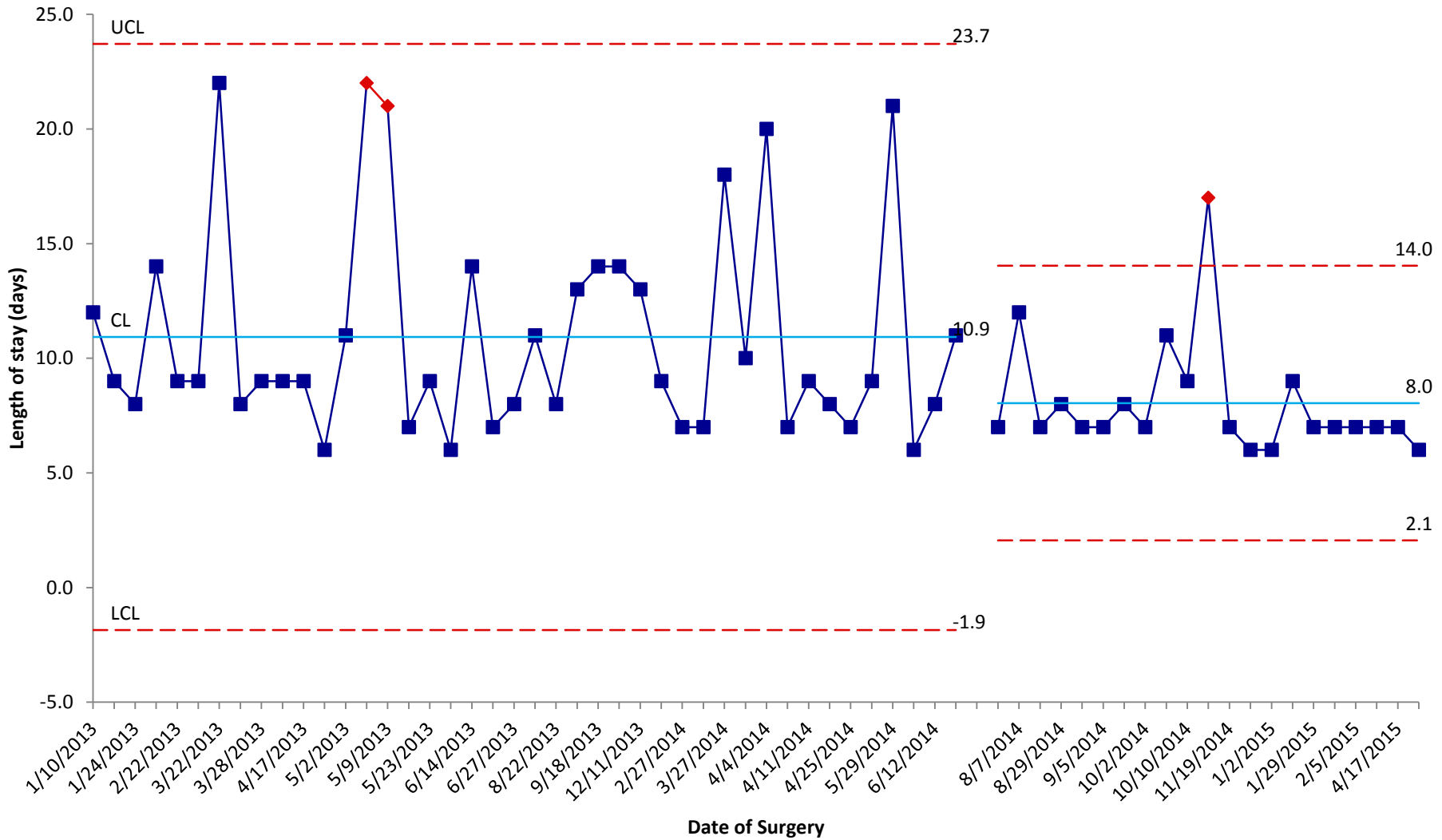
- Primary outcome: hospital length of stay
- Secondary outcomes:
 - Intraoperative fluid totals
 - Blood product administration
 - Post operative pain scores
 - PACU recovery times (phase I)
 - Readmission rates

