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Discharge within 24 hours following colonic surgery—a distant dream or near reality? A scoping review

Jarrod K.H. Tan, MMed (Surgery)[a], Lina Choe, BSocSci (Hons)[b], Jerrald Lau, MPH[b,c], Ker-Kan Tan, PhD[a,c,d,*]

[a] University Surgical Cluster, National University Health System, Singapore
[b] Saw Swee Hock School of Public Health, National University of Singapore, Singapore
[c] Department of Surgery, Yong Loo Lin School of Medicine, National University of Singapore, Singapore
[d] Division of Surgical Oncology, National University Cancer Institute, Singapore (NCIS), National University Health System, Singapore

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ABSTRACT

Background: Enhanced recovery after surgery programs have improved patient outcomes following colorectal surgery. This has provided a platform for the consideration of ambulatory colectomies where patients are discharged within 24 hours after surgery. Although some studies have demonstrated its feasibility, the safety profile and patient eligibility criteria for discharge within 24 hours after surgery remain relatively ill-defined. This study provided a review of the patient selection criteria and postoperative outcomes shown in patients discharged within 24 hours after surgery.

Methods: Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews guidelines were adhered to. A comprehensive search was performed on 3 electronic databases, and the relevant articles were identified. The primary outcome measures were postoperative morbidity and readmission rates. The different domains relevant to the selection of patients and perioperative care of patients discharged within 24 hours after surgery were also qualitatively assessed.

Results: Eight studies were included, which involved a total of 1,229 patients. The majority of selected patients underwent elective laparoscopic colonic surgeries. The patient characteristics, such as age, comorbidities, obesity, and psychosocial environment, were important considerations. A close follow-up with home-based medical services was ideal in patients discharged within 24 hours after surgery. The readmission rates ranged from 0.0% to 9.0%. Despite morbidity rates of up to 26.7%, the majority of them were minor and classified as Clavien-Dindo Grade I to II.

Conclusion: The use of programs related to discharge within 24 hours after surgery in colorectal surgery is safe, feasible, and practical in a select group of patients within a well-designed clinical framework and pathway. Future studies should compare patient outcomes following discharge within 24 hours after surgery with conventional enhanced recovery after surgery protocols. In addition, patient and caregiver perceptions, quality of life, and cost-effectiveness analysis should also be performed.

Introduction

Over the past 2 decades, enhanced recovery after surgery (ERAS) protocols have become a standard of care for patients undergoing colectomies.[1] Advances in anesthetic care, surgical techniques, and perioperative pain management have enabled institutions to improve patient outcomes, including a reduction in postoperative length of stay (LOS),[1] in a safe and reproducible manner. This serves not only to improve the patient experience but also results in significant cost savings.[2,3]

Jarrod K.H. Tan was responsible for conceptualization, methodology, and writing (original draft preparation, review, and editing). Lina Choe and Jerrald Lau were responsible for conceptualization, methodology, and writing (review and editing). Ker-Kan Tan was responsible for conceptualization and writing (review and editing).

* Reprint requests: Dr Ker-Kan Tan, Division of Colorectal Surgery, University Surgical Cluster, National University Health System, IE Kent Ridge Road, Singapore 119228.
E-mail address: surtkk@nus.edu.sg (K.-K. Tan).

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Recent surgical literature has attempted to push these limits further by considering the potential of ambulatory colectomy, where patients are discharged within 24 hours after surgery. Emerging evidence has suggested that such a practice can potentially be safe and feasible, with up to approximately 30% of patients undergoing colectomy being eligible for fast-track discharge.[4,5] Clinicians have also begun to establish the next logical step in the process by developing a framework for practice through defining the eligibility, discharge, and follow-up criteria for patients most suited to the benefits of ambulatory colectomy while minimizing the risk of postoperative complications.[6]

Nonetheless, ambulatory colectomy remains a relatively underdeveloped program in many surgical and colorectal units. Efforts to consolidate common findings, key outcomes, and existing gaps are essential in order to guide continued progress in this field. Therefore, the objective of this scoping review was to qualitatively establish a collective list of eligibility criteria from all relevant peer-reviewed studies on ambulatory colectomy. We also sought to summarize and quantify uncertainties in key clinical outcomes in patients undergoing colectomy who were fast-tracked in their hospital discharge.

Methods

The scoping review is a relatively new method of research to determine the extent of available evidence based on a broad research question. This is in contrast to systematic reviews, which are often extremely focused. Scoping reviews also do not require an assessment of the quality of the reviewed literature due to the expansive nature of the review questions. The ultimate aim following a scoping review is to describe and summarize the findings that would facilitate further understanding of the topic and to derive key concepts and gaps that are worth exploring thereafter. We performed the review by adopting Arksey and O'Malley's methodological framework.[7] This translated to the following: (1) identification of the research question; (2) comprehensive search of the literature; (3) selection of studies based on inclusion and exclusion criteria; (4) data charting; and (5) summarizing and reporting the results.

The current scoping review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews.[8] A registered protocol is not required for scoping reviews and is not available for the current study. Institutional Review Board approval and written consent were also not required for this manuscript.

