Enhanced Recovery After Surgery – ERAS Results of a 2-Year Research Project

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Muskoka Algonquin Healthcare

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Introduction

- **Enhanced Recovery After Surgery – ERAS**
  - A multimodal program designed to minimize post-surgical discomfort for patients
  - Enable patients' more rapid recovery
- **Project Goal:**
  - To establish an ERAS protocol for patients undergoing colorectal surgery
- **Project Objective: Monitor the impact of ERAS on:**
  - Length of stay
  - Readmission rate
  - Post-surgical complications

Timeline

- January 2015 NOAMA CIOF
  - Grant application and funding
- March 2015 – October 2015
  - Staff Training for ERAS procedures
- October 2015 – October 2017
  - ERAS patient data collection
- November 2019 – March 2018
  - Data Analyses (collection of retrospective data March 2018 – March 2019)
- March 2019 – March 2020 Manuscript preparation

- January 2018
  - NOAMA CIOF Establishment of ERAS order sets

ERAS Findings

- At McGill University Health Centre cost savings of **$2666/person**, reduced LOS by 2 days *(Nursing, 2017)*
- In 4975 colectomies performed by 15 NSQIP hospitals LOS was reduced by 1.7 days, out of 9950 control surgeries. *(JAMA Surgery, 2017)*
- 36 studies demonstrated reduced LOS, reduced **SSI**, reduced **HAI** in large centers *(Annals of Surgery, 2017)*
- 1 study at a small community hospital demonstrated significantly reduced LOS (3 days in 2011, 4 days in 2012), cost savings of **$3202/person** in 2011 and **$4803/person** in 2012. Also **13%** reduction in ileus and fewer self administered opioids *(AJON 2014)*

MAHC Findings

Dr. H Roldan	Prior To Study	Study Period	Estimated Cost Savings
Total Cases	22	20	$2,400 x 20 = $48,000
Average Length of Stay	6.9	4.5	$2,400
Total Readmits	1	2	[-1000] x days
Readmits for Anastomotic Leak	0	0	

All Other Surgeons	Prior To Study	Study Period	Estimated Cost Savings
Total Cases	100	40	$4,500 x 40 = $180,000
Average Length of Stay	9.2	4.5	$4,500/patient
Total Readmits	9	1	8[-1000] x days
Readmits for Anastomotic Leak	0	0	

Total Cost Savings: $180,000 plus readmits

Data outside of study provided by: HIMS; FD and JN Nov. 30, 2017 Daily rate: $750/bed + $250 maintenance costs (Sonya Sterling)

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ERAS Protocol

Preoperative Testing Day	Provision of written and verbal information to patients regarding ERAS
	Blood tests performed are CBC, other tests: ECG, Liver function
	All prescriptions are given to the patient/family and explained
	No bowel preparation-except 2 fleet enemas
Preoperative Day of Surgery	Complex Carbohydrate Load – 4 hours prior to surgery (50 grams in total)
	Complex OR checklist
	Flag complex discharge
	Record vital signs for patient like HR, stroke volume, and cardiac output
	Verify if patient took medications as mentioned in the pre-op orders
Postoperative Day 1	Advance to diet as tolerated +1 can Ensure/Boost with each meal. Total volume ≥ 2L per day of fluid
	Remove urinary catheter at 06:00. If no voiding by 14:00, perform bladder scan and follow retention protocol or leave catheter to straight drainage
Postoperative Day 2	Remove urinary catheter at 06:00. If no voiding by 14:00, perform bladder scan and follow retention protocol
	Commence epidural stop test at 0:600, if unsuccessful, remove at 10:00 – refer to epidural protocol
	Physician to remove original surgical dressing

ERAS Protocol cont.

Postoperative Day 3	Discharge patient before lunch (physician to review nursing assessment of fever, diet, activity, voiding, pain ≥ 4/10, GI and wound before discharge
	Follow-up appointment in clinic 2 weeks post discharge from hospital
	Resident must confirm discharge before 09:00

- Metrics
  - Length of stay
  - Readmission rate
  - Short/long-term complications
  - Mortality
  - Quality of life

Age-Sex Distribution of 40 ERAS patients

	Male		Female		All Patients	
Age (years)	Count	Percent	Count	Percent	Count	Percent
<60	6	27%	8	44%	14	35%
60-69	4	18%	4	22%	8	20%
70-79	7	32%	4	22%	11	28%
80-89	5	23%	2	11%	7	18%
Sub-total	22	100%	18	100%	40	100%

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Findings: Procedural Compliance Pre-and Post-operatively

