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Reduced Opioid Use and Prescribing in a Same Day Discharge Pilot Enhanced Recovery Program for Elective Minimally Invasive Colorectal Surgical Procedures During the COVID-19 Pandemic

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Abstract

Purpose: Enhanced recovery pathways (ERPs) are associated with reduced complications and length of stay. The validation of the I-FEED scoring system, advances in perioperative anesthesia, multimodal analgesia, and telehealth remote monitoring have resulted in further evolution of ERPs setting the stage for same day discharge (SDD). Pioneers and early adopters have demonstrated the safety and feasibility of SDD programs. The aim of this study is to evaluate the impact of a pilot SDD ERP on patient self-reported pain scoring and narcotic usage.

Methods: A quality improvement pilot program was conducted to assess the impact of a SDD ERP on post-operative pain score reporting and opioid use in healthy patients undergoing elective colorectal surgery as an alternative to post-operative hospitalization during the COVID-19 pandemic (May 2020-December 2021). Patients were monitored remotely with daily telephone visits on POD 1-7 assessing the following variables: I-FEED score, pain score, pain management, bowel function, dietary advancement, any complications, and/or re-admissions.

Results: Thirty-seven patients met the highly selective eligibility criteria for "healthy patient, healthy anastomosis." SDD occurred in 70%. The remaining 30% were discharged on POD 1. Mean total narcotic usage was 5.2 tablets of 5 mg oxycodone despite relatively high reported pain scores.

Conclusions: In our initial experience, SDD is associated with significantly lower patient narcotic utilization for postoperative pain management than hypothesized. This pilot SDD program resulted in a change in clinical practice with reduction of prescribed discharge oxycodone 5 mg quantity from #40 to #10 tablets.

Keywords

same day discharge, home recovery, colectomy, enhanced recovery after surgery, enhanced recovery programs, colorectal surgery, minimally invasive colectomy, multimodal analgesia, narcotic sparing, opioid prescribing and use

Introduction

The opioid epidemic in the United States is an important focus for improvement in our health care systems.[1] As postoperative recovery pathways evolve, opioid pain management is an integral part of surgical recovery. However, opioid use for postoperative pain management also has the potential for over-prescribing, overuse, and abuse. Enhanced recovery pathways (ERPs) have demonstrated that multimodal analgesia results in lower opioid utilization and prescribing. In addition, ERPs are

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associated with lower rates of complications and hospital length of stay (LOS).[2] Several recent advancements in minimally invasive surgical (MIS) techniques have led to an average LOS of 1-2 days following MIS elective colectomy. These advancements include intracorporeal anastomosis, regional abdominal nerve blocks [transversus abdominis plane (TAP), rectus sheath, posteriomedial quadratus lumborium (QL)], suprapubic (via Pfannenstiel incision) rather than midline specimen extraction sites, and natural orifice extraction in select cases. Shifting the specimen extraction incision away from the midline is associated with reduced postoperative pain, wound complications, and lower rates of incisional hernia development.

The early pioneers in SDD ERPs used the terminology "ambulatory colectomy." In 2009, Levy et al implemented a SDD pathway with 10 patients and a 3-day remote follow-up period.[3] None of these patients experienced complications or readmissions. In 2015, Gignoux et al published their initial experience with SDD for minimally invasive colectomies using daily home nursing visits for the first 10 days after surgery as a surrogate for hospital-based recovery and monitoring.[4] Subsequently, Gignoux and colleagues have published their ongoing experience and largest series to date, with 157 consecutive patients undergoing ambulatory colectomy.[5] The majority of patients (93%) were able to be discharged home the same calendar day. The readmission rate was 6% and the re-operative rate was 4%. Of the 6 patients requiring re-operation, 3 were for anastomotic leak. This study included right, left, transverse, and total colectomies, with 85% of cases being left colectomies.[5]