Search strategy

A comprehensive literature search was performed using the MEDLINE, Embase, and Cochrane Library electronic databases for identification of published articles. For each database, the search syntax was modified for compatibility, and the various permutation and combinations of search terms used were as follows: "ambulatory," "outpatient," "same day," "23-hour," "24-hour," and "colorectal surgery," "colon surgery," "colon resection," and "colectomy." Manuscripts published from inception to 30th April 2021 were included. There were no restrictions imposed on the manuscript language, and manual reference searching of articles was performed to ensure that all relevant articles were included.

Eligibility criteria

All of the studies that evaluated the postoperative outcomes of patients who were discharged in <24 hours (DC 24) after elective colorectal surgery were included in the current review. Original research, editorials, commentaries, opinion papers, letters, conference abstracts, protocols, and reports with relevant data published in peer-reviewed journals were evaluated. There was no minimum sample size for inclusion.

Selection of studies and data extraction

Relevant studies from each electronic database were imported into EndNote (Clarivate), and duplicates were removed using a published de-duplication method. All titles and abstracts were then assessed by 2 authors (JKHT, LC) independently for eligibility. Full-text copies of the eligible articles (if available) were then reviewed independently by 2 authors (JKHT, LC) to confirm their inclusion in the current review. Relevant articles were screened carefully for overlapping data involving the same institution and excluded accordingly. The papers that evaluated fast-tracked colectomies with hospital discharge >24 hours after surgery were also excluded. Disagreements were resolved by consensus or an appeal to a third reviewer (JL). The following parameters were extracted from the included studies: authors, year of publication, country, study design, study population, patient demographics, type of surgery, selection criteria, perioperative regimen, discharge criteria, and postoperative outcomes.

Outcome measures

The primary outcome measures were postoperative morbidity rates (%) and readmission rates (%). Readmission is an important outcome measure given that the main aim of fast-tracked colectomies is to reduce LOS, hence it is pertinent to ensure that there is no concomitant increase in readmission rates. Postoperative morbidity was also analyzed as early diagnosis of complications is crucial to reduce the severity and mortality risk. These factors were also important outcome measures in existing studies that evaluated the safety and effectiveness of ERAS protocols in colorectal surgery.[9] Different domains relevant to the selection of patients and perioperative care of patients who were DC 24 were also qualitatively assessed.

Risk of bias assessment

We did not aim to synthesize data in the current review; hence, it was not necessary to perform an assessment of the risk of bias.

Results

Study selection

The search identified a total of 1,446 articles. The removal of duplicates resulted in a remaining 762 articles, which were subsequently screened for relevance using title and abstract. Thirty-six articles were eventually selected for full-text review. After comprehensive evaluation, a total of 7 articles and 1 conference abstract met the inclusion criteria and were included in this review.[10–17] Although the studies by Chasserant et al and Gignoux et al were likely to report overlapping data, they were both included in this review as they each provided unique but relevant perspectives to the current review.[11,13] The former placed strong emphasis on the perioperative protocols implemented in their institution, whereas the latter focused on patient outcomes after fast-tracked discharge. This study selection process is demonstrated in Figure 1 via the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flowchart.