Question	Yes	No	No Answer
Did you drink bowel preparation?	**28**	**3**	9
	70%	**8%**	23%
Did you bring chewing gum with you?	24	1	17
	57%	2%	40%
Were you informed that you are expected to dangle your legs out of bed within four hours of surgery?	26	0	14
	65%	0%	35%
Were you informed that you are expected to chew gum after surgery to help you pass gas?	26	0	14
	65%	0%	35%
Were you informed that you are expected to eat your meals in a chair, out of bed?	26	0	14
	65%	0%	35%
Were you informed that you are able to consume solid foods the day after surgery?	19	5	16
	48%	13%	40%
Were you informed that your LOS is expected to be three days (colon) or four days (rectal)?	30	0	10
	75%	0%	25%
Were you encouraged to drink a high carbohydrate drink two hours before your surgery?	31	0	9
	78%	0%	23%
Night of surgery (with help)			
I sat at the side of my bed for 10 – 15 minutes (with help).	18	9	13
	45%	23%	33%
I did deep breathing exercises 10 times per hour when I was awake.	22	10	8
	55%	25%	20%
I was offered sips of clear fluids	29	3	8
	73%	8%	20%

Findings: Procedural Compliance Pre-and Post-operatively cont.

Days After Surgery	Day 1			Day 2			Day 3		
Question	Yes	No	No Answer	Yes	No	No Answer	Yes	No	No Answer
I sat in the chair for my morning meal.	15	13	12	23	6	11	23	7	10
	38%	33%	30%	58%	15%	28%	58%	18%	25%
I sat in the chair for my afternoon meal.	21	9	10	22	6	12	22	5	12
	53%	23%	25%	55%	15%	30%	56%	13%	30%
I sat in my chair at other times throughout the day.	16	9	15	23	4	13	15	4	21
	40%	23%	38%	58%	10%	33%	38%	10%	53%
I walked down the hall at least once.	17	9	15	23	2	15	23	2	15
	41%	22%	37%	58%	5%	38%	58%	5%	37%
I had nothing to eat or drink	0	30	10	3	6	31	2	6	32
	0%	75%	25%	8%	15%	78%	5%	15%	80%
I had liquids to eat/drink.	29	0	11	26	1	13	23	0	17
	73%	0%	28%	65%	3%	33%	58%	0%	43%
I had solid food.	17	4	19	18	3	19	19	3	28
	43%	10%	48%	45%	8%	48%	38%	8%	70%
I chewed gum in the morning.	28	2	9	28	3	8	25	3	12
	72%	5%	23%	72%	8%	21%	63%	8%	31%
I chewed gum in the afternoon.	31	1	8	29	2	9	22	3	15
	78%	3%	20%	73%	5%	23%	55%	8%	38%
I chewed gum in the evening.	27	2	11	29	3	8	19	3	18
	68%	5%	28%	73%	8%	20%	48%	8%	45%
My catheter came out today.	13	16	11	14	11	15	11	11	18
	33%	40%	28%	35%	28%	38%	28%	28%	45%
I am peeing on my own.	9	20	11	19	10	11	22	4	14
	23%	50%	28%	48%	25%	28%	55%	10%	35%
I am passing gas.	16	14	10	21	9	10	24	3	13
	40%	35%	25%	53%	23%	25%	60%	8%	33%

Patient reported Pain and Complications

Number of ERAS patients and their self-reported daily pain measurement score.

Time relative to Surgery	Pain level 0	Pain level 1-3	Pain Level 4-5	Pain level 6-7	Pain level 8-10	No Answer
First Night after surgery	5	4	9	10	5	8
	12%	10%	22%	24%	12%	20%
Day 1 after surgery	2	3	6	8	10	11
	5%	8%	15%	20%	25%	28%
Day 2 after surgery	2	7	8	8	5	10
	5%	18%	20%	20%	13%	25%
Day 3 after surgery	2	6	8	6	4	14
	5%	15%	20%	15%	10%	35%

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First Night after surgery	5	4	9	10	5	8
	12%	10%	22%	24%	12%	20%
Day 1 after surgery	2	3	6	8	10	11
	5%	8%	15%	20%	25%	28%
Day 2 after surgery	2	7	8	8	5	10
	5%	18%	20%	20%	13%	25%
Day 3 after surgery	2	6	8	6	4	14
	5%	15%	20%	15%	10%	35%

Complications of 40 ERAS patients

Complication	Yes	No
Nausea or Vomiting	9	31
	23%	78%
Urinary Retention	9	31
	23%	78%
Ileus	7	33
	18%	83%
Wound Dehiscence	1	39
	3%	98%
Deep Vein Thrombosis	1	39
	3%	98%
Pneumonia	1	39
	3%	98%
Wound Infection	0	40
	0%	100%
Anastomotic Leak	0	40
	0%	100%
Number of Patients with…		
No complications	24	60%
1 complication	7	18%
2 complications	7	18%
3 or 4 complications†	2	5%