ERAS: Length of Stay

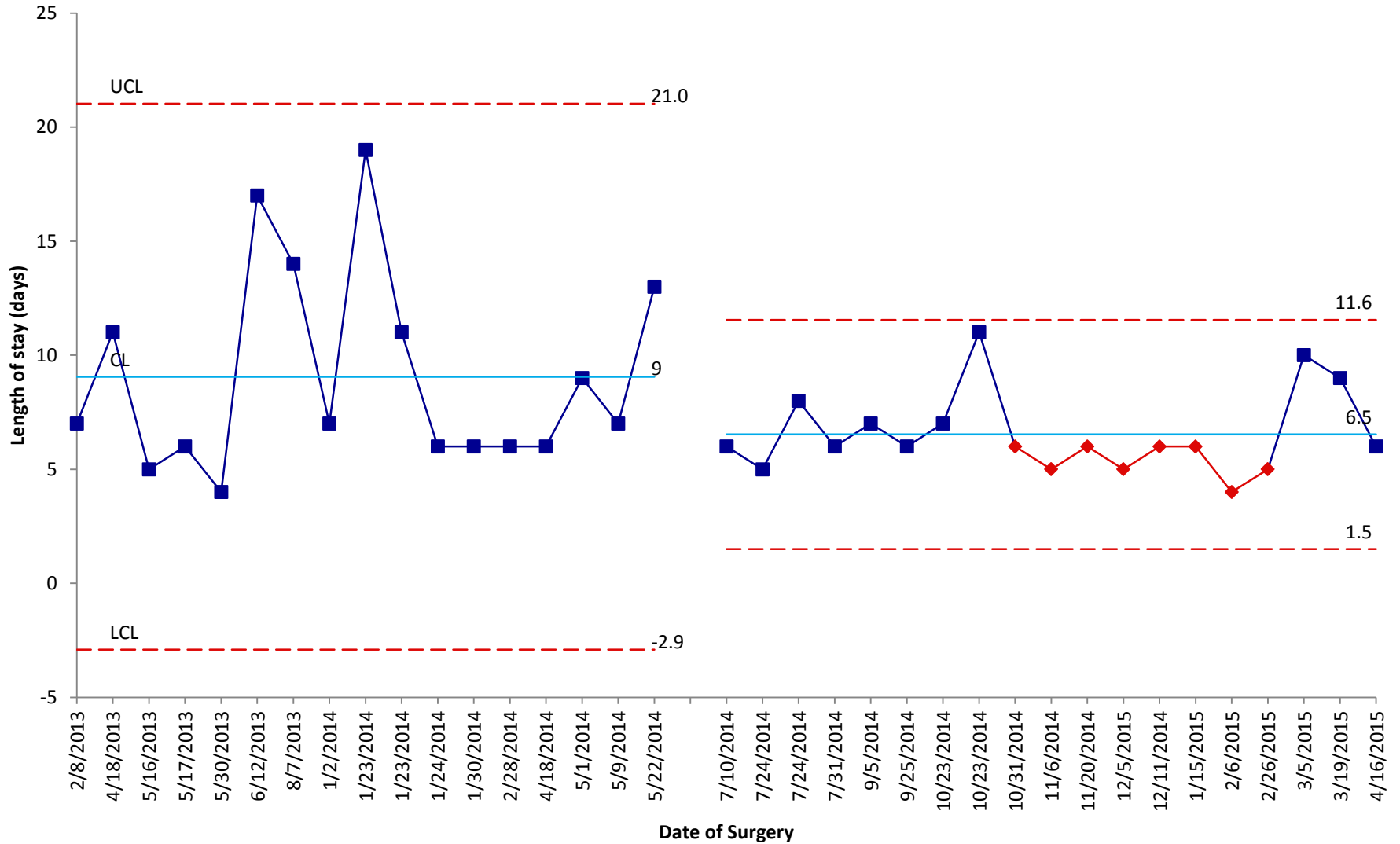
Whipple Procedures			
Total LOS (days)	Controls	ERAS	Difference
N=	42	21	
Mean LOS (days)	10.9	8.0	-2.9
Median LOS (days)	9.0	7.0	-2.0
Standard deviation (days)	4.64	2.56	-2.08
p-value	0.00125		

Distal Pancreatectomies			
Total LOS (days)	Controls	ERAS	Difference
N=	17	19	
Mean LOS (days)	9.1	6.5	-2.5
Median LOS (days)	7.0	6.0	-1.0
Standard deviation (days)	4.41	1.81	-2.60
p-value	0.0337		

