

**FINAL ID:** GS1

**TITLE:** Ambulatory Discharge after Colorectal Resection: How Early a Discharge after Surgery Is Feasible and Safe?

**ABSTRACT BODY:**

**Purpose/Background:** The feasibility and safety of ambulatory (23-hour stay) surgery and same-day discharge (<12-hour stay) in patients undergoing colorectal resection has recently been demonstrated by our group. We evaluate outcomes for patients discharged early from the post-anesthesia care unit (PACU) at 6-8 hours post-surgery.

**Methods/Interventions:** Between October 2020 and September 2022, suitable patients undergoing colorectal resection (excluding complex procedures such as ileoanal pouch, enterocutaneous fistula repair, reoperative pelvic surgery, multiple resections and/or ostomy creation) with predetermined criteria were offered discharge from the PACU at 6-8 hours post-surgery or within 24 hours after surgery. All patients undergoing similar procedures over the two-year period were identified from a prospective institutional database, and characteristics and outcomes were compared for those discharged the same calendar day at 6-8 hours or less after surgery (early discharge or EaD), <24 hours after surgery (ambulatory or AMB), and >24 hours after surgery (inpatient or INP). Data were analyzed using Kruskal-Wallis and ANOVA tests.

**Results/Outcomes:** Of 168 patients undergoing colorectal resection, 52 (31%) were discharged <24 hours: 11 within 6-8 hours (EaD, 7%) and 41 within 8-24 hours (AMB, 24%). AMB included 7 patients (4%) who were discharged the same day at <12 hours (total same-day discharges: 18 patients (11%)). EaD, AMB, INP had similar age, gender, race, and BMI. INP had higher ASA class 3/4 (EaD 27%, AMB 27%, INP 47%,  $p=0.04$ ). The most common operations were laparoscopic sigmoidectomy (EaD 36%, AMB 49%, INP 38%) and laparoscopic right hemicolectomy (EaD 46%, AMB 17%, INP 20%). 100% of EaD underwent laparoscopic surgery, compared to 95% of AMB and 88% of INP. Operative time was significantly shorter for EaD (median 87 minutes [IQR 67-106] vs. AMB 114 [90-135] vs. INP 122 [98-150],  $p=0.006$ ) and estimated blood loss lower (mean 6 mL vs. AMB 53 vs. INP 96,  $p=0.002$ ). Median length of stay was expectedly lower for EaD at 6.5 hours [3.6-6.9] vs. AMB 21.9 [18.3-22.8] and INP 66.5 [44.3-105] ( $p<0.0001$ ), while readmission rates were similar (EaD 9%, AMB 7%, INP 7%,  $p=0.9$ ). There were no deaths while anastomotic leak, postoperative ileus and surgical site infection rates were similar. Four INP patients (3%) required reoperation. INP also had a higher rate of transfusion (14%) while no EaD or AMB patients required transfusion ( $p=0.02$ ). A sub-analysis of EaD vs. patients discharged at 12 hours (same-day surgery) revealed that preoperative characteristics and outcomes were similar.

**Conclusions/Discussion:** With preoperative counselling, standardized perioperative care protocols and postoperative follow-up, selected patients can be safely discharged home from PACU as early as 6-8 hours after colorectal resection without adversely influencing readmission or outcomes.

(no table selected)