In 2021, Lee et al at McGill University published their initial experience with SDD ERPs using a remote mobile app for postoperative monitoring.[6] Collaborating with our colleagues at McGill University, we have recently published a combined postoperative outcomes following SDD, further demonstrating the safety and feasibility of SDD.[7] Intrigue and interest in SDD is evolving into implementation, as the surgical community is transitioning from the pioneer to early adopter phase of SDD. However, there is limited information regarding the impact of SDD ERPs on postoperative pain and opioid use in patients recovering at home.[2-10]

We began our SDD pilot program with the hypothesis that patients will require a larger quantity of opioid tablets at the time of hospital discharge than what is typically prescribed at the time of hospital discharge following the standard of care (hospital admission and initial recovery after minimally invasive, elective colorectal surgery). In our institution, patients undergoing elective, minimally invasive, colorectal surgery typically have a LOS of 1-3 days. At the time of discharge, these patients are prescribed #15 tablets of oxycodone 5 mg.[11] Based on our hypothesis that patients recovering at home would require a higher quantity of oral opioid for postoperative pain management, the initial discharge quantity for the SDD program was #40 tablets of oxycodone 5 mg. The aim of this study was to evaluate the impact of a SDD pilot program on patient self-reported pain scoring and narcotic usage for postoperative pain management.

Table 1. Patient Selection Characteristics in Same Day Discharge.

Inclusion criteria
Hgb > 10
Albumin >3.5, prealbumin >20
Ambulatory
Functionally independent
Elective surgery
Minimally invasive surgery
No contraindications to TAPP local anesthetic blocks or opioid-sparing analgesia
Adequate home support
Exclusion criteria
Significant cardiopulmonary disease
Anemia (Hgb <10)
Malnutrition (albumin <3.5)
Active tobacco/nicotine use
Coronary artery disease
Cardiac arrythmia
Chronic anticoagulation or coagulopathy
Liver or renal failure
Chronic opioid use
Intraoperative complications
Prolonged operative time
More than one bowel anastomosis created
Any revisions needed for the initial anastomosis
Inflammatory bowel disease (Crohns or ulcerative colitis)
Home >1 hour travel from institution
Lack of adequate home support
Language barrier (primary language other than English)

Methods

This study is a retrospective review of clinical outcomes prospectively documented in the electronic medical record as part of a pilot SDD enhanced recovery quality improvement program. The pilot program was offered during the COVID-19 pandemic as an alternative to hospitalization following surgery in select patients and operative cases (Table 1). The study review period was from May 4, 2020-December 31, 2021. The pilot SDD ERP was developed within a multi-disciplinary team including members of the departments of Surgery, Anesthesia, and Postoperative Recovery (PACU) nursing

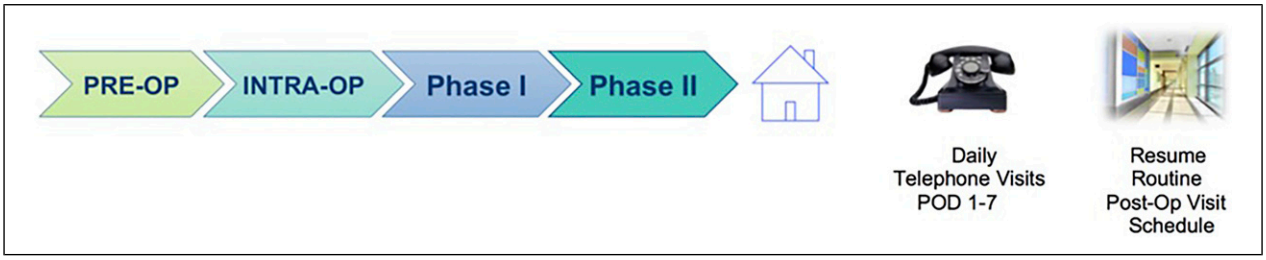


Figure 1. Same day discharge pilot program. Candidates for Same Day Discharge progress through the SDD protocol, which begins prior to surgery with patient and procedure selection, as well as perioperative patient education and same day hospital discharge. Early mobilization and early oral intake is initiated during PACU Phase I and II recovery. Following discharge home, patients are monitored remotely with daily telephone visits on POD 1-7. After 7 days, the patients resume routine postoperative in-person visits.