Control Chart: Whipple LOS



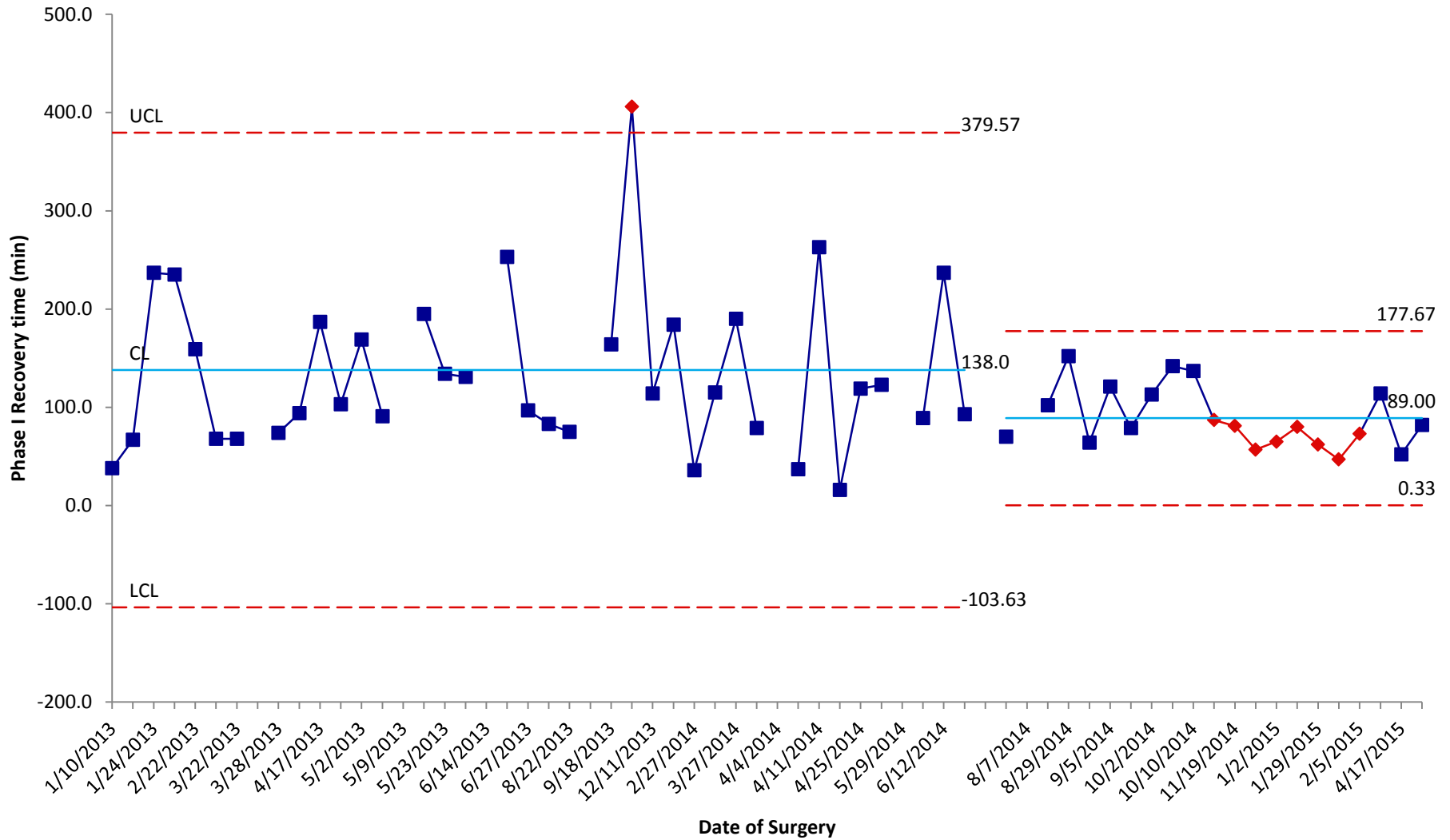
Control Chart: Distals LOS



ERAS PACU Phase I Recovery Time Whipple Procedures

Whipple Procedures	Controls	ERAS	Difference
PACU Ph I time (minutes)			
N=	36	20	
Mean (minutes)	138.0	89.0	-49
Median (minutes)	117.0	80.5	-36.5
Standard deviation (minutes)	78.55	31.19	47.37
p-value	0.0122		