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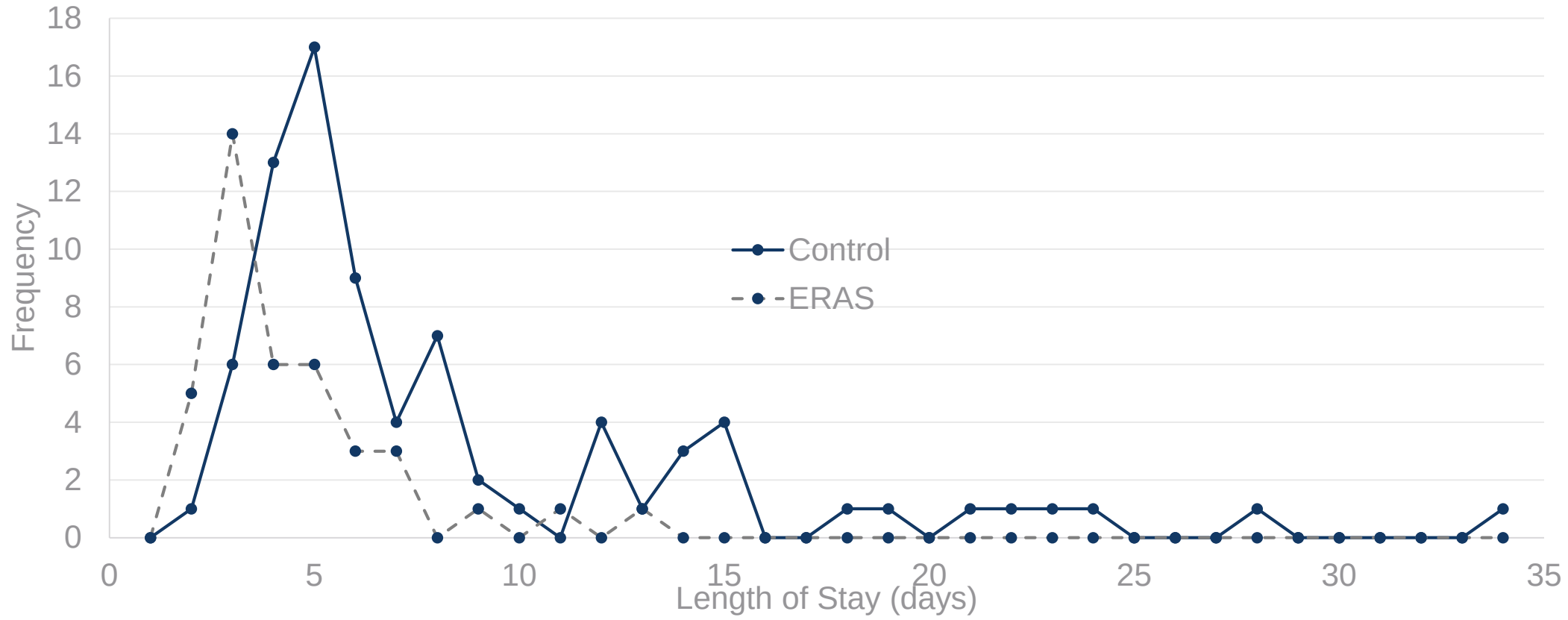
Frequency of Length of Stay for Control and ERAS patients



Length of stay (categories) by sex for control and ERAS patients

	Control						ERAS					
	Male		Female		All Control Patients		Male		Female		All ERAS Patients	
LOS (days)	n	%	n	%	n	%	n	%	n	%	n	%
≤3	2	5	5	13	7	9	11	50	8	44	19	48
4-6	16	40	23	58	39	49	8	36	7	39	15	38
7-10	9	23	5	13	14	18	3	14	1	6	4	10
>10	13	33	7	18	20	25	0	0	2	11	2	5
Total	40	100	40	100	80	100	22	100	18	100	40	100
Percentile					LOS (days)						LOS (days)	
25th					3						4	
50th (median)*					4						6	
75th					5						10	
Minimum					2						2	
Maximum					13						34	
Mean (sd)					8.44	(6.278)					4.45	(2.407)

Enhanced Recovery After Surgery (ERAS) Order Set Development and Program Audit

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Coinvestigators: Dr. Jennifer Macmillan, Dr. Andrew Brown, Dr. Biagio Iannantuono, Jane Radey, Leslie Secord, Lisa Allen