(Table 1, Figure 1). The safety and feasibility of the SDD pilot program has already been published.[7] The patient demographics and operative outcomes are summarized in the results section for context purposes only, as the scope of this manuscript is focusing on opioid use and prescribing in the SDD pilot program.[7]

The patient inclusion criteria focused on emphasizing that the patient would need to be ambulatory at baseline, functionally independent, eager to use opioid-sparing, multimodal analgesia for postoperative pain management, and the patient's commute to the hospital be no longer than 1 hour. Patient exclusion criteria included any history of coronary artery disease, cardiac arrhythmia, malnutrition, nicotine or tobacco use, anemia that would require transfusion, coagulopathy, bleeding diathesis, inflammatory bowel disease, and recent, ongoing, or chronic narcotic use (Table 1).

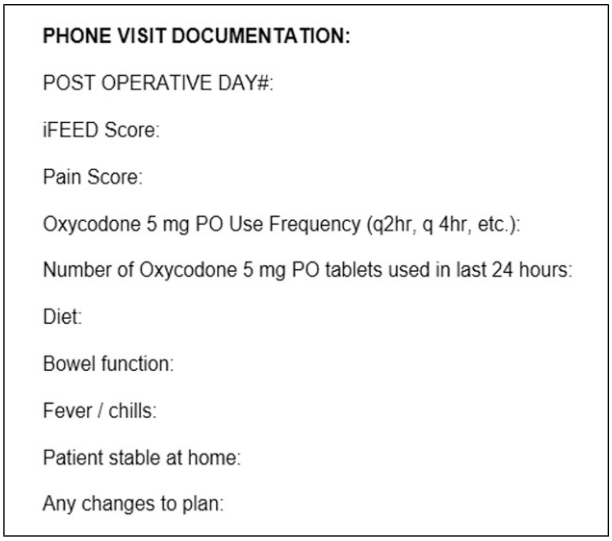
All patients who participated in the pilot SDD program were remotely monitored with daily telephone visits on postoperative day (POD) 1-7. The telephone visits were scripted and documented in the electronic medical record in real time to ensure the highest level of continuity in patient care as well as the highest fidelity of clinical documentation when reviewed retrospectively. During the daily POD 1-7 telephone visits, the patient's pain score, correct usage of multimodal pain management, oral food and liquid tolerance (I-FEED Score), gastrointestinal recovery, fever, chills, surgical incision related concerns, and any other patient questions or concerns were assessed (Figure 2). The patients were also counseled daily regarding postoperative narcotic sparing pain medications, their correct dosing and frequency, and dietary advancement.

Informed and shared decision making was conducted with all participants. Patients were educated preoperatively that the standard of care following their operative procedure would be hospitalization and monitoring for typically 1-3 days. Patients who met inclusion criteria were further educated about the option for same day discharge and recovery at home as an alternative to the standard of care. The final determination for SDD candidacy was made at the end of the operation to assess for a healthy anastomosis creation. A healthy anastomosis was defined as surgery without intra-operative complications, any revisions needed for the anastomosis during surgery, prolonged operative time, excessive blood loss, more than one anastomosis, excessive intraoperative fluid or narcotic use that was not in compliance with the SDD ERP (Table 2).

Following completion of the operation, SDD patients were transferred to the postoperative anesthesia care unit (PACU; Table 2, Figure 1). In the first recovery phase, the patients are mobilized to sitting in a chair within the first hour. Multimodal analgesia is provided and includes scheduled acetaminophen, gabapentin, and as needed short acting intravenous narcotics or oral oxycodone 5 mg tablets. At least two anti-emetics are available to manage any post-operative nausea as needed. In the second PACU recovery phase, the patients are given electrolyte and high-carbohydrate oral intake, and ambulation with assistance is initiated. The patients are reassessed 4-6 hours after surgery and discharged from PACU Phase II when they meet all the anesthesia criteria for recovery. This includes being able to ambulate independently, postoperative pain and nausea well-managed with oral medications, an I-FEED score of 0-1,[12-14] and voiding independently.