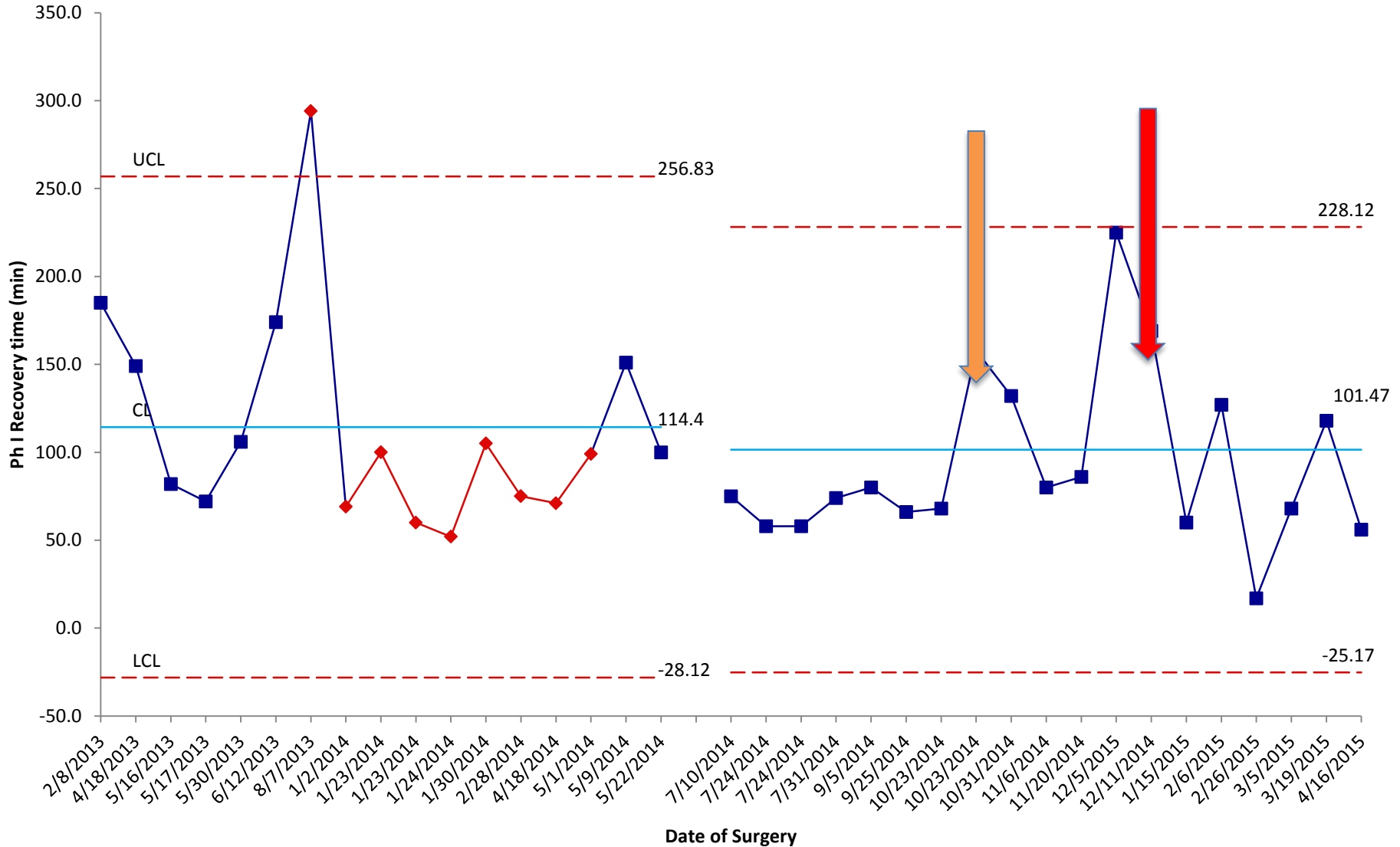
Control Chart: Whipples PACU times



ERAS PACU Phase I Recovery Time: Distal Pancreatectomy

Distal Pancreatectomy			
PACU Ph I time (minutes)	Controls	ERAS	Difference
N=	17	19	
Mean (minutes)	114.4	101.5	-12.9
Median (minutes)	100.0	80.0	-20.0
Standard deviation (minutes)	60.90	49.02	-11.88
p-value	0.398		

Control Chart: Distal PACU times



HYPOTHESIS #3:

Insufficient volume of local anesthetic was administered to the distal pancreatectomy group.

PLAN: Review infusion rates and total volume of local anesthetic administered to both the distal pancreatectomy and Whipple patients.

DO: Reviewed the intraoperative anesthetic record for time the epidural infusion was started, the infusion rate, and the total volume of local anesthetic that was administered.

CHECK: No difference in the time the epidural was started (immediately after induction of general anesthesia) or infusion rates (4-6 mL/hr). However, there was a significant difference in total volume administered to the distal pancreatectomy group as compared to the Whipple group, as the average surgical time was much shorter in the distal pancreatectomy group (2 hours) versus the Whipple group (7 hours).

ACT: Changed the thoracic epidural management strategy for distal pancreatectomy group to include a bolus of local anesthetic prior to start of the infusion, which improved dermatomal spread and significantly improved post operative pain scores for this group.

HYPOTHESIS #1:

Anatomic placement of the thoracic epidural may have been different for the distal pancreatectomy group.

PLAN: Review procedure notes for documentation on anatomic placement of the thoracic epidural catheter in both patient groups.

DO: Reviewed the procedure notes for anatomic location of the epidural catheter.

CHECK: Anatomic placement was the same (T9) in both patient groups.

ACT: Explore a different hypothesis.

HYPOTHESIS #2:

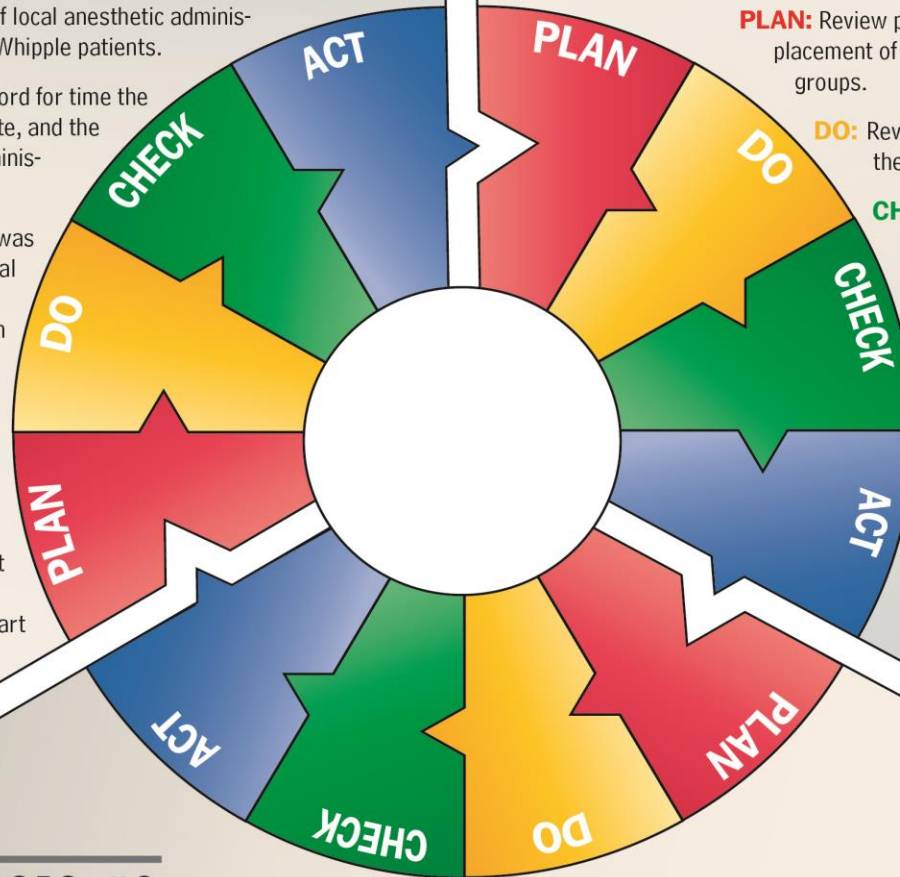
The surgical incision covered more dermatomes in the distal pancreatectomy group (8 cm vertical incision to the right of midline) than in the Whipple group (20 cm horizontal incision below the subcostal margin). The thoracic epidural may not cover the lower part of the incision in the distal pancreatectomy group.

