

ERAS Implementation Outcomes at Grey Nuns Hospital – Reduction in Use of Total Parenteral Nutrition

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Declaration of Conflict of Interest



I, SIMON BYRNS declare that in the past 3 years:

I have received manufacturer funding from the following companies*: No

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**pharmaceutical or medical/dental equipment*

Outline

- Background and Rationale
- Hypothesis and Study Design
- Results, Subgroup Analysis
- Cost Analysis
- Limitations and Precautions
- Conclusions



ERAS Development



- Enhanced Recovery AKA “Fast-Track” pioneered by Dr. Henrik Kehlet from Hvidovre University, Denmark
 - Multimodal approach to reducing postoperative morbidity/mortality
- Guidelines designed to streamline and optimize patient education, fluid management, minimal incision length, decreased use of tubes/drains, opioid sparing analgesia, early mobilization and oral intake/nutrition

Evidence for ERAS

- Several Meta-Analyses of Enhanced Recovery Programs (ERPs) have demonstrated a significant reduction in postoperative morbidity and length of stay
- Cochrane review suggests too few RCTs to recommend ERPs as standard of care at this time
- Disadvantages?
 - Some studies report increased rates of readmission (bounce backs) for patients enrolled in an ERAS pathway
- No previous studies report the effect of ERAS/ERPs on TPN use

Quality Improvement in Colorectal Surgery

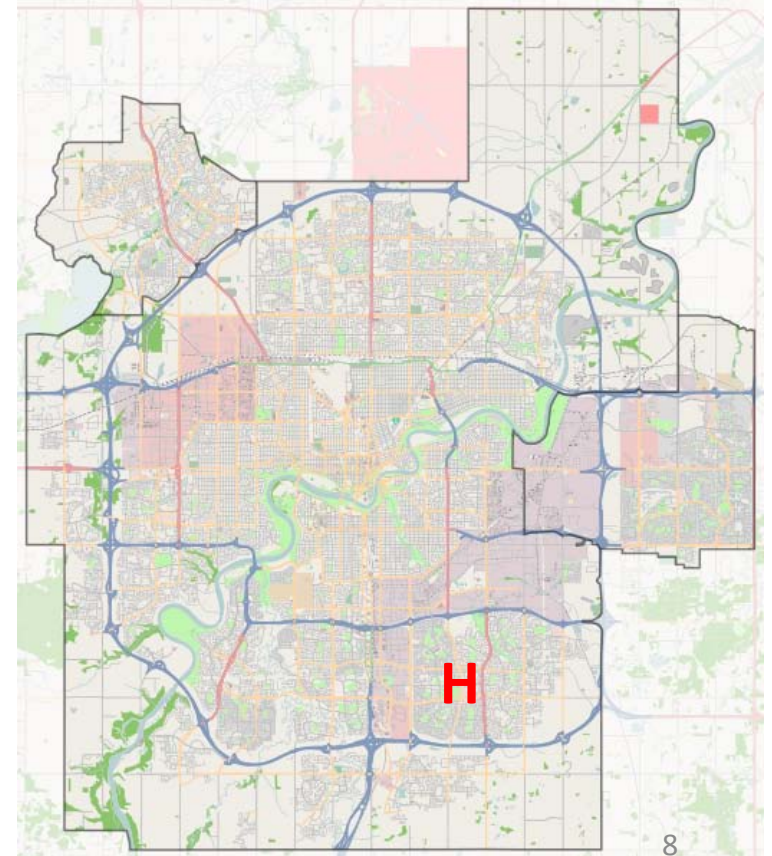
- Grey Nuns selected as one of two pilot sites for implementation of an ERAS program in Alberta in late 2013
- Development of a site specific protocol for pre and postoperative care based on ERAS society guidelines and recent literature
- Gradual introduction of protocol in selected colorectal patients
- Date selected for full implementation based on consensus among members of multidisciplinary team

Evidence for ERAS, what about TPN?