SDD patients are discharged home on a clear liquid diet, 1000 mg of acetaminophen three times daily for 2-4 weeks, 100 mg of gabapentin three times daily for 5 days, and 1-2 tablets of 5 mg oxycodone as needed every 4-6 hours. If the SDD candidate did not meet the discharge criteria on the day of surgery, the patient was admitted for observation and reassessed for discharge home on POD 1.

At the outset of the pilot program, SDD patients were discharged home with #40 tablets of 5 mg oxycodone. The discharge quantity was reduced to #20 tablets after preliminary observations in the first 8 patients required no more than 10 tablets of oxycodone 5 mg for pain management at home. This trend continued, and the opioid prescription discharge quantity was further reduced to #10 tablets after the initial 20 participants.


PHONE VISIT DOCUMENTATION:

POST OPERATIVE DAY#:

iFEED Score:

Pain Score:

Oxycodone 5 mg PO Use Frequency (q2hr, q 4hr, etc.):

Number of Oxycodone 5 mg PO tablets used in last 24 hours:

Diet:

Bowel function:

Fever / chills:

Patient stable at home:

Any changes to plan:

Figure 2. POD 1-7 daily telephone visit documentation template. All patients participating in the SDD protocol were called daily during POD 1-7. The data was recorded in real-time on the day of the telephone visit. For patients discharged in the morning on POD 1, rather than the day of surgery, the first telephone visit was performed in the afternoon on POD 1. For patients discharged on POD 1, any narcotic usage after PACU phase II was included in the narcotic use assessment.

During the POD 1-7 period, daily telephone calls were utilized for remote monitoring of the patient's recovery. The patients were counseled daily regarding postoperative multimodal pain medication use, frequency, and dosing. In order to ensure consistency during the patient telephone visit, a standardized template was utilized (Figure 2). Following the initial POD 1-7 daily telephone visits, the patients would resume the routine postoperative visit schedule. The first in-person postoperative evaluation typically occurred within 1-2 weeks of hospital discharge, and the final visit within 4-6 weeks of hospital discharge.

Statistical data is expressed as mean with standard deviation, median, and range. Univariate comparisons were done with Student's t-test. All analyses were performed using Microsoft Excel and statistical significance was defined at $P < .05$.

Results

Patient demographics, indications for surgery, safety and feasibility, and post-operative outcomes have been previously published.[7] An abbreviated summary of this information is included for context purposes only (Table 3). Thirty-seven patients completed the SDD program between May 2020 and December 2021. Despite an average pain score of 4.5 (SD 1.8) out of 10 on POD 1 and 4.2 (SD 1.6) on POD 2, patients used an average of 5.2 (SD 5.8) tablets total of 5 mg oxycodone during their entire postoperative recovery. Eight (23%) patients did not use any tablets of the prescribed 5 mg oxycodone. Only 1 (2.8%) patient requested a refill of narcotics. Figure 3 demonstrates the trend in patient self-reported narcotic use, pain scores, and I-FEED scores that were documented in the electronic medical record by the surgical team during the daily telephone remote monitoring visits on POD 1-7.

For context only, the previously published safety and feasibility outcomes of the pilot SDD ERP are summarized as follows.[7] Thirty-three (89%) patients had zero complications, emergency department or urgent care visits, re-operations, or hospital readmissions during the first 7 days. This continued to hold true for 30 (81%) patients during the remaining 30-day post-operative recovery period. During the first 7 days after surgery, four patients were readmitted to the hospital. One patient had a vasovagal syncope episode on POD 7 and was re-admitted for dehydration. Another was readmitted on POD 1 for urinary retention. A patient with a history of well-controlled seizure disorder had a seizure on POD 7 requiring hospital readmission. The last patient was re-admitted to the hospital on POD 6 with acute abdominal pain secondary to anastomotic leak. This is the only patient that required reoperation and was managed with abdominal washout and Hartmann's procedure. This patient's clinical course was without event or complication up until this point.

