

# An enhanced recovery program in colorectal surgery has the power to decrease a broad range of complications

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## Background

Historically, perioperative care has been uncoordinated and lacked standardization throughout the service spectrum. Enhanced recovery programs (ERP) have been shown to decrease aggregate complications across surgical specialties. However, studies examining ERPs have traditionally shown improvement in composite complication outcome measures rather than specific organ system based complication rates. We hypothesize that the sustained implementation of a multi-modality ERP will be associated with a decrease in a broad range of organ system complications.

## Methods

Adult patients undergoing elective colorectal procedures at a single institution between 1/2011 and 10/2016 were included. Patients were stratified based on exposure to an ERP (7/2014-10/2016) after an 18 months wash out period in a pre-post analysis. The primary outcome was 30 day complication rate by organ system as collected by National Surgical Quality Improvement Program (NSQIP) abstractors. Demographic and other patient level data was collected. Complication rates were compared using both Fisher's exact test and multivariable logistic regression models including all predictive variables.

## Results

A total of 1,182 patients were included in this study, with 47% (N=550) treated in an ERP. The two groups were similar in age, gender, race, BMI, comorbidity index and procedure type. Significant reductions were seen in surgical site infection, postoperative pulmonary complications, transfusion, urinary tract infections, sepsis, and cardiac complications. A reduction in 30-day readmission was also noted. Length of stay decreased from median 5.2 to 3.5 days. These reductions persisted in a multivariable analysis. No significant changes occurred for acute kidney injury and hematologic complications.

## Conclusions

An ERP was associated with reduced complication rates across a wide range of organ systems and >1.5 day reduction in length of stay in a colorectal surgery population.

Outcome	Incidence		Unadjusted model for Post		Adjusted Model for Post	
	Pre	Post	OR (95% CI)	Wald P-Value	OR (95% CI)	Wald P-Value

SSI	21.05	7.4%	0.30 (0.21-0.44)	<0.001	0.30 (0.20-0.43)	<0.001
Pulmonary	4.9%	2.4%	0.47 (0.24-0.91)	0.02	0.45 (0.23-0.89)	0.02
Transfusion	7.9%	2.5%	0.30 (0.16-0.56)	0.0001	0.28 (0.15-0.52)	<0.001
AKI	1.4%	2.0%	1.41 (0.58-3.43)	0.44	1.43 (0.59-3.49)	0.43
UTI	5.8%	2.4%	0.39 (0.20-0.74)	0.004	0.37 (0.19-0.71)	0.003
Sepsis	7.7%	3.4%	0.42 (0.25-0.73)	0.002	0.43 (0.25-0.74)	0.002
Cardiac	1.5%	0.2%	0.11 (0.01-0.88)	0.03	0.11 (0.01-0.90)	0.03
Heme	2.7%	2.2%	0.80 (0.38-1.70)	0.57	0.80 (0.30-2.66)	0.58
Readmission	16.1%	11.3%	0.66 (0.47-0.92)	0.01	0.67 (0.47-0.94)	0.02
Return to ED	4.7%	4.4%	0.92 (0.53-1.59)	0.75	0.95 (0.55-1.64)	0.84
			<b>β (SE)</b>	<b>P-value</b>	<b>β (SE)</b>	<b>P-value</b>
LOS (median)	5.2 d	3.5 d	-1.45 (0.28)	<0.001	-1.51 (0.29)	<0.001