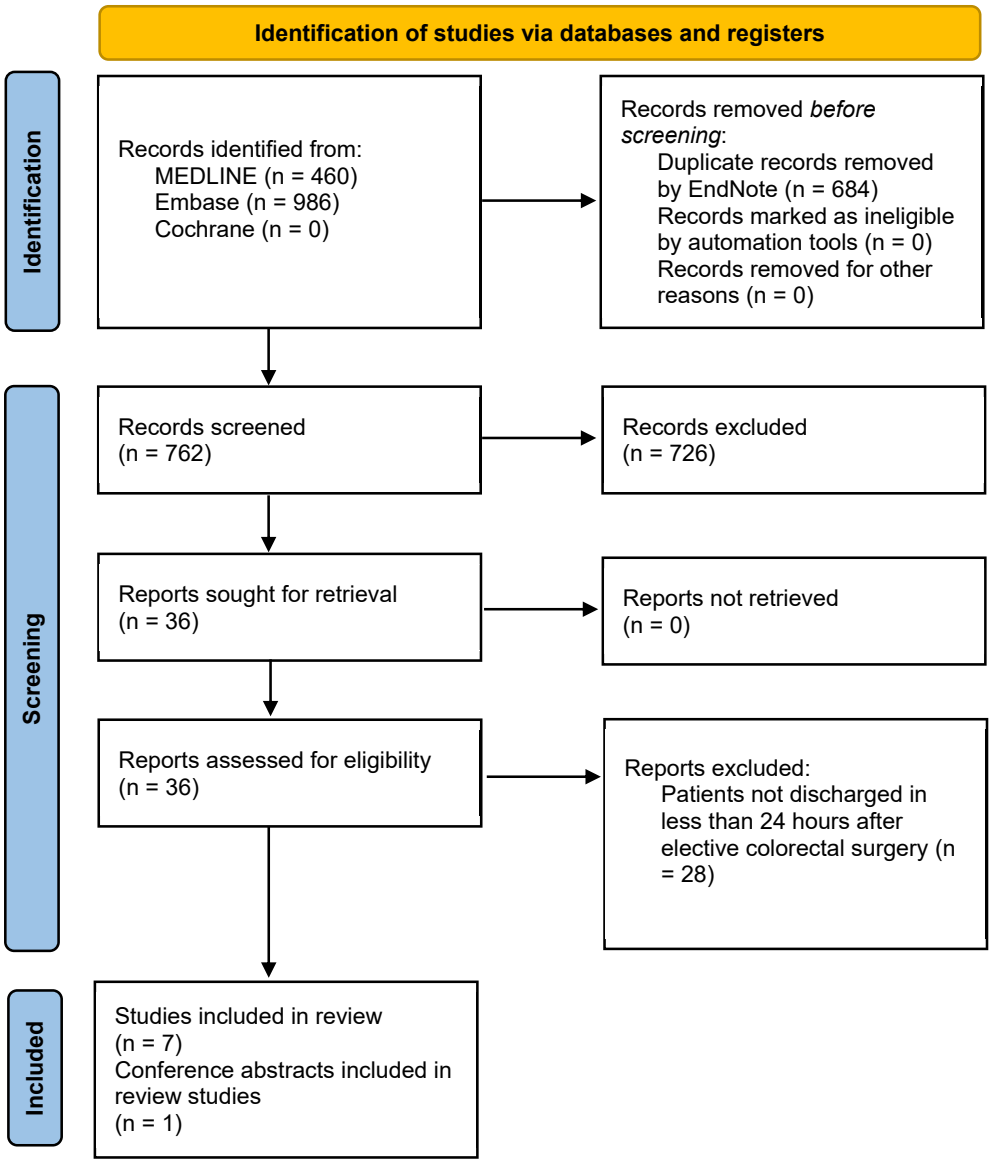

Figure 1. Preferred Reporting Items for Systematic reviews and Meta-Analyses flowchart.

Characteristics of included studies

The 8 studies selected in the current review involved a total of 1,229 patients who had undergone colorectal surgery and were discharged within 24 hours postoperatively. Six of the studies reported outcomes from a dedicated program in their respective institutions designed for fast-tracked discharge,[10–14,17] whereas the remaining 2 studies derived data from retrospective analyses of either the individual unit or National Surgical Quality Improvement Program colorectal database.[15,16] There were 4 studies that only reported single-arm data from patients who were discharged within 24 hours, but comparative results with patients discharged after 24 hours were provided in the other four studies. Table I summarizes the characteristics of the included studies.

Criterion for DC 24 after colorectal surgery

The widely adopted ERAS protocols in colorectal surgery involved decreased fasting time, supplemental nutritional drink on the day before surgery, opioid-sparing multimodal postoperative analgesia, early removal of urinary catheter, avoidance of nasogastric tube, early postoperative mobilization, and early postoperative oral intake. These components are consistently used as a foundation for DC 24 programs to be built upon. Table II summarizes the criterion across 5 different domains that were standardized for patients who were eligible for DC 24 after colorectal surgery.

Type of surgery

The majority of studies selected elective laparoscopic colonic surgeries to be eligible for DC 24. In the study by Harmouch et al, DC 24 was only applied to robotic-assisted laparoscopic elective segmental colectomy.[16] Half of the 40-patient cohort described by Chasserant et al had surgery via a single-port laparoscopic approach.[11] Levy et al included laparoscopic surgeries for high rectal tumors but excluded patients who required conversion or an ostomy.[14] Studniarek et al derived data from a patient database retrospectively and included all elective and emergency colorectal resection patients.[16] However, they excluded the patients who

Table I
Characteristics of included studies

Author, y	Study type	Study sample size (DC 24)	Methodology	Dedicated DC 24 program	Country study was conducted	Average age, y	Average BMI	ASA	Malignancy	Benign	Bowel preparation regime	Median operating time, min
Brandt, 2013[10]	Comparative study	$N = 24$	Retrospective	No (ERAS program)	Denmark	64 (35–81)	25 (18–32)	ASA I–II: $n = 22$ (91.7%) ASA ≥III: $n = 2$ (8.3%)	$N = 24$ (100.0%)	$N = 0$ (0.0%)	Rectal enema for sigmoidectomy	120 (82–220) vs 155 (85–350) $P = .002$
Chasserant, 2016[11]	Single-arm	$N = 40$	Prospective	Yes	France	56 (30–76)	26 (20–32)	ASA I: $n = 8$ (20.0%) ASA II: $n = 24$ (60.0%) ASA III: $n = 8$ (20.0%)	$N = 6$ (15.0%)	$N = 34$ (85.0%)	Fleet soda 4 d before surgery	78 (54–147)
Dobradin, 2013[12]	Single-arm	$N = 7$	Retrospective	Yes	United States	66 (30–84)	26 (20–34)	ASA I: $n = 1$ (14.3%) ASA II: $n = 4$ (57.1%) ASA III: $n = 2$ (28.6%)	$N = 4$ (57.1%)	$N = 3$ (42.9%)	1 gal of polyethylene glycol electrolyte solution 1 d before surgery	118 (65–158)
Gignoux, 2018[13]	Single-arm	$N = 146$	Prospective	Yes	France	61 (25–82)*	26 (16–45)*	ASA I–III: $n = 146$ (100.0%)	$N = 54$* (34.4%)	$N = 103$* (65.6%)	No mechanical bowel preparation	95 (45–232)
Harmouch, 2020[17]	Single-arm	$N = 7$	Retrospective	Yes	–	–	–	–	–	–	–	188 (118–280)
Levy, 2009[14]	Comparative study	$N = 10$	Prospective	Yes	United Kingdom	60 (43–72)	–	ASA I: $n = 1$ (10.0%) ASA II: $n = 9$ (90.0%)	$N = 9$ (90.0%)	$N = 1$ (10.0%)	Phosphate enema for left sided resection	73 (50–110) vs 88 (50–160) P = .17
Mckenna, 2019[15]	Comparative study	$N = 906$	Retrospective	No (ACS NSQIP protocol)	United States	60 (52–68)	<18.5: 9 (1.0%) 18.5–24.9: 234 (25.8%) 25.0–29.9: 366 (40.4%) 30+: 291 (32.1%) Missing: 6 (0.7%)	ASA I: $n = 47$ (5.2%) ASA II: $n = 560$ (61.8%) ASA III: $n = 291$ (32.1%) ASA IV: $N = 8$ (0.9%)	$N = 236$ (26.0%)	$N = 670$ (74.0%)	–	95 min (66–141)
Studniarek, 2020[16]	Comparative study	$N = 78$	Retrospective	No (ERAS program)	Germany	59 (30–93)	28 (range not provided)	ASA I: $n = 3$ (3.8%) ASA II: $n = 59$ (75.6%) ASA III: $n = 16$ (20.5%)	$N = 37$ (47.4%)	$N = 41$ (52.6%)	–	–

