Prospective Evaluation of Discharge Trends after Colorectal Surgery within an Enhanced Recovery after Surgery Pathway

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Key Words

Enhanced recovery after surgery · Colorectal surgery · Discharge · Postoperative recovery

tion was surgeon- or patient-related reluctance or ‘precaution’; thus, better and more of general information seems to be necessary.

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Abstract

Introduction: Enhanced recovery after surgery (ERAS) pathways proved to reduce complications, length of hospital stay and costs after colorectal surgery. Standardized discharge criteria have been established that are fulfilled after complete medical recovery is achieved. This study aimed to assess the timing of complete medical recovery in relation to the timing of actual discharge, and to assess reasons for prolonged hospital stay within an ERAS pathway. **Methods:** One hundred fourteen consecutive patients undergoing elective colorectal surgery within an ERAS pathway were included in this prospective analysis. Fulfillment of discharge criteria was assessed daily and reasons for prolonged hospital stay were documented. **Results:** Thirty percent of patients went home on the day that all discharge criteria were met. Overall, patients were discharged at a median of 2 days (interquartile range 1–3) after fulfillment of discharge criteria. Reasons for delayed discharge were (1) organizational in 20%; (2) patient or surgeon unwilling in 29%; and (3) because the patient was deemed to be discharged too soon distance from the operation in 51%. **Conclusion:** In this observational study, only 30% of patients were discharged on the day all recovery criteria were met. The main reason for continued hospitaliza-

Introduction

In recent days, much effort is put in to reduce hospital stay, due to administrative and economic constraints [1, 2]. Apart from financial benefits, returning home will result in increased mobilization, increased food intake, and a lower risk of nosocomial infections [3–5]. Due to reduced perioperative stress, enhanced recovery after surgery (ERAS) pathways has further helped to reduce hospital stay, without increasing readmission rates [6, 7]. However, from the caregiver’s perspective the fear of missing complications after a quick and a hurried hospital discharge can be an obstacle to the full implementation of this strategy. From the perspective of patients, very short hospital stays can be unexpected and therefore may cause confusion, also among relatives [8–10]. Furthermore, the duration of hospital stay is not just dependent on medical recovery, but also on other aspects, such as the severity of

The content of this manuscript was presented at the Annual Meeting of the Swiss Society of Surgery on May 22, 2014, Bern, Switzerland.

Table 1. Discharge criteria after colorectal surgery, according the international consensus. ‘When all 5 criteria are fulfilled the patient can be considered ready for discharge’ [11]

Criteria	End points to determine when criteria should be considered to have been achieved
Tolerance of oral intake	Patient able to tolerate at least 1 solid meal without nausea, vomiting, bloating, or worsening abdominal pain. Patient drinks liquids actively without requiring intravenous fluids infusion to maintain hydration
Recovery of lower gastrointestinal function	Patient should have passed flatus
Adequate pain control with oral analgesia	Patient able to rest and mobilize (sit up and walk, unless unable preoperatively) without significant pain (i.e., patient reports pain is controlled or pain score ≤ 4 on a scale from 0 to 10) while taking oral analgesics
Ability to mobilize and self-care	Patient able to sit up, walk, and perform activities of daily living (e.g., go to the toilet, dress, shower, and climb stairs if needed at home) unless unable preoperatively
Clinical examination and laboratory tests show no evidence of complications or untreated medical problems	Normal temperature. Pulse, blood pressure, and respiratory rate stable and consistent with preoperative levels. Serum hemoglobin concentration stable, within acceptable levels. Patient able to empty the bladder without difficulty

postoperative complications, the presence of administrative discharge professionals at the hospital, and the availability of care-institutions or care-services at home.

Consensus regarding standardized criteria for hospital discharge after colorectal surgery has been established in a conference to reduce the risk of premature discharge and avoid unnecessary hospital stay [11]. These criteria define complete recovery after colorectal surgery, and include oral pain management, independent mobilization, sufficient food intake, gastrointestinal function, and the absence of any suspicion regarding complications [11]. When all criteria are fulfilled complete medical recovery should have been achieved, and the patient can be declared ‘fit for discharge’.

The primary aim of this study was to prospectively assess the timing of complete medical recovery and actual discharge in a cohort of consecutive unselected patients undergoing colorectal resections within an ERAS pathway. The secondary aim was to identify reasons and risk factors for prolonged hospital stay.