PLAN: Check analgesic level of the thoracic epidural in all patients upon arrival to the PACU, to ensure that the incision was well covered by the local anesthetic.

DO: Assessed each patient for the level of thoracic epidural analgesia upon arrival to the PACU.

CHECK: Patients in the distal pancreatectomy group had insufficient coverage of the lower part of their incision.

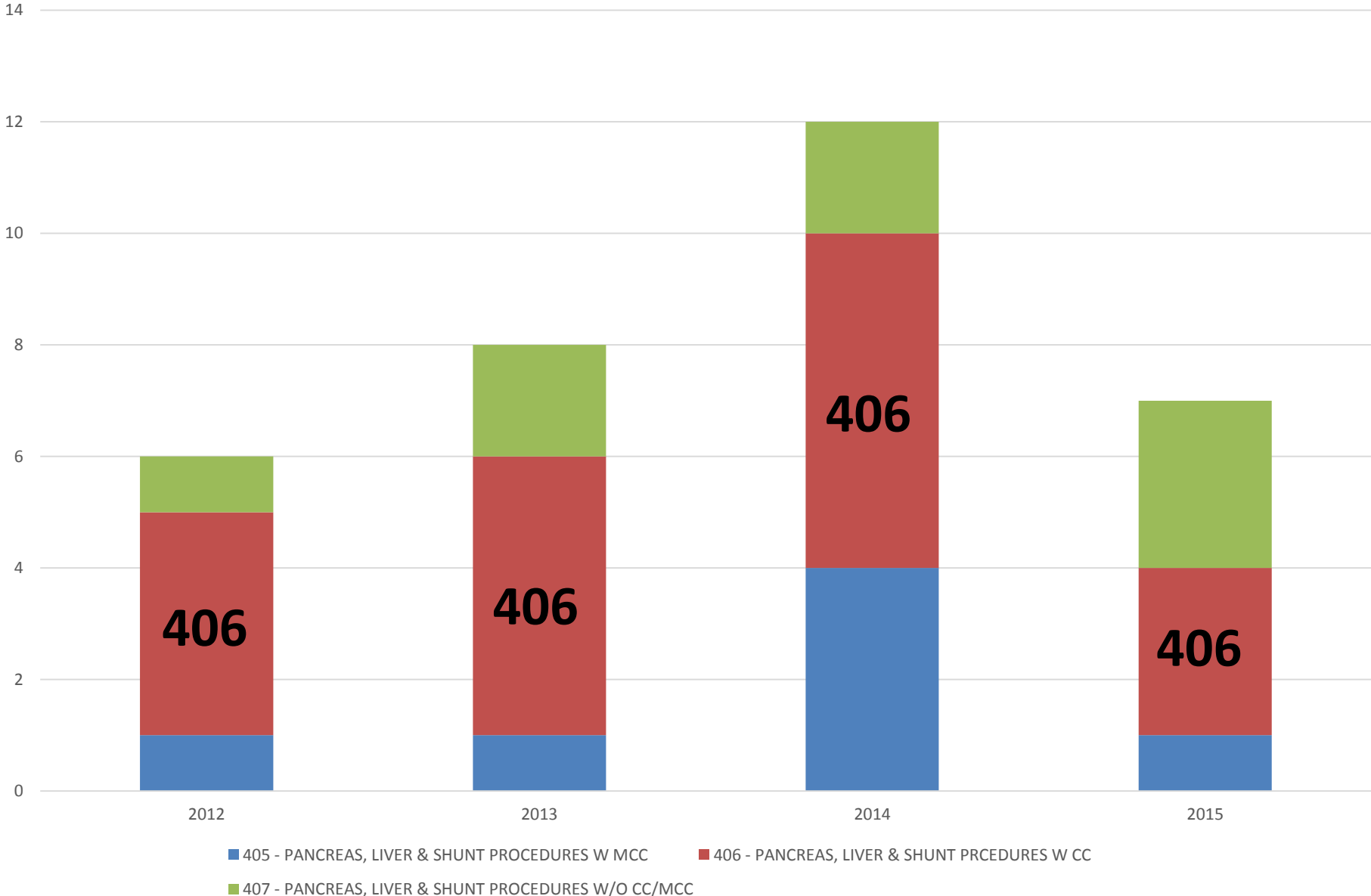
ACT: Re-evaluate the thoracic epidural management strategy, specifically with regards to volume of administered local anesthetic in each group.