ACS NSQIP, American College of Surgeons National Surgical Quality Improvement Study; *ASA*, American Society of Anesthesiologists; *BMI*, body mass index; *ERAS*, enhanced recovery after surgery.
* sample size for these numbers $n = 157$, as $n = 11$ required admission and were excluded from DC 24

Table II
Criterion across five domains in DC 24 Programs

Author, y	Type of surgery	Prerequisites	Intraoperative and postoperative regimen	Discharge criteria	Follow-up
Brandt, 2013[10]	Laparoscopic right hemicolectomy or sigmoidectomy for colon cancer	–	Urinary catheters and oral tubes removed No drains Postoperative analgesia-paracetamol, ibuprofen, and morphine (oral), if needed No epidural catheters Mobilisation POD 0 Feeding POD 0	Completion of discharge consultation with surgeon Adequate pain control Major meal consumption Lack of fever Lack of surgical site infection Patient acceptance Presence of another person at home during first 24 h following discharge	Day 10
Chasserant, 2016[11]	Laparoscopic left colectomy	Lesion above pelvic peritoneal reflection Single pathology Cancer or diverticulitis Moderate or controlled comorbidities No previous surgery Good patient comprehension Does not stay alone or live in poor psychosocial conditions No anemia No anticoagulation No antiplatelet use within 72 h	Target-controlled intravenous analgesia TAP block + acetaminophen + nefopam + morphine during closure Routine antiemetics Prophylactic antibiotics No drain No urinary catheter Chewing gum once patient awake Discharge from PACU once Aldrete score 9 Oral clear liquids once in ambulatory care unit Sit up in chair for meals Prompt ambulation 6 h after surgery	Postanesthetic discharge scoring system (PADSS) score >9	Home surveillance with visiting nurse D1–D4 2× daily, D5–D10 1× daily Daily transmission of clinical data by nurse Daily phone call by surgical assistant CBC, electrolytes, CRP on D1, D3, D5 Follow up visit D10 and D21
Dobradin, 2013[12]	Laparoscopic colon surgery	–	No drain No nasogastric tubes No epidural anaesthesia Prompt removal of urinary catheter	Immediate postoperative liquid diet Early ambulation PO ketorolac 10 mg	Day 7
Gignoux, 2018[13]	Laparoscopic colectomy	Start as first case	LA infiltration or TAP block No gastric tube No urinary catheter No abdominal drain No preoperative sedative Anesthetic agents with short duration of action Limit IV fluid intake 5 mL/kg/h Multimodal combination of paracetamol, nefopam, lidocaine, ketamine, tramadol and morphine IV droperidol, and/or dexamethasone Chewing gum once awake Only oral analgesia postop Walk within 2 h Food intake within 2 h	Postanesthetic discharge scoring system (PADSS) score > 9	Provision of chewing gum and oral magnesium supplements Thromboembolic prophylaxis for 10 d Home care nurse surveillance twice for D1 to D5 then once D6 to D10 Phone call by PACU nurse every morning D1 to D5 TW, Electrolytes and CRP POD 1, 3 and 7 POD 30 clinic follow-up
Harmouch, 2020[17]	Robotic-assisted laparoscopic elective segmental colectomy	Start as first case Segmental resection Absence of an ostomy	–	Stable labs Tolerating full liquid or soft diet Pain controlled without need for IV narcotics Unremarkable abdominal examination	–
Levy, 2009[14]	Laparoscopic colon or high rectal surgery No stoma No converted cases No patients with strong history of PONV	ASA 1 or 2 Age <75 BMI <28 Competent adult present for 24 hr after discharge Telephone line or mobile phone Home <10 mi from hospital Incision <7 cm Agreement with general practitioner Uncomplicated operation	Avoidance of preoperative sedatives Spinal analgesia before skin incision Target driven fluid therapy Upper body air heating cover Avoidance of drains Avoidance of nasogastric tube Oral fluid once in recovery Sit out on POD 0 Normal diet from dinner Mobilization on evening of surgery Urinary catheter taken off at Day 0 midnight Termination of IV fluids 18–20 h after surgery Aperient given	Tolerating breakfast Passing urine Comfortable	Phone on evening of discharge Follow-up in clinic end of the week
Mckenna, 2019[15]	Laparoscopic segmental colectomy No stoma	–	–	–	–