- Several Meta-Analyses of Enhanced Recovery Programs (ERPs) have demonstrated a significant reduction in postoperative morbidity and length of stay
- No previous studies report the effect of ERAS/ERPs on TPN use
- Could TPN be used as a surrogate marker for impaired intestinal motility (adynamic ileus) in ERAS patients?

Study Setting

- Grey Nuns Hospital is a 323 Bed hospital in Southeast Edmonton with 111 Acute Care Beds
- ~200-225 *elective* colorectal procedures per year
- ERAS program formally implemented on September 1, 2013



Hypothesis

- Implementation of an the ERAS enhanced recovery program at Grey Nuns hospital would result in a significant decrease in length of stay and use of TPN

Primary Outcomes

- Length of Stay
- TPN Initiation
- TPN Duration

Secondary Outcomes

- Complication rate
- Reoperation rate
- ICU Admission rate
- Mortality

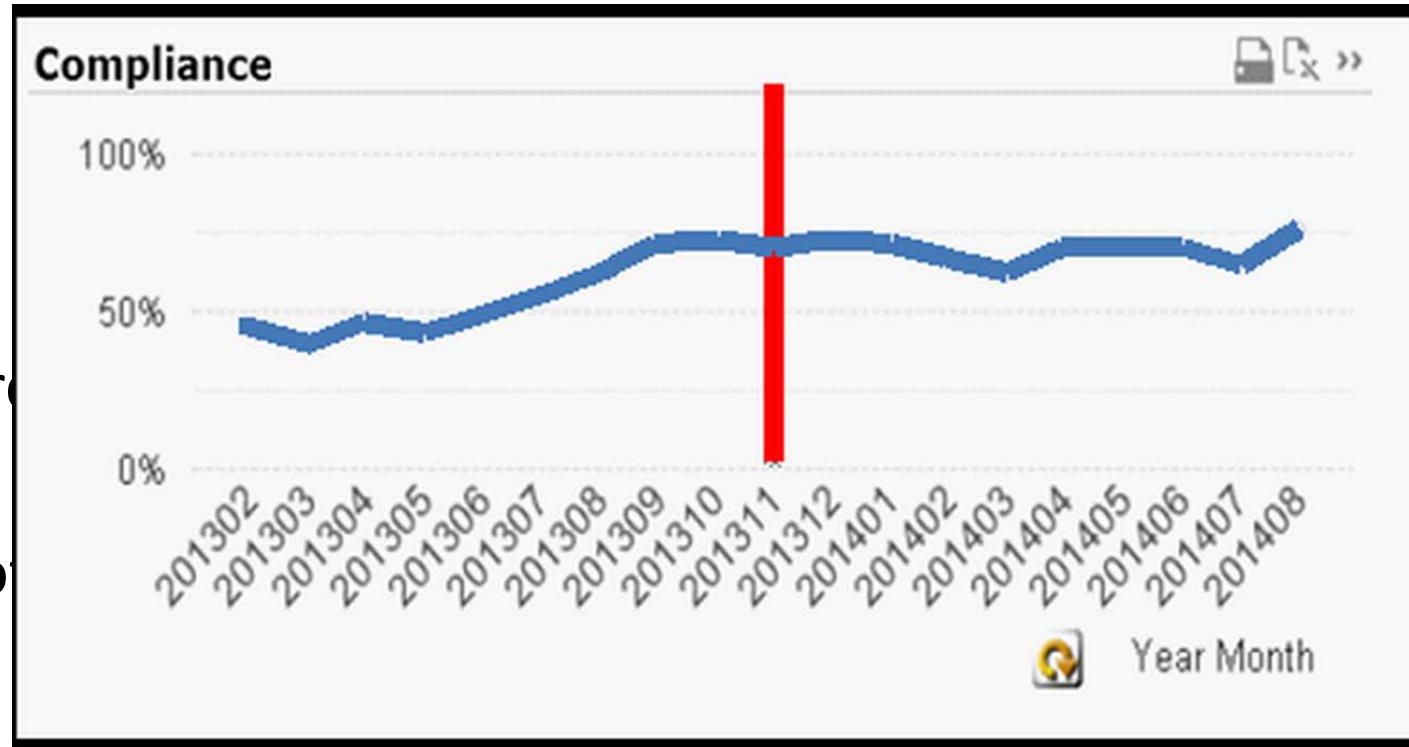
Methodology

- Health Ethics Review Board approved study at the University of Alberta (TPN Data)

