Anesthesia process measure compliance correlates with reduced length of stay: results from an enhanced recovery after surgery (eras) for colorectal surgery cohort

Authors: Michael C. Grant, MD[1], Claro Pio Roda, MHS[1], Daniel Galante, MD[1], Philip Sommer, MD[1], Deborah Hobson, BSN[1], Susan Gearhart, MD[1], Christopher L. Wu, MD[1], Elizabeth Wick, MD[2]

[1] Johns Hopkins University
[2] University of California-San Francisco

Background
Enhanced Recovery After Surgery (ERAS) programs are designed to add value to the perioperative care experience through mitigation of surgical insult and reduction in hospital length of stay (LOS). While numerous surgical interventions have been examined, it remains unclear how a focused effort on improving compliance with the anesthesia-based protocol elements impacts care in the setting of an ERAS for colorectal surgery program.

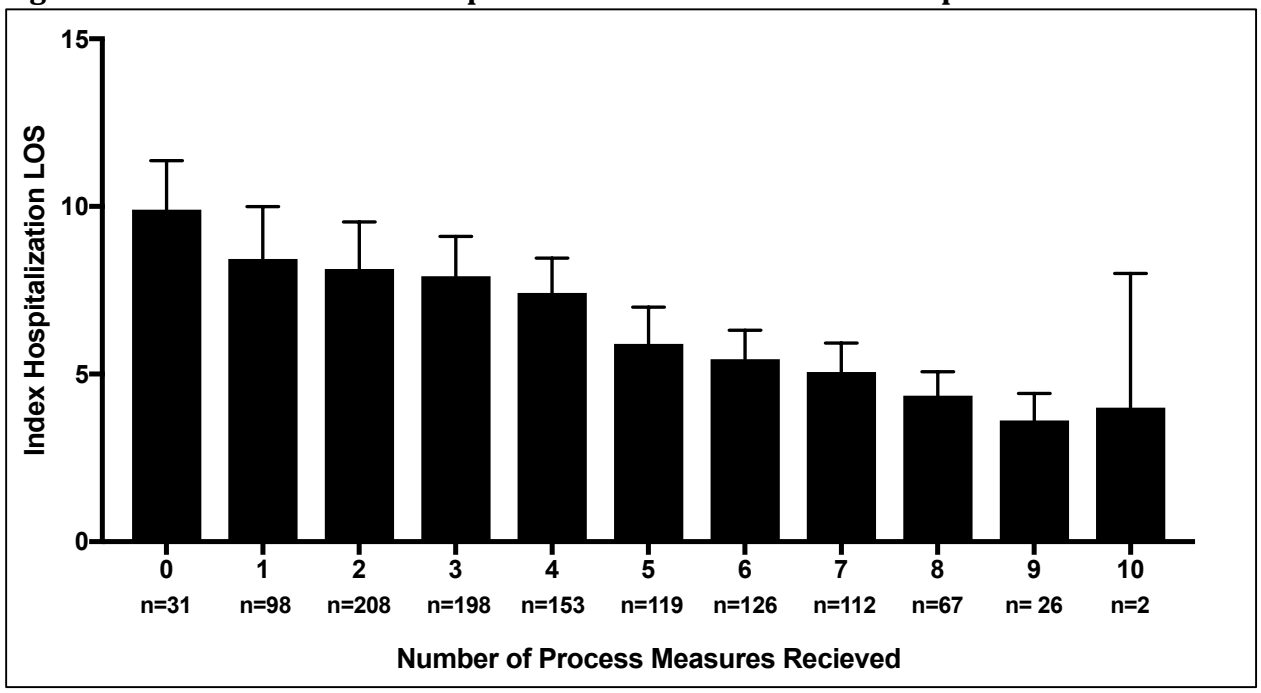
Methods
From January 2013 – April 2015, compliance and outcome data was collected and analyzed for all patients prior to (pre-ERAS) and following (ERAS) implementation of an ERAS for colorectal surgery program at a single institution. Compliance with ten specific process measures that were mainly influenced by the anesthesiologist or acute pain service (APS) was analyzed to determine the collective impact on subsequent index hospitalization LOS as well as direct variable and total hospital charges.