(*continued on next page*)

Table II (*continued*)

Author, y	Type of surgery	Prerequisites	Intraoperative and postoperative regimen	Discharge criteria	Follow-up
Studniarek, 2020[16]	Colorectal resections Elective, urgent, emergency cases No APR, total proctocolectomies, IPAA, coloanal pull-through procedures	–	–	–	APDS platform

ASA, American Society of Anesthesiologists; *APR*, abdominalperineal resection; *APDS*, Active Post-Discharge Surveillance; *BMI*, body mass index; *CBC*, complete blood count; *CRP*, c-reactive protein; *IPAA*, ileal pouch-anal anastomosis; *IV*, intravenous; *LA*, local anesthetic; *PACU*, postanesthesia care unit; *PADSS*, postanesthetic discharge scoring system; *PO*, taken orally; *POD*, postoperative day; *PONV*, postoperative nausea and vomiting; *TAP*, transverse abdominis plane.

required abdominoperineal resections, total proctocolectomies, and coloanal pull-through procedures.

Prerequisites

Chasserant et al selected patients who had no previous surgery, moderate or controlled comorbidities, and a single pathology of either cancer or diverticulitis.[11] The patients who were anemic or had anticoagulation use/antiplatelet use within 72 hours were excluded. This allowed for 83.9% (47/56) of evaluable patients to be considered for the study. However, 7 patients were not keen for the outpatient care approach; hence, 40 patients were eventually included. Gignoux et al had similar prerequisites for patients eligible for DC 24 but also indicated that surgeries should start as the first case.[13] Levy et al included patients <75 years old, American Society of Anesthesiologists I or II, and had a body mass index <28 who had undergone an "uncomplicated operation," which was not defined.[14] The patients who stayed alone or lived in poor psychosocial conditions were also excluded. In addition, Levy et al specified that patients eligible for DC 24 must have a telephone line or mobile phone and should ideally live <10 miles from the hospital.[14]

Intraoperative and postoperative regimen

Most authors described a predefined set of intraoperative and postoperative instructions for patients eligible for DC 24. Similar to ERAS protocols, avoidance of drain placement and early removal of urinary catheters and oral tubes are advocated. Early mobilization and feeding must also be instituted postoperatively. Emphasis was also placed on reducing preoperative sedatives, use of multimodal analgesia, use of opioid-sparing agents, and also limiting intravenous fluids with target-driven fluid therapy.

Discharge criteria

Chasserant et al and Gignoux et al used a validated cumulative index termed Post-anesthetic Discharge Scoring System to measure the home-readiness of ambulatory surgery patients.[11,13] The scoring system encompasses a composite assessment of systolic blood pressure, ambulation status, severity of nausea symptoms, pain score, and estimated blood loss. A score of >9 was used as a discharge criterion.[18] Gignoux et al reported that 7.0% (11/157) of patients failed to be discharged within 24 hours due to operative difficulties and medical and social reasons, whereas 1 patient in the study by Chasserant et al had to be admitted as he was retrospectively found to have lived alone.[11,13] Brandt et al dictated that adequate pain control, major meal consumption, lack of fever, and patient acceptance must be present before discharge.[10] These patients should also complete a discharge consultation with the primary surgeon. Harmouch et al had discharge criteria that included stable blood results, tolerance of full liquid or soft diet, pain control without the need for intravenous narcotics, and unremarkable abdominal examination.[17]

Follow-up protocol

The follow-up protocol varied across different institutions. Dobradin and Levy et al advocated for a follow-up clinic visit within 7 days, although a phone consultation on the evening of discharge was also described by the latter.[12,14] Brandt et al were less stringent, and patients eligible for DC 24 had a planned follow-up evaluation at the outpatient clinic after the 10th POD.[10] Studniarek et al described a patient-centered communication and surveillance system for follow-up via the Active Post-Discharge Surveillance platform.[16] It is a Health Insurance Portability and Accountability Act-compliant mobile platform that follows a multimedia text messaging paradigm to allow for real-time communication between the patient and operating surgeon. Chasserant et al and Gignoux et al incorporated home surveillance with nurse visitation into their follow-up regimen during the first 10 days after surgery,[11,13] during which serum markers such as total white blood cell count, C-reactive protein, and electrolytes were performed at regular intervals during the first week.[11,13] Daily phone calls during the first few days after discharge were also performed either by the surgical assistant or postanesthetic care unit nurse.[11,13] Additionally, a follow-up outpatient visit on days 10 and 21 (Chasserant) and 30 (Gignoux) was planned.[11,13]

Perioperative framework for DC 24 colectomies

The institutions that are keen to implement DC 24 programs should ideally have considerable experience with the implementation of ERAS protocols. Several commonalities across the different domains in the criteria for DC 24 programs were extracted and demonstrated in Figure 2 to serve as a perioperative framework for DC 24 colectomies.