- All other data

- Retrospective 2013 and March

- Two cohorts of procedures at



between February 12,

colorectal
ation

- November 1st 2013 selected as start of ERAS cohort, based on surgeon consensus and database generated compliance figures

Analysis

- Outcome measures were compared in both cohorts with a 2-sample Mann Whitney U test (continuous data) and Fischer's Exact test (categorical data)
- TPN was analysed as both a categorical (initiation) and continuous (number of bags/days) variable
- Complications were reclassified using Clavian Dindo classes I-IV
- Subgroup analysis was used to calculate median length of stay by procedure and operative approach

Direct Cost Analysis

- Cost analysis was performed by obtaining the total direct cost for the equipment and manpower required to initiate and maintain a TPN infusion
- Estimated the cost-savings based on changes to the median length of TPN administration.

Patient Demographics

	Pre-ERAS (n=50)	ERAS (n=50)	P value
	Years	Years	
Age	63±14.2	66±12.5	0.46
Gender			
M	32	25	0.23
F	18	25	
ASA Class	%	%	
1	11	8	0.09
2	68	49	
3	19	43	
≥4	2	0	

- No significant difference in any of the patient factors
- Relatively higher ASA class patients in ERAS cohort

Patient Demographics

Patient Factor	Pre-ERAS (n=50)	ERAS (n=50)	P value
BMI Category	%	%	
Underweight (BMI <20)	8	6	0.53
Normal (BMI 20-25)	25	18	
Overweight (BMI 25-30)	42	44	
Obese (BMI >30)	25	32	
	%	%	
Diabetic	6	20	0.07
	%	%	
Smoker	10	14	0.76