Table 1. Patient Characteristics and Outcomes

	<6-8 hours EaD (n=11)	8-24 hours AMB (n=41)	>24 hours INP (n=116)	P
Age, years (median, IQR)	55.2 [49.6–69.1]	55.3 [46.5–67.3]	63.8 [47.4–73.6]	0.38
Female	4 (36.4%)	21 (51.2%)	66 (57%)	0.39
Race (white vs not)	8 (72.7%)	28 (68.3%)	76 (65.5%)	0.86
Body mass index (median, IQR)	22.8 [20.2–28]	25.8 [21.9–29.6]	25.5 [22.6–28.9]	0.56
ASA class 3-4*	3 (27.3%)	11 (26.8%)	55 (47.4%)	0.04
Hypertension	1 (9.1%)	15 (36.6%)	41 (35.3%)	0.2
Diabetes	0 (0%)	4 (9.8%)	16 (13.8%)	0.36
Cardiac comorbidity	0 (0%)	2 (4.9%)	12 (10.3%)	0.33
Chronic obstructive pulmonary disease	0 (0%)	1 (2.4%)	3 (2.6%)	0.87
Chronic kidney disease	0 (0%)	1 (2.4%)	1 (0.9%)	0.68
Steroids	0 (0%)	0 (0%)	1 (0.9%)	0.8
Smoking (current or history)	2 (18.2%)	7 (17.1%)	19 (16.4%)	0.99
Prior abdominal surgery	0 (0%)	7 (17.1%)	26 (22.4%)	0.18
Indication				
Cancer	4 (36.4%)	15 (36.6%)	40 (34.5%)	0.97
Inflammatory bowel disease	2 (18.2%)	4 (9.8%)	19 (16.4%)	0.57
Diverticulitis	0 (0%)	13 (13.7%)	32 (27.6%)	0.10
Other	5 (45.5%)	9 (22.0%)	25 (21.6%)	0.20
Site of surgery				
Laparoscopic ileocolic resection	1 (9.1%)	5 (12.2%)	15 (12.9%)	0.93
Laparoscopic low anterior resection	0 (0%)	4 (9.8%)	6 (5.2%)	0.4
Laparoscopic left colectomy	0 (0%)	2 (4.9%)	9 (7.8%)	0.54
Laparoscopic right colectomy	5 (45.5%)	7 (17.1%)	23 (19.8%)	0.11
Laparoscopic sigmoid colectomy	4 (36.4%)	20 (48.8%)	44 (37.9%)	0.46
Laparoscopic subtotal colectomy	0 (0%)	1 (2.4%)	2 (1.7%)	0.86
Laparoscopic transverse colectomy	1 (9.1%)	0 (0%)	3 (2.6%)	0.21
Open ileocolic resection	0 (0%)	0 (0%)	4 (3.4%)	0.4
Open low anterior resection	0 (0%)	0 (0%)	1 (0.9%)	0.8
Open right colectomy	0 (0%)	1 (2.4%)	5 (4.3%)	0.69
Open sigmoid colectomy	0 (0%)	1 (2.4%)	2 (1.7%)	0.86
Open transverse colectomy	0 (0%)	0 (0%)	2 (1.7%)	0.64
Length of stay, hours (median, IQR) ***	6.45 [3.6–6.9]	22.2 [21.3–22.9]	66.5 [44.3–105]	<0.0001
Operating time, min (median, IQR) **	87 [67–106]	114 [90–135]	122 [98–150]	0.006
Estimated blood loss, mL (mean, IQR) **	6.4 [5–5]	53 [5–45]	96 [5–150]	0.001
Readmission	1 (9.1%)	3 (7.3%) <sup>†</sup>	8 (6.9%)	0.86
Reoperation	0 (0%)	0 (0%)	4 (3.4%)	0.4
Death	0 (0%)	0 (0%)	0 (0%)	NA
Leak	0 (0%)	0 (0%)	6 (5.2%)	0.25
Ileus	1 (9.1%)	0 (0%)	7 (6.0%)	0.24
Obstruction	0 (0%)	1 (2.4%)	2 (1.7%)	0.86
SSI	0 (0%)	0 (0%)	3 (2.6%)	0.51
Abscess	0 (0%)	1 (2.4%)	2 (1.7%)	0.86
Transfusion*	0 (0%)	0 (0%)	16 (13.8%)	0.02

<sup>†</sup>One patient was readmitted for hemodynamically stable hematochezia

Table 1. Patients Characteristics and Outcomes

**IMAGE CAPTION:** Table 1. Patients Characteristics and Outcomes

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**FINAL ID:** GS2

**TITLE:** Implementation of Electronic Self-Scheduling of Colonoscopy

**ABSTRACT BODY:**

**Purpose/Background:** Colorectal cancer (CRC) is the second leading cause of cancer-related deaths in the United States and worldwide. Colonoscopy remains the gold-standard screening test. To address staffing shortages, the increasing backlog of colonoscopies related to COVID-19, and recently updated guidelines decreasing the age of CRC screening, we have implemented an electronic colonoscopy self-scheduling system to address these needs. The primary endpoint was the utilization of the new system. Secondary outcomes were cost-effectiveness and patient satisfaction.