Postoperative outcomes

The postoperative outcomes of DC 24 programs are summarized in Table III.

Readmission rates

Five studies reported no readmissions,[10–12,14,17] whereas the remaining 3 studies demonstrated readmission rates of <10.0%.[13,15,16] Gignoux et al revealed a readmission rate of 6.1% (9/146).[13] Amongst these patients, 6 patients required a reoperation (3 anastomotic leaks, 2 small bowel obstructions, 1 omental necrosis), whereas the other 3 patients recovered with conservative treatment.[13] Mckenna et al reported an overall readmission rate of 4.8% (43/906).[15] In addition, the early readmission rate (defined as within seven days from discharge) was also reported to be at 2.0% (22/906).[15] The leading causes of readmission were found to be ileus/obstruction and bleeding-related complications.[15] Similarly, Studniarek et al reported a readmission rate of 9.0% (7/78)[16].

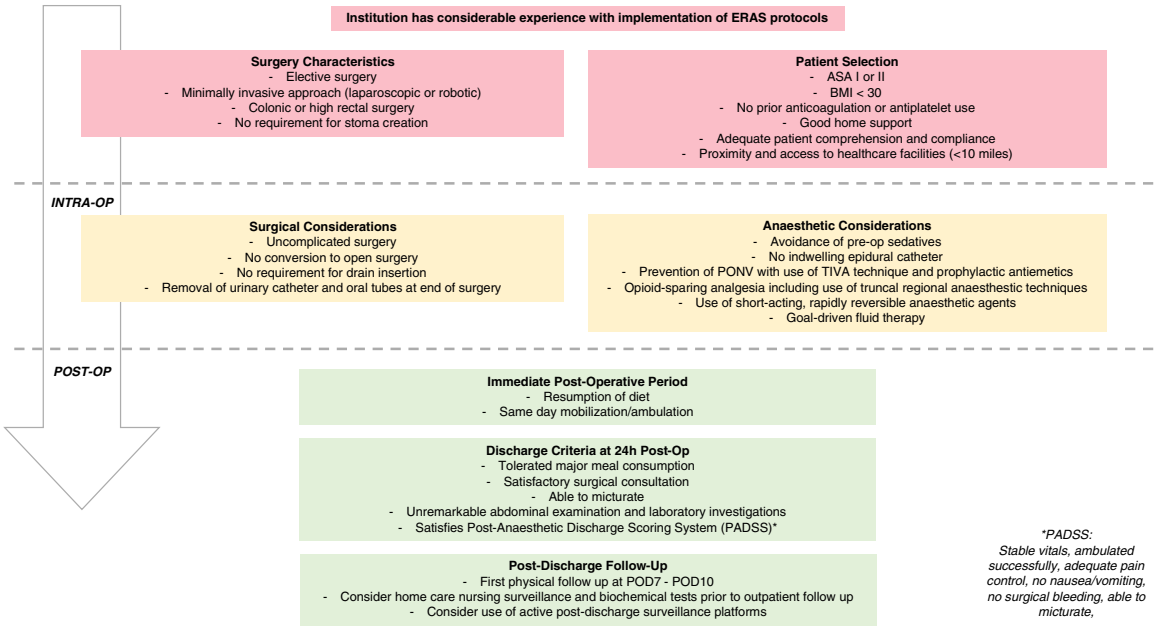

Figure 2. Perioperative framework for colectomies discharged within 24 hours after surgery. *ASA*, American Society of Anaesthesiology; *BMI*, body mass index; *DC 24*, discharged within 24 hours after surgery; *PADSS*, Satisfies Post-Anaesthetic Discharge Scoring System; *POD*, post-operative day; *PONV*, post-operative nausea and vomiting; *TIVA*, total intravenous anaesthesia.

Table III
Postoperative outcomes

Author, y	Study type	Study sample size (DC 24)	Readmission rates	Postoperative morbidity rates	Mortality	Grade of complications
Brandt, 2013[10]	Comparative study (DC 24 versus normal ERAS pathway)	$N = 24$ vs $N = 209$	$N = 0$ (0.0%) vs $N = 9$ (4.0%) $P = .369$	$N = 0$ (0.0%) vs $N = 20$ (10.0%) $P = .103$	$N = 0$ (0.0%) vs $N = 0$ (0.0%)	Not provided
Chasserant, 2016[11]	Single-arm	$N = 40$	$N = 0$ (0.0%)	$N = 2$ (5.0%)	$N = 0$ (0.0%)	Not provided
Dobradin, 2013[12]	Single-arm	$N = 7$	$N = 0$ (0.0%)	$N = 0$ (0.0%)	$N = 0$ (0.0%)	Not provided
Gignoux, 2018[13]	Single-arm	$N = 146$	$N = 9$ (6.1%)	$N = 30$ (20.5%)	$N = 0$ (0.0%)	CCI I–II: $n = 24$ (80.0%) CCI III: $n = 6$ (20.0%)
Harmouch, 2020[17]	Single-arm	$N = 7$	$N = 0$ (0.0%)	$N = 0$ (0.0%)	$N = 0$ (0.0%)	Not provided
Levy, 2009[14]	Comparative study (DC 24 versus normal ERAS pathway)	$N = 10$ vs $N = 30$	$N = 0$ (0.0%)	$N = 0$ (0.0%)	$N = 0$ (0.0%)	Not provided
Mckenna, 2019[15]	Comparative study	$N = 906$	$N = 43$ (4.7%)	$N = 62$ (6.8%)	–	–
Studniarek, 2020[16]	Comparative study (DC 24 vs 24–48 h vs >48 h)	$N = 78$ vs $N = 112$ vs $N = 170$	$N = 7$ (9.0%) vs $N = 8$ (7.1%) vs $N = 18$ (10.6%) $P = .6453$	$N = 8$ (10.3%) vs $N = 13$ (11.6%) vs $N = 27$ (15.9%) $P = .1389$	$N = 0$ (0.0%) vs $N = 0$ (0.0%) vs $N = 1$ (0.6%)	CCI I: $n = 6$ (75.0%) CCI II: $n = 0$ CCI IIIa: $n = 2$ (25.0%) (for DC 24 arm)