- Relatively more diabetics in ERAS cohort

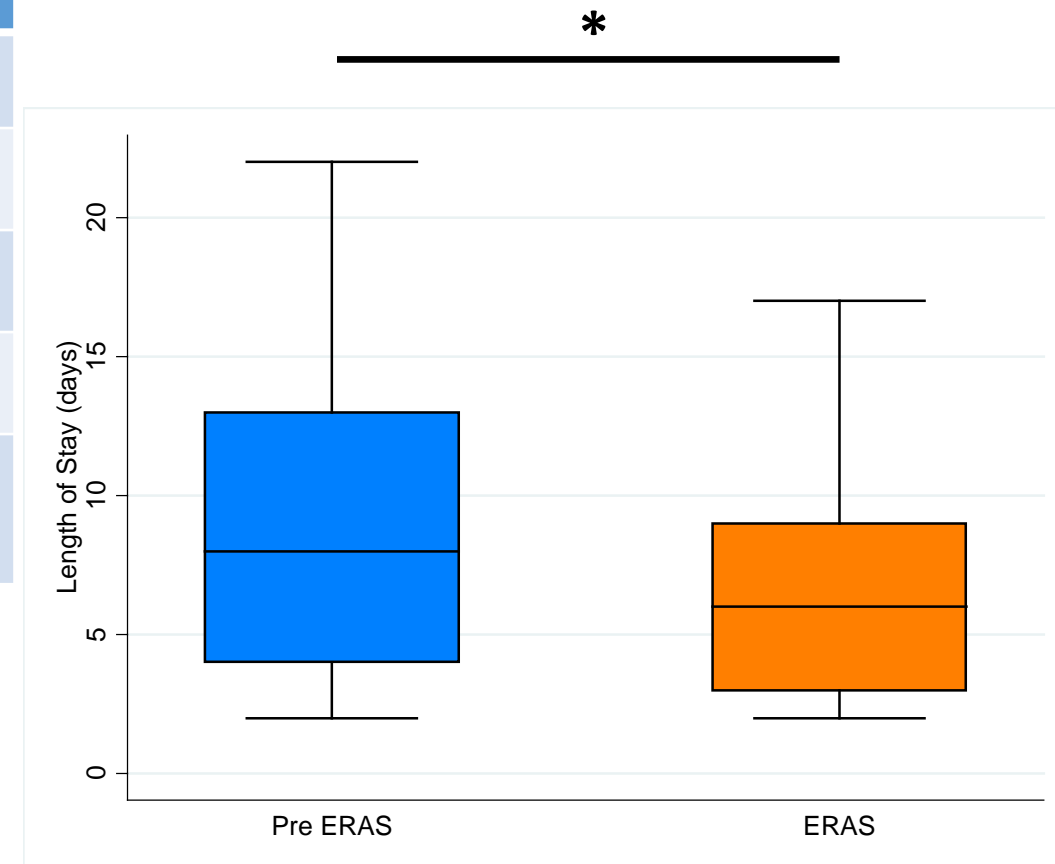
Results

Results – Primary Outcomes

	Pre-ERAS (n=50)	ERAS (n=50)	P value
Length of Stay	Days	Days	
Mean	11.6±13.1	8.3±9.5	0.02
Median	8	6	
	n (%)	n (%)	
TPN Initiation	10 (20)	4 (8)	0.07

- Significant reduction in length of stay
- Greater than 50% reduction in rate of TPN administration but not statistically significant

Length of Stay by ERAS Intervention



Subgroup Analysis: Outliers and Matched Procedure

- Both groups contained single outliers with a LOS of 62 and 87 days in the ERAS and Pre-ERAS cohorts respectively
- Only the Pre-ERAS cohort included Abdominoperineal Resection, and only the ERAS cohort included colostomy revision procedures

Cohort	Mean LOS (days)	Median LOS (days)	Minimum LOS (days)	Maximum LOS (days)	P value
Pre-ERAS	10.0 ±7.4	8	2	30	0.02
ERAS	7.2 ±5.6	6	1	27	

Subgroup analysis, excludes outliers

TPN Administration – Subgroup Analysis

Cohort	TPN Initiated n(%)	No TPN n(%)	P value
Pre-ERAS	9 (21)	34(79)	0.04
ERAS	3 (6)	44 (94)	