**Methods/Interventions:** In this single institutional retrospective observational study, we analyzed the data of all patients referred to our institution for screening colonoscopy. Group A included those patients who underwent the process of scheduling and completing their colonoscopy in the 6-months prior to implementation of the electronic system (January 2021 – June 2021). Group B were individuals who underwent the process in the 6-months after implementation (October 2021 – March 2022). Data from both groups were compared, the cost savings of the new system was evaluated, and the patients in group B were surveyed about their experience with this new system.

**Results/Outcomes:** Out of the 9,395 patients included in this study, 4,365 patients were in group A. Seventy percent (n=3,079) of those were scheduled for colonoscopy, all by staff. Of those scheduled, 1,715 (56%) underwent colonoscopy within six months. In group B, there were 5,030 patients, seventy-six percent (n=3,844) of whom were scheduled for colonoscopy. 2,326 (60.5%) were scheduled by staff and 1,518 (39.5%) electronically. Colonoscopy was completed in 1242 (53%) of staff-scheduled patients and 768 (51%) of electronically scheduled patients (p=0.225). There was a significant decrease in the proportion of patients scheduled by staff before and after implementation of the new system (100% vs. 60.5%, p<0.001). In group B, the “no-show” rate was significantly lower in electronically scheduled patients compared to staff scheduled patients (142 [9.4%] vs. 449 [19.3%], p<0.001).

Electronic self-scheduling of colonoscopies demonstrated cost saving with an average of \$15.42 saved per procedure for a total savings of \$23,408 in the six-month post-implementation period. The survey of patients in group B demonstrated that 64.7% preferred electronic self-scheduling, and 76.4% plan to do so in the future. Positive comments centered on efficacy and convenience. Negative comments centered on colon preparation instructions. Of those patients who performed electronic scheduling, 27% were performed outside of business hours (9am-5pm).

**Conclusions/Discussion:** Implementing an electronic self-scheduling colonoscopy system is an innovative approach that is convenient, cost-effective, efficient, and has high patient satisfaction. The transition from staff scheduling to this new system should be considered for patients requiring routine screening or surveillance colonoscopies.

(no table selected)

**Table 1: Comparison of colonoscopies scheduled and completed before and after implementation of an electronic self-scheduling system**

	<b>Group A (6 months pre-implementation) (Referrals N=4365)</b>	<b>Group B (6 months post-implementation) (Referrals N=5030)</b>	<b>p-value</b>
Patients able to schedule electronically, n (%)	4,048 (92.7)	4,338 (86.2)	<.001
<b>Scheduled for Colonoscopy, n</b>	3,079	3844	
▪ Staff scheduled, n (%)	3,079 (100)	2,326 (60.5)	<.001
▪ Electronically scheduled, n (%)	0	1,518 (39.5)	NA
<b>Completed Colonoscopy</b>			
▪ Staff scheduled, n (%)	1,715 (56)	1,242 (53)	.028
▪ Electronically scheduled, n (%)	0	768 (51)	NA
<b>No Shows</b>			
▪ Staff scheduled, n (%)	489 (15.9)	449 (19.3)	.001
▪ Electronically scheduled, n (%)	0	142 (9.4)	NA

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**IMAGE CAPTION:**

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## Found 5 Records

**FINAL ID:** GS3

**TITLE:** Complications Following Recent and Distant Neoadjuvant Radiation in Rectal Cancer

**ABSTRACT BODY:**

**Purpose/Background:** Neoadjuvant chemoradiotherapy (nCRT) is standard of care in locally advanced rectal cancer. Radiation therapy is known to induce fibrotic change in tissues which can make surgery more challenging. With adoption of total neoadjuvant therapy (TNT) protocols, time between completion of radiation and surgical resection are increasing which may lead to increased operative difficulty and complications.

**Methods/Interventions:** Single institution retrospective review of rectal cancer database for patients with nCRT from 2015-2022. Patients were dichotomized into two cohorts: surgery <90 days from end of radiation, and ≥90 days from radiation to surgery. Institutional data was compared to the national NSQIP rectal cancer data from 2015-2020. Primary outcome was technical operative outcomes, secondary outcomes included: oncologic outcomes, and overall 30-day complications.