Methods

This is a prospective cohort study including all consecutive unselected patients operated between August 2013 and March 2014. Patients undergoing elective surgery or surgery >24 h after an unplanned admission were included. Immediate emergent surgery (0–24 h) was excluded. All colorectal surgery was included, colonic and rectal resection as well as stoma creation or closure. The study was registered under www.researchregistry.com (UIN 665), and reported according to STROBE recommendations. For this observational study, an anonymised database was used; all personal information about patients was removed from data sets.

ERAS was systematically introduced for all colorectal surgery at the tertiary academic centre in Lausanne in May 2011 [7]. The institutional enhanced recovery pathway was published recently and is in accordance with the ERAS recommendations updated in 2013 [6].

Data Collection

Discharge criteria were prospectively assessed 2 days before the anticipated target day of discharge until 5 days thereafter. Discharge criteria were assessed daily by one of the three surgical residents at the time of executing the morning rounds. Interobserver variability was not calculated. The discharge criteria used were those defined according to the international consensus published in 2012 (table 1) [11]. For all surgical interventions, an anticipated target day of discharge was defined based on durations of hospital stay described in literature for patients with an uncomplicated postoperative course. This was the third postoperative day (POD) for stoma surgery (confection of a stoma without bowel resection, closure of a loop stoma); the fourth POD for colon surgery (segmental colectomy, (sub)total colectomy, Hartmann’s reversal); and the fifth POD for rectum surgery (anterior resection of the rectum, proctectomy or proctocolectomy).

Reasons for delayed discharge are grouped and defined in table 2. Prospective demographic and surgical details of all patients, as well as clinical outcome until 30 days after surgery, were documented for all patients. Postoperative complications were documented and graded according to the Clavien classification [12]. The length of stay was counted from the day of surgery until discharge. Readmissions were documented from the day of discharge until 30 days postoperatively.

Outcomes

The primary outcome was the delay in hospital discharge, defined as the time lapse between the time that all discharge criteria fulfilled (= complete medical recovery) and the time of actual hospital discharge to a home or a care-institution. Subgroup analyses for colon versus rectum surgery were a priori planned. Reasons for delayed discharge were documented systematically. Secondary outcomes were perioperative factors associated with delayed discharge.

Table 2. Definitions of reasons delayed discharge

	Description
Organizational reason	All discharge criteria fulfilled, but, for example, unable to take care of stoma, waiting for care institution, home alone, no transport to home, not managing anti-thrombotic medication
Patient/surgeon unwilling	All discharge criteria fulfilled, but patient refused discharge, or surgeon decides to postpone discharge
Before target date	All discharge criteria fulfilled before the institution target date, therefore patients were not encouraged to leave the hospital. Target dates are mentioned in methods

Table 3. Patient and surgical characteristics

	All patients (n = 114)	Discharge on day all criteria were met (n = 27)	Delayed discharge (n = 63)	p value
Gender, male, n (%)	59 (52)	13 (48.1)	39 (61.9)	0.251
Age above 70 years, n (%)	40 (35.1)	8 (29.6)	20 (31.7)	1.00
ASA, n (%)				
1–2	87 (76)	23 (85.2)	48 (76.2)	0.409
3–4	27 (24)	4 (14.8)	15 (23.8)	
BMI, kg/m ² , median (range)	24.7 (21.7–28.6)	24.9 (22–28.7)	24.7 (22.3–28.4)	0.758
Surgical approach, n (%)				0.231
Laparotomy	33 (29)	10 (37)	11 (17.5)	
Laparoscopy	49 (43)	10 (37)	33 (52.4)	
Converted	8 (7)	1 (3.7)	4 (6.3)	
Local approach for stoma	24 (21)	6 (22.2)	15 (23.8)	
Duration surgery, min, median (range)	154 (98–224)	138 (87–180)	153 (98–228)	0.393
Days of discharge, median (range)	5 (2–48)	5 (3–7)	5 (3–7)	0.813
Readmission rate, n (%)	15 (13)	4 (14.8)	8 (12.7)	0.747
30-Day complications, n (%)				0.624
Grade I–II	32 (28)	10 (37)	15 (24)	
Grade III–IV	16 (14)	1 (3.7)	2 (3.2)	
Mortality	0	0	0	

ASA = American Society of Anesthesiologists-score; BMI = body mass index.