- Decreased rate of TPN initiation in ERAS cohort

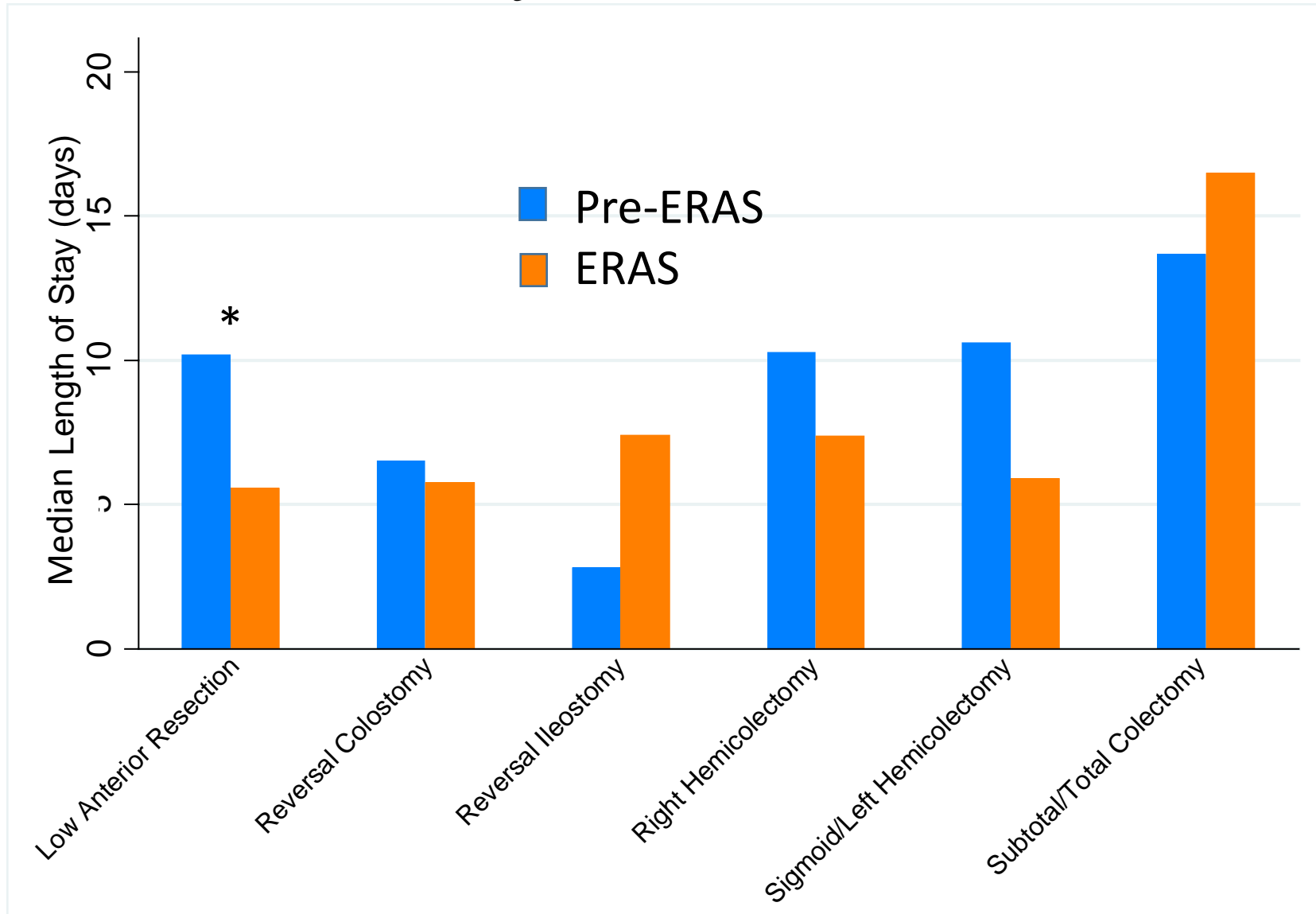
Subgroup analysis, excludes non-matched procedures

Cohort	Median (days)	Min (days)	Max (days)	P value
Pre-ERAS	6.5	1	22	0.04
ERAS	6	4	9	