**Results/Outcomes:** We identified 119 institutional patients, 96 ended radiation <90 days before surgery, 23 ended radiation ≥90 days after surgery. Baseline demographics, tumor stage, and operative characteristics did not differ among groups. 30-day complication rates, postoperative outcomes, technical complications, and overall 30-day complications did not differ among groups. There was no difference in margin positivity rates or number of lymph nodes harvested. There was greater percentage of a complete mesorectal envelope in the <90 day group (92% vs 65%, p=0.008), and more nearly complete envelope in the ≥90 day group (23% vs 4%, p=0.036).

When evaluating national data, 3059 patients were included in analysis, 2029 ended radiation <90 days before surgery and 1030 national patients ended radiation ≥90 days after surgery. There was an equal percent of patients with clinical stage 2 disease between groups (49% vs 50%, p=0.56); more patients had stage 3a disease in the ≥90-day group (3.6% vs 9.5%) and 3b in the <90-day group (37% vs 31%) p<0.001. Operative time, conversion to open, and lymph node harvest did not differ between groups. Patients without radiation 90 days before surgery had higher radial margin positivity (9.2% vs 4.6%, p<0.001), greater rate of organ space infection (8.6% vs 6.4%, p=0.026) and pneumonia (2.2% vs 0.9%, p=0.01).

**Conclusions/Discussion:** In our institution there were no differences in rate of technical or short-term complications in patients with ≥90 days between nCRT and surgery. Lymph node harvest and margin positivity did not differ, but more patients had non-complete mesorectal envelopes in the ≥90-day group. In the national dataset there were similar findings in technical outcomes, however there was increased rate of radial margin positivity in ≥90 day group. Despite increased pelvic tissue fibrosis following distant radiation, we did not find an increase in adverse technical outcomes. Prospective studies, evaluating type of neoadjuvant treatment received, and impact in surgery is warranted as therapies change in rectal cancer management.

(no table selected)

Institution Data	Total (n= 119)	<90 days rads to surgery (n=96)	≥90 days rads to surgery (n=23)	p-value		Total (n= 119)	<90 days rads to surgery (n=96)	≥90 days rads to surgery (n=23)	p-value
Operative time (mins), median (IQR)	224 (217, 306)	242 (218, 301)	259 (217, 345)	0.47	Radial Margin distance (cm), median (IQR)*	0.6 (0.2, 1.2)	0.6 (0.2, 1.4)	0.45 (0.1, 0.9)	0.16
Estimated blood loss (CCs), median (IQR)	50 (50, 150)	50 (50, 150)	100 (50, 200)	0.17	Number positive radial margin	11 (12)	7 (9)	4 (22)	0.21
Unplanned conversation to open, n (%)	5 (4)	4 (4)	1 (4)	1.0	Complete tumor response/missing data	23/3	19/2	4/1	
Technical complication	7 (6)	6 (6)	1 (4)	1.0	Distal Margin distance (cm), median (IQR)*	3.1 (1.5, 4.5)	3.2 (1.5, 4.5)	3 (1.5, 4.5)	0.66
Leak rate, n (%)	4 (3)	3 (3)	1 (4)	0.58	Number positive distal margin	1 (1.1)	1 (1.4)	--	1.0
					Complete tumor response/missing data	23/7	19/6	4/1	
					Intact mesorectal envelope				
					no data	54	48	6	
					Complete	55 (85)	44 (92)	11 (65)	0.008
					Nearly complete	6 (9)	2 (4)	4 (23)	0.036
					Incomplete	4 (6)	2 (4)	2 (12)	0.278
					# of nodes collected, mean (sd)	17 (5.1)	17 (5.0)	15 (5.4)	0.18

\*Radial margin: (3 missing, 23 complete response), distal margin: (7 missing, 23 complete response)



**IMAGE CAPTION:**

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**FINAL ID:** GS4

**TITLE:** Implementation of a Multimodal Enhanced Recovery Protocol in Ambulatory Anorectal Surgery: a Randomized Trial

**ABSTRACT BODY:**

**Purpose/Background:** Few studies report outcomes for enhanced recovery pathways (ERP) in ambulatory anorectal surgery. We hypothesize that an ambulatory anorectal ERP with multimodal preoperative and postoperative analgesia can reduce postoperative opioid use. Here we report the results of a randomized clinical trial comparing postoperative opioid use in ambulatory anorectal surgical patients receiving a multimodal ERP vs. standard of care.