During POD 8-30, one patient was readmitted with abdominal pain on POD 8 and found to have *C. difficile* colitis. The patient re-admitted for urinary retention on POD 1, was admitted again on POD 8 for oral intolerance and post-operative ileus. Two additional patients did not require readmission but were treated during their routine, in-person postoperative clinic visits: 1 with dysuria and findings of UTI (urinalysis and culture positive), and the 2nd with a wound seroma that did not require medical or surgical interventions, such as drainage.

Discussion

The aim of this study was to evaluate the impact of a pilot SDD ERP on patient self-reported pain scoring and narcotic usage following elective, minimally invasive, major abdominal colorectal surgery procedures. Our observations led us to reject our initial hypothesis, as patients required significantly fewer opioid tablets for postoperative pain management than hypothesized (Figure 3). This resulted in a clinical change in practice reducing the quantity of prescribed narcotics at the time of discharge for postoperative pain management.

Same day discharge (termed "home recovery" in our institution) initially began with select cases in total joint replacement surgery, breast surgery, and pediatric surgery. In our experience, SDD is a safe and feasible alternative to hospitalization for elective, minimally invasive, major abdominal colorectal procedures in well-selected

Table 2. Same Day Discharge Protocol.

Pre-operative phase
- 1000 mg acetaminophen
- 100 mg gabapentin
- Scopolamine patch
- 20 mg famotidine
- 5000U subcutaneous heparin
- 12 mg alvimopan

Peri-operative phase
- Venous thromboembolism prophylaxis (SCDs)
- Anesthetic agents
  - Lidocaine, propofol, rocuronium induction
  - Fentanyl
  - Propofol/Dexmedetomidine hydrochloride/Lidocaine/Ketamine infusion
  - Sevoflurane maintenance using brain monitor (BIS/Sedline)
- Ventilation (VT 5-7 mL/kg, PEEP 6-8 cmH2O)
- Temperature control
- Volume status
- Goal 500-700 mL IV fluids

PACU phase 1
- Pain medications
- Multimodal pain control
- Short-acting or oral narcotics
  - 25 mg fentanyl
  - 0.2 mg Hydromorphone
  - 5 mg oxycodone
- At least 2 anti-emetics available
  - 4 mg ondansetron
  - 10 mg promethazine
- Incentive spirometry
- Out of bed to chair within 1 hour

PACU phase 2
- Out of bed/ambulate
- High carbohydrate/electrolyte drinks
- Discharge criteria
  - Able to ambulate
  - Controlled dizziness and nausea
  - Clear liquids with I-FEED score of 0-1
  - Able to void
- Pain controlled with oral medications

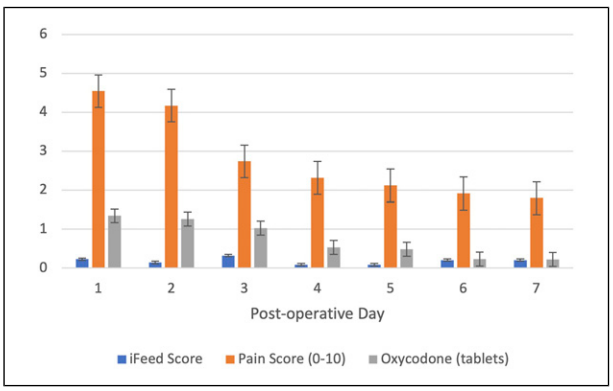


Figure 3. POD 1-7 patient reported daily I-FEED score, pain score, and opioid use. The post-operative day is recorded on the X-axis. Patient reported highest daily I-FEED score, highest daily Pain score (scale 0-10, 0 is no pain, 10 is excruciating pain), and daily narcotic use (number of oxycodone 5 mg tablets) are recorded on the Y-axis. Information was obtained during the daily POD 1-7 remote monitoring telephone visit.

patients.[7] In this small pilot SDD program, patients utilized fewer narcotics at home than initially hypothesized. This led to a clinical change in practice, reducing the total tablet quantity to #10 oxycodone 5 mg. This is even lower than our current discharge quantity of #15 tablets of oxycodone 5 mg for patients who do not qualify for the SDD ERP and are hospitalized following surgery.[11] An ERP cornerstone is employing multimodal analgesia, moderating narcotic use, and improving pain control. These goals must also be balanced with the need to reduce opioid over-prescribing and utilization in the United States.[15] Our observations have led us to question our current standard of care discharge quantity of #15 tablets of oxycodone 5 mg for routine postoperative pain management following colorectal surgery. Given the low opioid usage in this SDD pilot program, we are looking to identify any potential over-prescribing for our standard of care postoperative pain management in the hospital setting or in the discharge quantity.