- Significant reduction in number of days/bags of TPN administered

Subgroup analysis, excludes non-matched procedures

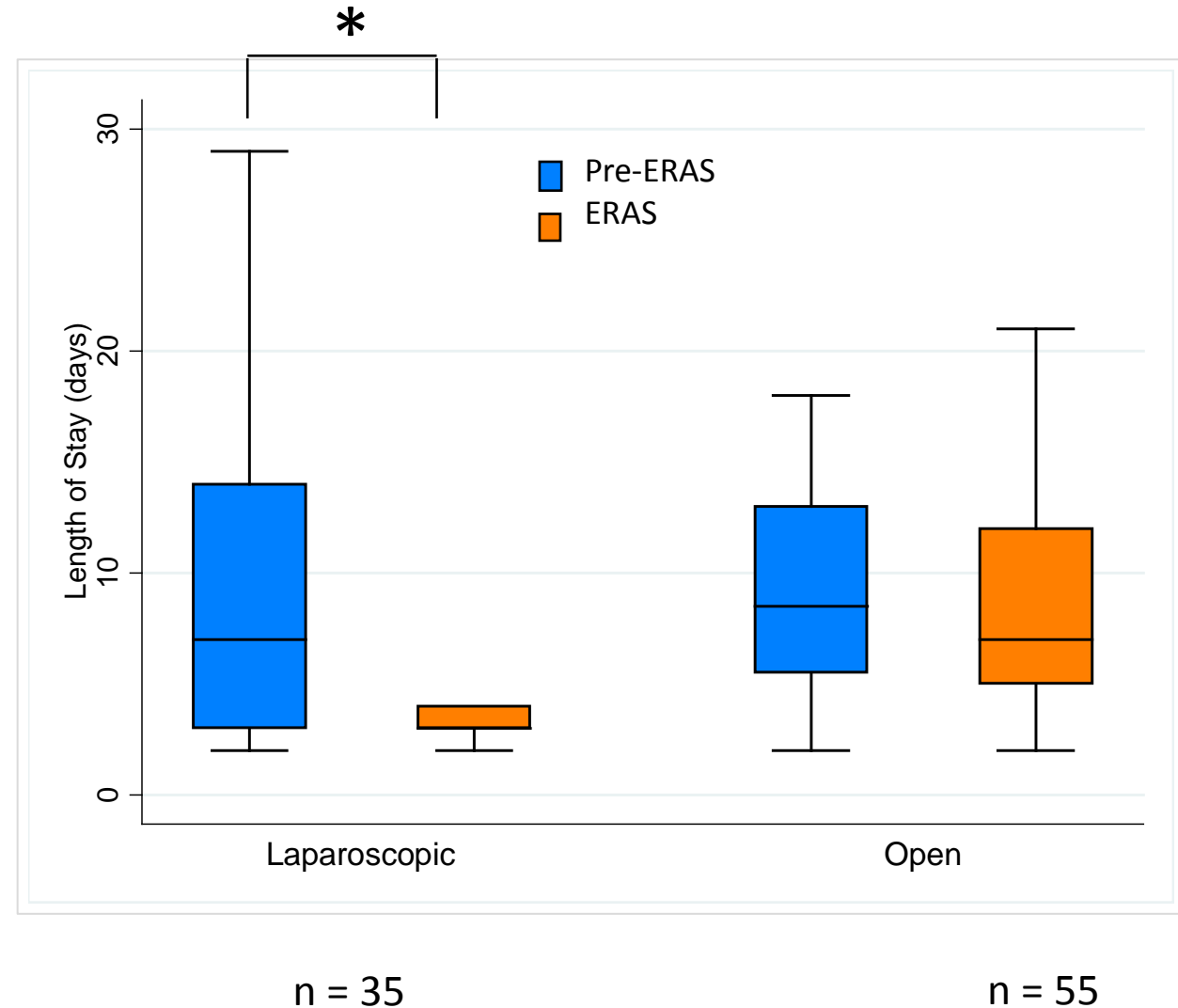
Median LOS by Procedure and ERAS Intervention



- Limited power based on number of patients per procedure

Length of Stay by Operative Approach and ERAS Intervention

- Only included procedures performed in both cohorts
- Converted procedures classified as open
- Significant reduction in LOS in Laparoscopic cohort and trend in Open cohort



Results – Secondary Outcomes

	Pre-ERAS	ERAS	p value
	n(%)	n(%)	
Complications	28(67)	19(41)	0.02
	n(%)	n (%)	
Reoperation	3(6)	3(6)	-
	n(%)	n(%)	
ICU Admission	2(5)	4(9)	0.68
	n(%)	n(%)	
Mortality	0	0	-