**Methods/Interventions:** A single center randomized trial of patients undergoing elective anal fistula or hemorrhoid surgery was conducted from September 2018 to May 2022. Patients were stratified by surgery type and randomized 1:1 to multimodal ERP (Arm E) or No ERP (Arm NE). Patient demographics, pain score, nausea, and urinary function using the International Prostate Symptom Score (I-PSS) were recorded pre- and postoperatively. All patients voided 30 minutes before surgery, underwent monitored anesthesia care, minimization of IV fluids, and received a standardized perianal and bilateral pudendal nerve block. Patients in Arm E received preoperative oral gabapentin 600mg, oral acetaminophen 1000mg and intraoperative ketorolac IV 30mg. Postoperatively, patients in Arm E received oral gabapentin 300mg q8hr, oral acetaminophen 1,000mg q8hr, oral ketorolac 10mg q8hr, and PRN oral oxycodone 5mg q6hr. Patients in Arm NE received oxycodone 5mg q6hr PRN and could supplement with acetaminophen and ibuprofen as needed. Patients kept a daily log of pain, nausea, and medications. The primary endpoint was oral morphine milligram equivalents (MME) use during the first postoperative week. Secondary endpoints included maximum pain and nausea visual analogue scores, adverse events and emergency room or hospital admissions during the first 30 days postoperatively. Fisher's Exact Test and Mann-Whitney U-test were used to compare outcomes.

**Results/Outcomes:** Of the 111 enrolled patients, 22 were lost to follow-up. The remaining 89 patients had a median age of 38 (range, 20-67) years and included 41 (46%) females. There were no significant differences between the E and NE arms in terms of preoperative and surgical characteristics (Table). The study primary endpoint, oral MME use during the first week, was significantly higher among patients in the NE arm (79mg; range: 0-600) than patients in the E arm (8mg; range: 0-390) ( $p=0.002$ ). On subgroup analysis, both fistula and hemorrhoid surgery patients assigned to the NE arm took significantly higher oral MME in the first week than patients in the E arm. There was no significant difference in secondary endpoints.

**Conclusions/Discussion:** The results of our trial show that standardized multimodal analgesia decreases postoperative opioid use with no impact on postoperative pain scores in ambulatory anorectal surgery patients. We support implementing an ERP including multimodal analgesia for patients undergoing elective anal fistula and hemorrhoid surgery.

(no table selected)

	Cohort (n=89)	Arm E (n=45)	Arm NE (n=44)	P-value
<i>Baseline Characteristics</i>				
Age	38 (20-67)	38 (20-67)	39 (23-59)	0.67
Gender (female)	41 (46)	25 (56)	16 (36)	0.09
BMI	25 (17-46)	24 (17-34)	26 (20-46)	0.25
Preoperative I-PSS	0 (0-16)	0 (0-13)	0 (0-16)	0.52
Intraoperative fentanyl dose (mcg)	100 (0-250)	100 (0-150)	100 (0-250)	0.86
PACU MME	0 (0-20)	0 (0-13)	0 (0-20)	0.63
<i>Primary Study Endpoints</i>				
Oral MME use	38 (0-600)	8 (0-390)	79 (0-600)	0.002
<i>Fistula surgery</i>	8 (0-213)	8 (0-169)	30 (0-213)	0.03
<i>Hemorrhoid surgery</i>	83 (0-600)	60 (0-390)	148 (0-600)	0.03
<i>Secondary Study Endpoints</i>				
Pain on arrival to PACU	0 (0-10)	0 (0-9)	0 (0-10)	0.51
Pain on discharge from PACU	0 (0-8)	0 (0-8)	1 (0-8)	0.16
Maximum daily pain score postoperative day 0-7	8 (0-10)	7 (0-10)	8 (0-10)	0.31
<i>Fistula surgery</i>	4 (0-10)	5 (0-10)	4 (0-10)	0.63
<i>Hemorrhoid surgery</i>	9 (1-10)	9 (1-10)	9 (7-10)	0.66
Median daily pain score postoperative day 0-7	5 (0-10)	4 (0-10)	6 (0-10)	0.07
<i>Fistula surgery</i>	2 (0-10)	1 (0-8)	4 (0-10)	0.17
<i>Hemorrhoid surgery</i>	7 (0-10)	6 (0-10)	8 (3-10)	0.29
Maximum daily nausea score postoperative day 0-7	0 (0-2)	0 (0-2)	0 (0-2)	0.38
I-PSS	5 (0-34)	5 (0-34)	5 (0-29)	0.88
Days to first bowel movement	1 (0-7)	1 (0-5)	1 (0-7)	0.32
30-day adverse event	6 (7)	4 (9)	2 (5)	0.68
30-day ER or inpatient care	1 (1)	1 (2)	0	1.00