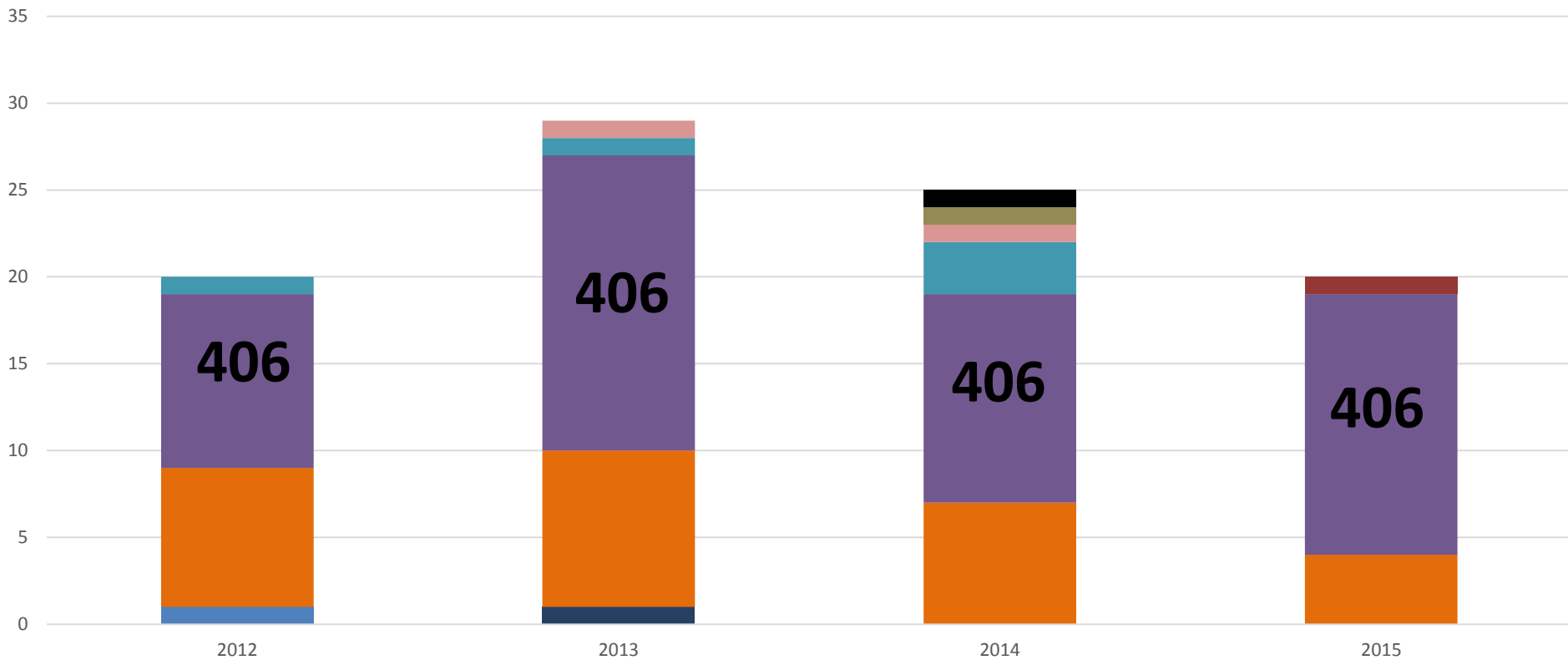
ERAS: Financial Analysis

- Step 1: Define the patient group and principle proceduralist (HJ Kim)
 - ICD9 principle procedure code 52.7 (Whipple)
 - ICD9 principle procedure code 52.52 (Distal)
- Step 2: Categorize these procedure groups into MS-DRGs with similar expected resource utilization
 - Helped to ensure that the changes in LOS were due to changes in the clinical care pathway, and NOT due to changes in patient mix.
- Step 3: Look for observed changes in mean LOS within these groups.

MS-DRG Breakdown: ICD-9 principle procedure is 52.52 (Distal Pancreatectomy) and surgeon HJ Kim