CCI, Comprehensive Complication Index; *DC 24*, discharged in less than 24 hours; *ERAS*, enhanced recovery after surgery, Nil, none.

Postoperative morbidity rates

Four studies reported no patient morbidities.[10,12,14,17] These patients were reportedly followed up physically in the outpatient setting within 7 to 10 days after surgery. Of the 4 studies, 3 had dedicated DC 24 programs implemented in their respective centers, whereas the remaining study had ERAS protocols put in place. Three other studies reported morbidity rates of 10.0% or less. Chasserant et al reported the lowest morbidity rate at 2.5% (1/40), as 1 patient developed a surgical site abscess requiring surgical drainage.[11] Analysis from Mckenna et al revealed a morbidity rate of 6.8% (62/906),[15] and 0.6% of patients developed an anastomotic leak, and 1.2% required reoperation.[11,15] The majority of patients had superficial surgical site infections (1.8%) and ileus (1.9%).[11,15] Studniarek et al showed a morbidity rate of 10.3% (8/78) in the DC 24 group.[16] In addition, 62.5%, 18.8%, and 4.2% of patients had a Clavien-Dindo surgical complication grade of I, II, and IIIa, respectively.[19] The study by Gignoux et al demonstrated the highest morbidity rate of 20.5% (30/146).[13] Nonetheless, most patients (24/30) had benign complications that were labeled as Clavien-Dindo I to II.[13] There were 6 patients who required reoperation as mentioned above and, hence, were classified as Clavien-Dindo III.[13] No mortalities for DC 24 were reported in any of the studies.

Discussion

The implementation of ERAS protocols has been proven to improve clinical outcomes in patients after surgery. Specific to colorectal surgery, such programs have led to earlier bowel movement after surgery, lower surgical morbidity rates, and reduction in postoperative LOS.[20–24] Optimization of the

aforementioned postoperative outcomes has also predictably resulted in significant cost savings across healthcare systems worldwide.[25]

The combination of minimally invasive surgery, multimodal analgesia, and the increasing adoption of ERAS protocols has provided a platform for postoperative recovery and hospital LOS to be further shortened. As shown in the current review, several institutions have demonstrated the feasibility and reproducibility of DC 24 in a select group of patients. Nonetheless, the feasibility of practice does not imply that it should be routinely adopted as standard of care. A prudent review of patient and caregiver perceptions and acceptability, quality of life, and cost-effectiveness analysis are critical before routine adoption. Upon initiation of a DC 24 program, judicious review of all patient outcomes and morbidity rates must be performed to ensure that the safety of patients is not compromised.

The main concerns of expedited discharges after colonic surgery are the potential for higher readmission rates and delayed diagnosis of postoperative morbidity. The majority of the articles included in this review reported no readmissions and morbidity in their study population. However, these studies only evaluated a select group of patients who underwent a dedicated program designed for expedited discharge in a relatively small study cohort. In a larger study with 157 patients, Gignoux et al revealed readmission and postoperative morbidity rates of 6.1% and 20.5%, respectively.[13] Retrospective studies of large patient databases by Mckenna et al and Studniarek et al showed readmission rates of 4.8% and 9.0%, and postoperative morbidity rates of 6.8% and 10.3%, respectively.[15,16] Despite being limited by selection bias, these outcomes were found to be either comparable or superior to patients with delayed discharges. Meta-analyses evaluating postoperative outcome measures in ERAS and non-ERAS colorectal populations demonstrated readmission rates between 3.8% and 11.4%, whereas postoperative morbidity was reportedly lower in the ERAS group at 17.8% and 27.0%, respectively.[9,26] Although the aforementioned studies demonstrated the safety of DC 24, they also highlighted the need for stringent patient selection and a well-designed clinical framework for the program to achieve success. The patients of older age, with high American Society of Anesthesiologists scores, previous abdominal surgery, obesity, site of tumor, and stoma creation are perhaps not suitable to be enrolled in such programs as these have been consistently reported as factors predictive of morbidity and mortality after colorectal surgery.