Table 3. Patient Demographics, Indication for Surgery, Operations, Extraction Sites, and Discharge Day SD – Standard Deviation; *n* = 37.

Age (years)	55.6 (SD 14)
Male	15 (41%)
Female	22 (59%)
BMI	28.2 (SD 5.9)
Charleston comorbidity index	2.7 (SD 2.3)
Indication	
Neoplasm	22 (59%)
Stoma closure	10 (27%)
Diverticular disease	5 (14%)
Operation	
Left/Sigmoid	10 (27%)
Right/Transverse	10 (27%)
LAR (low anterior resection)	6 (16%)
Soma closure	11 (30%)
Extraction type	
Pfannenstiel	22 (64%)
Peri-umbilical	2 (5%)
Stoma site	11 (31%)
Same day discharge (POD 0)	26 (70%)
POD 1 discharge	11 (30%)

Where did the notion of same day hospital discharge following colorectal major abdominal procedures initially begin? SDD programs were developed by pioneers in centers with highly functional and evolved ERPs resulting in further reducing LOS to 24 hours or less. In our experience, the idea of going home the same day following minimally invasive colorectal surgery is typically brought up first by the patients who may be fearful of hospitalization during the COVID-19 pandemic, feel more comfortable recovering at home, or both. Additional observations leading to interest in SDD programs are the occasional episodes of non-compliance with ERP early mobilization protocols in hospitalized patients and/or perceived overuse of narcotics in treating pain scores rather than appropriate management of the whole patient who may be reporting a higher pain score but appears otherwise comfortable.

Subjectively, several patients in the SDD program who were recovering at home reported improved satisfaction in having more flexibility and independence in moderating their own pain assessment and analgesia. In addition, patients reported increased comfort with postoperative ambulation and mobilization in a familiar environment or exercise routine. The overall patient feedback was positive regarding early independence and recovery at home in what the patients described as a more supportive and comfortable environment. These perceptions by the authors are highly prone to recall bias. The enthusiasm and investment of the authors in the SDD protocol development may potentially influence patient perception. Additionally, the patients may be reluctant to report negative feelings or feedback. The authors are currently in the process of obtaining more objective patient satisfaction data. If patients feel more comfortable at home, this may also contribute to the observed reduction in opioid needs for pain managed in this highly selective patient group.

There are several limitations to this study. The sample size is small, as is typical for a pilot program. The inclusion and exclusion criteria are highly selective for the healthiest patients and bowel anastomosis. These limitations make it difficult to determine the underlying cause of the reduced narcotic usage in SDD patients—is it the ERP, highly selective patient population, home environment, or the impact of daily telephone visits with the surgical team following discharge? Is recovery at home without the interruption of hospital noises, vital checks, blood draws, etc. also a contributing factor? And if so, to what extent? These are difficult questions to answer, as the driving force for the SDD program was the COVID-19 pandemic in order to provide an alternative to hospitalization for patients who feared coming into the hospital following elective colorectal surgical procedures along with addressing the shortage of beds and allied health care providers during this crisis.

The authors continue to offer the SDD program for patients who meet inclusion criteria and are interested in this alternative to hospitalization following surgery. In addition, the elements in the SDD protocol are now standard elements in the ERP offered to all of our elective minimally invasive colorectal surgery cases, with the exception of hospitalization following surgery rather than discharge home on the same day as surgery. In summary, patients in the SDD pilot program required significantly less opioids for postoperative pain management. This observation led us to reject our initial hypothesis, and also led to a change in our clinical practice with reduced opioid quantity prescribing from #40 to #10 oxycodone 5 mg tablets.

Declaration of Conflicting Interests

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