Values expressed as median (range) or n (%)

BMI body mass index; I-PSS international prostate symptom score; PACU post anesthesia care unit; MME morphine milligram equivalents; ER emergency room

**IMAGE CAPTION:**

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**FINAL ID:** GS5

**TITLE:** More Problems, More Money: Identifying High-cost Rescue After Colorectal Surgery

**ABSTRACT BODY:**

**Purpose/Background:** Successful rescue after elective surgery is associated with increased healthcare costs, but costs after rescue events vary widely. Treating all rescue events with a cost-agnostic perspective may overlook targeted opportunities for preventing or reducing the costliest rescue events. The purpose of this study was to assess variability in the costs of rescue after elective colectomy and identify high-cost predictors.

**Methods/Interventions:** We identified adult patients from the National Inpatient Sample 2016-2019 who underwent elective colectomy or proctectomy within 48 hours of admission using ICD-10-PCS codes. Rescued patients were defined as those who underwent additional major procedures after index colorectal resection. Patients were stratified into three groups: 1) uneventful recovery (no additional procedures after index surgery); 2) Low-cost rescue (rescued patients whose total charges <75<sup>th</sup> percentile of all rescued patients), 3) High-cost rescue ( $\geq$  the 75<sup>th</sup> percentile). Patients who died prior to discharge were excluded. All data were weighted to be representative of the entire U.S. population. Multivariable Poisson regression was used to identify preoperative clinical predictors of high-cost versus low-cost rescue.

**Results/Outcomes:** Of 451,765 admissions for elective colorectal resection, 429,945 (95.2%) recovered uneventfully, while 21,280 (4.8%) underwent rescue procedures. Median total costs of inpatient care were: \$16,228 (IQR: \$12,204-22,427) in the uneventful recovery group, \$33,618 (\$23,878-45,565) in the low-cost rescue group, and \$93,012 (\$75,512-128,129) in the high-cost rescue group ( $p < 0.001$ ). High-cost rescue was driven primarily by length of stay (median 25 days vs. 11 days for low-cost rescue,  $p < 0.001$ ) and additional subsequent procedures performed (median 3 vs. 1,  $p < 0.001$ ). High-cost rescue included more returns to the operating room (76.2% vs. 54.9%,  $p < 0.001$ ) and ICU-level critical care procedures (56.9% vs. 33.0%,  $p < 0.001$ ) compared with low-cost rescue. Preoperative characteristics independently associated with higher cost of rescue included heart disease (congestive heart failure, IRR [95% CI]: 1.53 [1.31-1.78]; atrial fibrillation, 1.36 [1.18-1.57]) and surgical indication (e.g. colorectal cancer vs. diverticular disease 1.33 [1.10-1.60]).

**Conclusions/Discussion:** Rescue after colorectal surgery is associated with a doubling of inpatient costs; the costliest patient quartile incurs total costs five times higher than those with uneventful recovery. Although rescue events are an important quality measure, high-cost rescue (returns to the operating room, ICU-level care) may be a more relevant measure of value. Therefore, high-cost rescue offers a target for healthcare value improvement.

(no table selected)

(No Image Selected)

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