MS-DRG Breakdown: ICD-9 procedure 52.7 (WHIPPLE), and surgeon HJ Kim



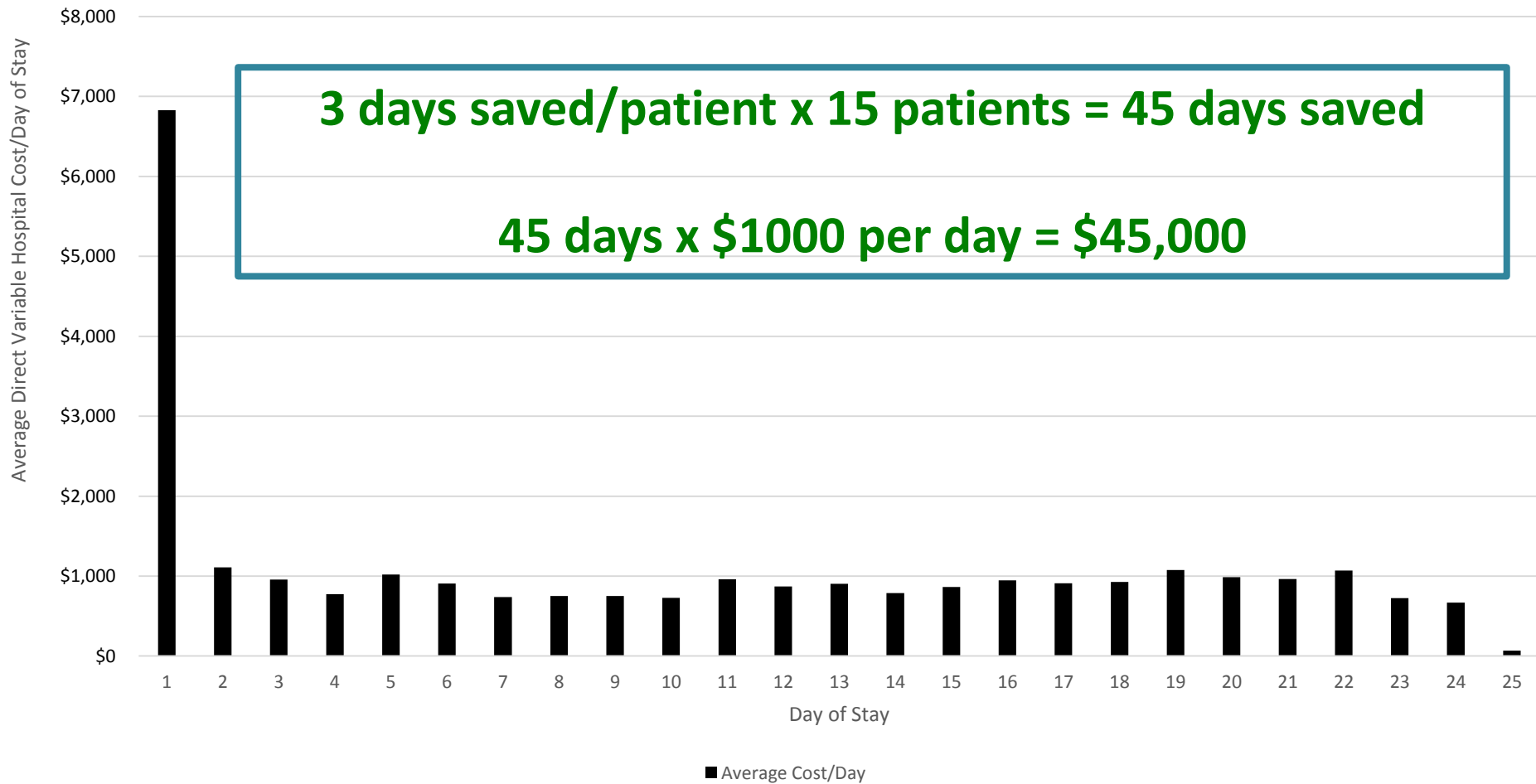
- 982-EXTENSIVE O.R. PROCEDURE UNRELATED TO PRINCIPAL DIAGNOSIS W CC
- 907-OTHER O.R. PROCEDURES FOR INJURIES W MCC
- 830-MYELOPROLIF DISORD OR POORLY DIFF NEOPL W OTHER O.R. PROC W/O CC/MCC
- 829-MYELOPROLIF DISORD OR POORLY DIFF NEOPL W OTHER O.R. PROC W CC/MCC
- 407-PANCREAS, LIVER & SHUNT PROCEDURES W/O CC/MCC
- 406-PANCREAS, LIVER & SHUNT PROCEDURES W CC
- 405-PANCREAS, LIVER & SHUNT PROCEDURES W MCC
- 327-STOMACH, ESOPHAGEAL & DUODENAL PROC W CC
- 326-STOMACH, ESOPHAGEAL & DUODENAL PROC W MCC

2012: LOS 9.9
 2013: LOS 11.9
 2014: LOS 11.0
 2015: LOS 7.9

ERAS: Financial Impact

- Focus in on **MS-DRG 406** for Whipples (n=15):
 - Average total variable cost for a single pancreatic surgery admission (10 days): **\$14,000 to \$17,000.**
 - Average cost per hospital day: \$1000 to \$1200

Average Variable Cost by Day of Stay – Whipple cohort MS-DRG 406



ERAS: Financial Impact

- Need to save **8** days to create a new opportunity for a surgical admission, known as **“backfill opportunity”**
- ERAS has saved approximately 3 days per patient (n=40).
 - $3 \times 40 = 120$ days saved
 - $120/8 = 15$ new backfill opportunities created

ERAS Financial Impact: Whipple procedures in cohort **MS-DRG 406**

45 days saved

X

\$1000 direct variable cost/day

\$45,000 in total cost savings

Estimation of backfill opportunity (created by the decreased LOS) in this cohort:

Total days saved/Mean LOS = Capacity for additional cases

45 days saved/8 Days = Capacity for ~5 additional cases

We conservatively estimate the average hospital contribution margin per case in this cohort to be **~\$14,000**, which means that the financial impact of the backfill opportunity is **~\$70,000**

ERAS Financial Impact: Whipple procedures in **MS-DRG 406**

Total financial impact in this cohort is estimated as:

Total impact = cost savings + backfill cost

Total impact = \$45,000 in cost savings + \$70,000 in backfill cost
= \$115,000

The impact of scaling ERAS to larger cohorts of patients could be sizeable if similar LOS savings are observed

To summarize:

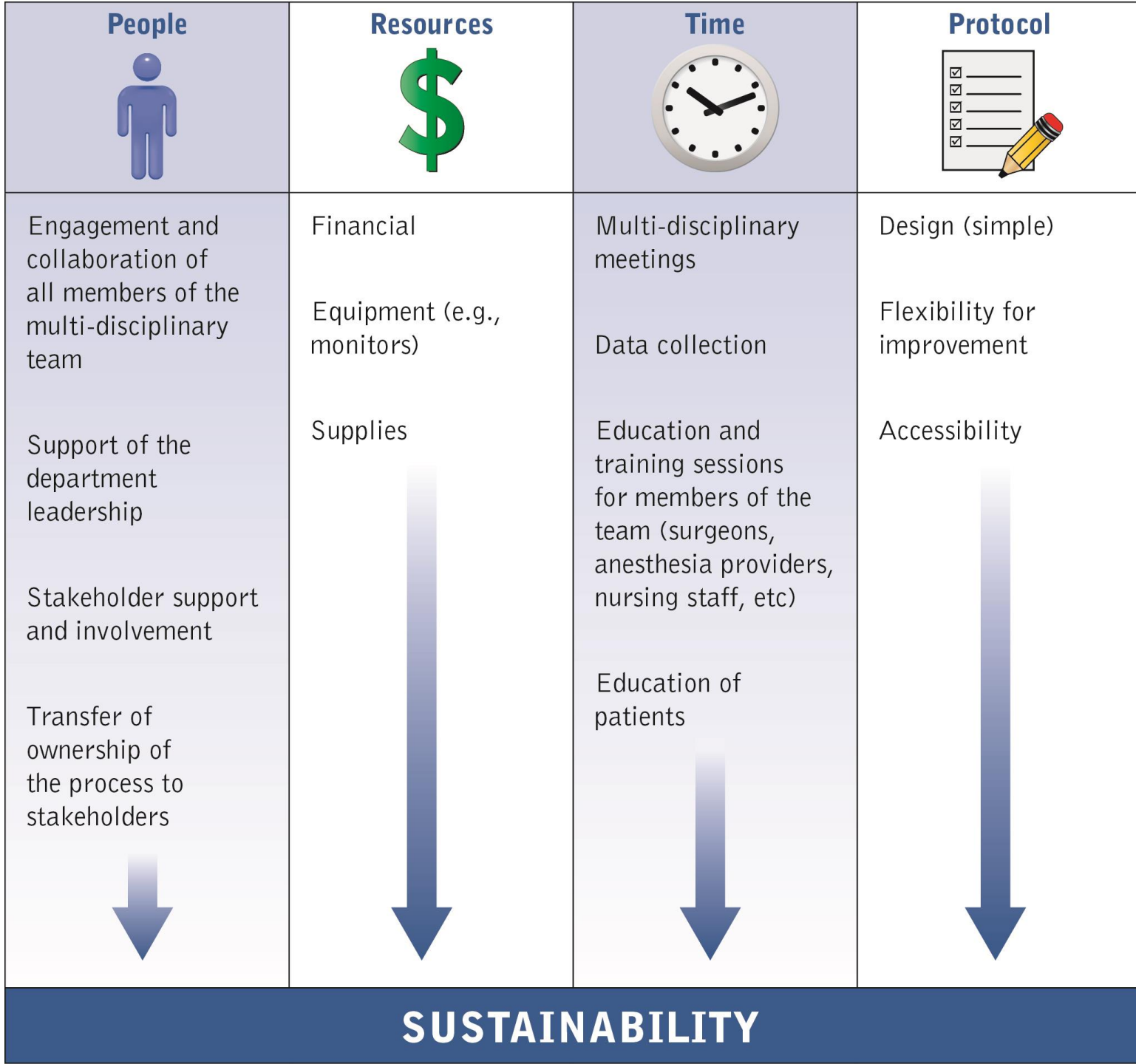
In a cohort of 15 patients, we believe the financial impact over the course of less than one year to be
~\$115,000

ERAS: Impact on UNC Culture

- PACU Nurse Testimonials:
 - “He came out to me with a 10-12” incision with **zero pain**, which is a rarity....”
 - “It’s amazing to have a 12-13” incision AND **stable blood pressure** AND no pain.”
- Resident Physician Testimonials:
 - “Our patient looks amazing!!! ...**looked like he had not had surgery yesterday**. Would have to say he is the best looking POD #1 Whipple patient I have seen in my 6+ years as a resident here at UNC.
 - “**I have never seen a Whipple patient come out of the OR looking better**. I could hardly believe that this patient had just undergone a long open surgery.”

I think the care I received at this hospital with everyone involved was outstanding. Dr Kim and his team are absolutely super, delightful, and caring people. How blessed we are to have been in their care.

Video



Sustainability

Action 1: Transfer of ownership of ERAS **identification and education process** to surgical oncology clinic.

Action 2: Surgical oncology provides ERAS patients with the **pre-operative carbohydrate beverage**.

Action 3: Surgical oncology takes **two sets of blood pressures** as a first step in calculating the target systolic blood pressure range used in the intra-op part of the ERAS pathway.

Action 4: Creation of an electronic preop note in EPIC which contains **ERAS-specific information for perioperative team**. This will replace physical hard-copy “pink” preop sheet.

Expansion

→Plan 1: Each surgery clinic will have ownership of this part of the ERAS process.

→Plan 2: Each surgery clinic will be responsible for stocking the pre-operative carbohydrate beverage and giving it to their ERAS patients.

→Plan 3: Each surgery clinic will take two sets of blood pressures during the patient encounter.

→Plan 4: Surgery clinics will use this EPIC smart phrase to create their own electronic preop ERAS note. This note will be familiar to the ERAS Anesthesia Team on the day of surgery.

Sustainability

Action 5: Create a user-friendly, quick **reference guide for the anesthesia team** to refer to on the day of surgery. It will include key steps and useful formulas.

Action 6: Stock ERAS operating rooms with **ERAS identification bracelets and stickers**. This removes the need for a research coordinator to place them in the patient's chart beforehand.

Action 7: Develop an **ERAS patient educational booklet**. This will reinforce clinician instruction provide patients with material to review at home.

Action 8: Identify cheaper **alternatives to carbohydrate beverage**. (Vitamin Water contains a similar nutritional profile and is 1/10th the cost).

Expansion

→Plan 5: A similar quick reference guide will be created for each ERAS-specific surgery.

→Plan 6: Stock other operating rooms with ERAS identification bracelets and stickers.

→Plan 7: Each surgery clinic will provide ERAS education booklets to facilitate education.

→Plan 8: Work with UNC food services to obtain bulk discounted price on Vitamin water.