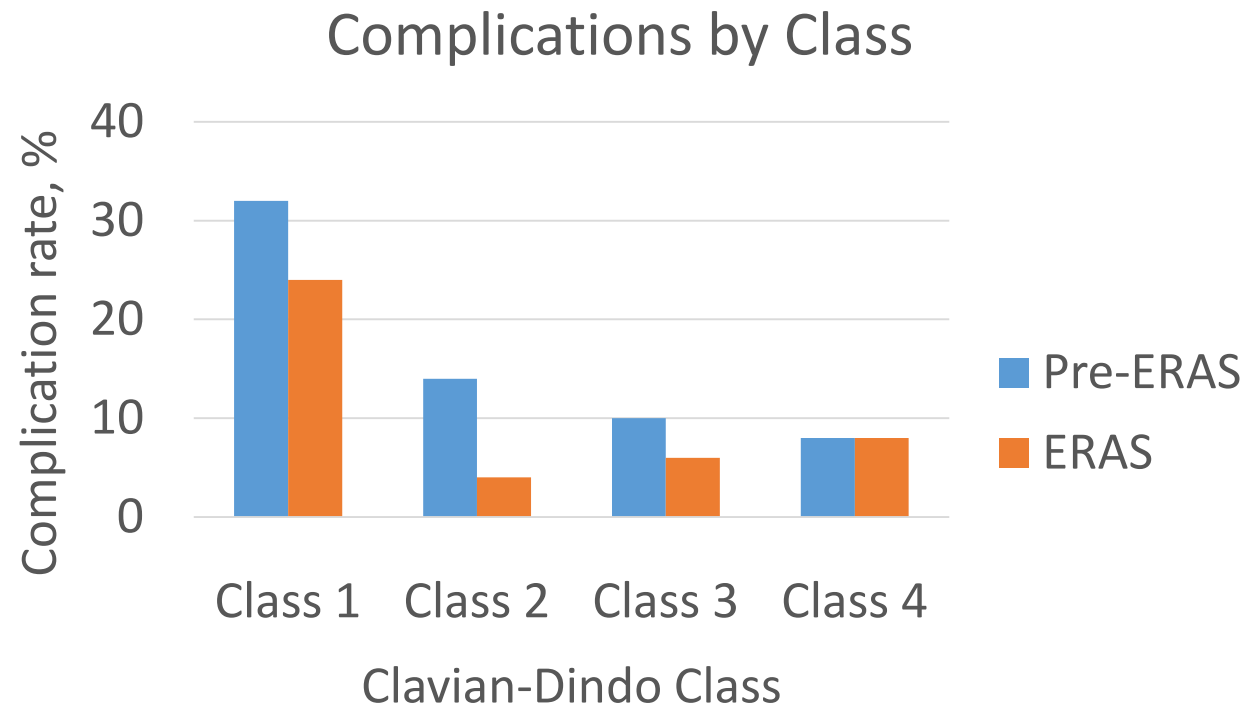
- ERAS patients had shorter ICU admissions

Subgroup analysis, excludes non-matched procedures

Complications

- Based on contracted Clavian-Dindo class I-IV

Cohort	Complications n(%)	P value
Pre-ERAS	32(64)	0.03
ERAS	21(42)	



- Significant reduction in overall complications
- No grade V (mortalities) in either group
- Majority of Grade I due to UTIs and superficial skin infections
- Foley catheters removed POD1 in ERAS cohort

TPN Cost Analysis

Expenditure	Direct Cost (\$)	Initiation Direct Cost (\$)	Daily Maintenance Direct Cost (\$)
Registered Dietician	55.80 per hour	55.80	27.90
TPN – AADS	65.00 per day	65.00	65.00
TPN – Lipids	12.00 per day	12.00	12.00
Administration set (consumables)	7.83 per 24 hours (AADS)	7.83	7.83
	8.66 per 72 hours (Lipid)	8.66	2.89
TOTAL		149.29	115.62

- This analysis does not include costs for:
 - TPN bloodwork
 - Peripherally inserted central line

Based on six fewer patients requiring initiation and administration for a median of 6.5 days, the TPN cost savings was \$4,711.20 or \$785.20 per patient.

Limitations and Precautions

- Due to small number of patients, regression analysis limited for testing influence of other factors e.g. specific surgery or complication
- Temporal bias and changes in compliance over course of data collection
- Enormous amount of data available in database, need to be cautious with interpretation (e.g. complications)
- Cost analysis not exhaustive

Conclusions

- ERAS implementation at Grey Nuns Hospital resulted in a significant decrease in length of stay
- There was a decrease in the initiation of TPN in ERAS patients and a significant reduction in days of TPN in matched procedure cohorts
- Overall complications were significantly reduced following ERAS implementation, primarily CD Class I

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