Results
A total of 1,140 patients were included in the study, divided among pre-ERAS (n=512) and ERAS (n=628) groups. Implementation of ERAS resulted in significantly increased compliance of the designated anesthesiology process measures (5.3±2.1 vs. 2.6±1.3 process measures per patient; $p<0.001$). Increased compliance was associated with a stepwise reduction in LOS (Figure 1) and patients who received greater than 5 process measures (annotated as "High" compliance group) had a significantly shorter LOS (Inverse Risk Ratio [IRR] 0.78; 95% Confidence Interval [CI] [0.71 – 0.87]; $p<0.001$) compared to lower compliance counterparts. Multivariate regression suggests that utilization of multimodal PONV prophylaxis (IRR 0.78; 95% CI [0.68 – 0.89], $p<0.001$), scheduled postoperative NSAID use (IRR 0.76; 95% CI [0.68 – 0.85], $p<0.001$), and adherence to less than three days of postoperative opioids (IRR 0.58; 95% CI [0.51 – 0.67]; $p<0.001$) were independently associated with reduced LOS (Table 1). High compliance was also associated with a significant reduction in direct variable ($p<0.001$) and total hospital charges ($p<0.001$) compared to lower compliance groups.

Conclusions
ERAS for colorectal surgery relies upon a transdisciplinary approach to perioperative care, which increases the relative scrutiny to each involved provider type. Our study suggests there is added value to a concerted anesthesia-based protocol with anesthesia provider participation both in the operating room and as part of the post-operative care. Further

investigation is warranted to develop tools to maximize compliance with anesthesia process measures in order to optimize the patient care experience.

Figure 1: Number of anesthesia process measures and index hospitalization LOS



LOS=length of stay; graphs expressed as means + 95% confidence interval; numbers above grafts correspond to number of patients in each category

Table 1: Univariate and multivariate correlates of index hospitalization LOS

	Univariate		Multivariate	
Process Measure	**IRR (95%CI)**	**p-value**	**IRR (95% CI)**	**p-value**
ERAS Provider	0.83 (0.74 – 0.94)	***0.003***	0.98 (0.87 – 1.10)	0.68
Preop CHO Drink	0.72 (0.61 – 0.86)	***<0.001***	0.97 (0.81 – 1.15)	0.70
Preop Pain Meds	0.65 (0.58 – 0.74)	***<0.001***	0.96 (0.83 – 1.10)	0.54
Epidural/TAP	0.85 (0.76 – 0.95)	***0.003***	0.96 (0.86 – 1.07)	0.44
Forced Warming	1.07 (0.96 – 1.20)	0.19	-	-
TIVA/No inhaled	0.67 (0.60 – 0.75)	***<0.001***	0.91 (0.79 – 1.05)	0.19
PONV Prophylaxis	0.64 (0.56 – 0.73)	***<0.001***	0.78 (0.68 – 0.89)	***<0.001***
24 Hour Fluids	0.84 (0.75 – 0.95)	***0.004***	1.006 (0.89 – 1.13)	0.91
Postop NSAID	0.65 (0.58 – 0.73)	***<0.001***	0.76 (0.68 – 0.85)	***<0.001***
Opioid Avoidance	0.51 (0.45 – 0.59)	***<0.001***	0.58 (0.51 – 0.67)	***<0.001***

Preop=preoperative; CHO=carbohydrate; TAP=transversus abdominus plane; TIVA=total intravenous anesthesia; PONV=postoperative nausea and vomiting; postop=postoperative; NSAID=non-steroidal anti-inflammatory drug; IRR=incidence rate ratio; CI=confidence interval