The other key tenet in DC 24 programs is the ability to detect postoperative patient morbidity in a timely manner. Frequent monitoring of vital signs, early consultation via teleconsultation, or home visits should be considered. The ability to contact the clinical team in the event of clinical deterioration and subsequent expedient transfer to the hospital are also crucial to minimize delays in the diagnosis of complications.

A major hindrance to the successful discharge of patients within 24 hours of surgery is the presence of pain, which is an important component of postoperative discharge criteria. Optimal pain control after intra-abdominal surgery facilitates early ambulation and compliance to incentive spirometry and deep breathing exercises, which are vital to the avoidance of postoperative respiratory and thromboembolic complications. However, the provision of adequate analgesia is challenging in an out-of-hospital setting, where traditional methods (eg, as the use of patient-controlled analgesia pumps or epidural catheters) are no longer viable options. The use of large amounts of intraoperative and postoperative opioids is also undesirable due to the myriad of opioid-related adverse effects, including nausea and vomiting, ileus, acute retention of urine, sedation, and respiratory depression. Minimally invasive surgery has obvious advantages over open techniques in this aspect, and employing the use of opioid-sparing methods, including regional anesthesia techniques such as abdominal plane blocks, and a multimodal analgesic regimen, are hence imperative in the provision of adequate postoperative pain control.[27] Multidisciplinary management with involvement of the primary anesthetist as well as pain teams is necessary in facilitating the above.

On a larger scale, the initiation of DC 24 programs is relevant in today's context, where the COVID-19 pandemic has led to the increased prioritization of surgical cases to accommodate a potential surge in admissions.[28] Adopting a fast-track discharge system can improve bed occupancy rates and allow for more patients to undergo surgery in an expedient manner. The recent popularization and growing acceptance of teleconsultation and home-based medical services (eg, consultations, phlebotomy, and delivery of medications) as the "new norm" in the pandemic era can also serve to facilitate the implementation of such ambulatory colectomy protocols.[29] Health technology innovations (eg, wearable devices) may potentially have an integral role in providing real-time monitoring of discharged patients for early detection of any deterioration.[30]

Moving forward, although it may be tempting to expedite new models of care based on the objective benefits to individual institutions and healthcare systems, it is also important to understand the perspectives of key stakeholders in the holistic care of patients to avoid implementation failures. The existing studies on ERAS program implementation have already shown that uniquely different subjective barriers exist at the patient, provider, and system levels. The patients may be hesitant to accept early discharge due to the lack of confidence in resolving postoperative complications at home or the absence of an available caregiver to help when the need arises.[31] At the healthcare provider and system level, resistance to changing long-held standard practices and additional workload or confusion due to the lack of care coordination remain key challenges in the implementation of new programs.[32] Therefore, it is imperative that future studies evaluate the perceptions of the various stakeholders involved (surgeon, anesthetist, nurse, patient caregiver) toward DC 24 programs.

The current review comprised several retrospective studies, which have their attendant limitations. Firstly, the clinical eligibility criteria required in respective DC 24 programs confer an inherent selection bias, as the majority of the eligible patients were healthy individuals deemed to have a low surgical risk in their respective cohorts. This limited the generalizability of the postoperative outcomes reported, and these results should be carefully interpreted in accordance to the selection criteria used in individual DC 24 programs, as shown in this current review. In addition, 3 of the studies retrospectively analyzed patients who did not follow a dedicated DC 24 program pathway but were discharged within 24 hours after colorectal surgery. As such, the postoperative outcomes reported in this group of patients—although consistent with the general narrative of this review—might not be fully representative of a clinical context where DC 24 protocols are put in place. Thirdly, a number of the included studies comprised relatively small sample sizes. Although this is unlikely to significantly impact the study findings in demonstrating a perioperative DC 24 framework, small sample sizes tend to be more susceptible to chance bias and poorer statistical power. As such, less common postoperative complications may require a larger patient population to manifest and may not have been picked up in these studies. Lastly, the included studies did not report on adjunct data, such as the proportion of patients eligible for DC 24 from the respective institutions' patient cohorts and the number of DC 24-eligible patients who were part of the program but were not discharged accordingly due to clinical judgment or social reasons. Such findings allow for estimates of use

and implementation failure rates and will be useful for healthcare administrators who intend to roll out a DC 24 program.

Nonetheless, this study demonstrated the feasibility of DC 24, albeit in a select group of low-risk patients that satisfy the aforementioned prerequisite criteria. It also provided a summary and clinical framework for institutions to consider when implementing DC 24 programs in colorectal surgery. Future studies should seek to conduct a pragmatic prospective pilot implementation of DC 24 using a formalized and systematic clinical framework as proposed in Figure 2 to allow for the evaluation of clinical outcomes in DC 24. In addition, these studies can also serve as a platform for the examination of perceptions of the various stakeholders involved, as mentioned above, and for the exploration of a cost-effectiveness analysis of this new model of surgical care compared to existing discharge pathways.

In conclusion, the use of DC 24 programs in colorectal surgery is safe, feasible, and practical in a select group of patients within a well-designed clinical framework and pathway. A multidisciplinary approach involving allied healthcare workers, nurses, surgeons, and anesthetists and early adoption of novel healthcare technology relevant to home-based patient monitoring may be the key to making this distant dream a near reality.

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Conflict of interest/Disclosure

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