Thirty-day complications are rated according to Clavien classification [12].

Chi-square was used for comparison of discrete variables. Continuous variables were compared with Mann–Whitney U test.

Statistical Analysis

Descriptive statistics for discrete variables were reported as frequency and percentage and continuous variables were reported as median and interquartile range (IQR). Chi-square or Fisher's exact test was used for comparing discrete variables. Continuous variables were compared with the Mann–Whitney U test. All statistical tests were two-sided and a level of 0.05 was considered statistically significant. Statistical analyses were performed with SPSS® 19 (IBM, Armonk, N.Y., USA).

Results

The study cohort included 114 consecutive patients, 63 colectomies, 16 rectal resection, and in the remaining 35 patients, stoma creation or closure. All consecutive patients undergoing elective colorectal surgery were includ-

ed, and there was no loss of patient follow-up during the study period. There were no differences in patient characteristics, overall hospital stay, readmission rate, and postoperative complications in patients with on-time and delayed discharge (table 3). The overall readmission rate was 13%.

In 24 patients, discharge was not achieved during the study observation period described in the Methods section.

Discharge in Relation to Discharge Criteria

Of the 90 patients discharged within the study observation period, the median delay in discharge was 1 day (IQR 0–2) after meeting all discharge criteria. Twenty-seven patients (30%) went home on the same day that all discharge criteria were met. In the remaining 63 patients, there was a

delay with a median of 2 days (IQR 1–3) between fulfilling all discharge criteria and actual discharge. The reason for delayed discharge was of an organizational origin in 20% of patients; in 29% of patients either the patient was not willing to be discharged or the surgeon was unwilling to permit the discharge; and in 51% of patients, the discharge criteria were fulfilled before the institution target date and therefore, patients were not encouraged to leave the hospital. Reasons for delayed discharge are depicted in the flowchart in figure 1.

Six of 63 patients (9.5%) who had a prolonged hospitalization despite having achieved all discharge criteria developed a complication during the in-hospital period. Three complications occurred in the group of patients who did not leave the hospital because it was deemed too early for discharge and 3 complications occurred in the group where either the patient or the doctor was unwilling to go ahead with the discharge.

Discharge in Relation to the Target Day

On our predefined target day of discharge, 52% of patients had met all 5 discharge criteria, and 36% were discharged from the hospital. Figure 2 shows the percentages of discharged patients and those who fulfilled discharge criteria during the study observation time. Approximately 2 days after all discharge criteria were met, patients were discharged.

For patients undergoing rectal surgery, the target day of discharge was 1 day later than for colonic surgery (POD 5). Patients with rectal surgery had all discharge criteria fulfilled on the target date in 63% and 44% of patients were discharged (fig. 3).

Risk Factors for Prolonged Hospital Stay

Patients leaving on the day of medical recovery were compared to patients who had a delay in discharge in spite of all discharge criteria being fulfilled. No significant differences were found in univariate analysis at the time of discharge with regard to gender, age, body mass index, surgical approach, American Society of Anesthesiologists score, and duration of surgery (table 3).

Discussion

In this study, only one third of patients after elective colorectal surgery left the hospital as soon as they were fit for discharge. In all other patients, discharge was delayed; organizational reasons accounted for only one fifth of the identified reasons and the overwhelming reason for delay in discharge was the perception of both patients and sur-

Fig. 1. Flowchart of timing of discharge in relation to discharge criteria and with regard to reasons for delayed discharge. Delayed discharge: patients having obtained all discharge criteria, however, not yet discharged out of hospital. Definitions of reasons for delayed discharge are shown in table 2.

geons that the discharge was ‘too early’. This gives much room for improvement. Yet, medically fully recovered patients did have low rates of complications and acceptable rates of readmissions.

Reasons for Delayed Discharge

Organizational reasons for delayed discharge included the fact that patients had to wait for admission into care-institutions, stoma-education, or for a family member to take care of them at home, and this accounted only for one fifth of the reasons. It is the most obvious opportunity for improvement, but to our surprise, it constituted a rather small percentage of ‘delayed patients’. Furthermore, with the presence of discharge-professionals, it remains challenging to bring this percentage further down. The main reason for this is the long waiting list that exists for care institutions or for care at home and both these reasons can seldom be influenced by the primary hospital. A third of all delayed discharge was caused by the reluctance of the patient and/or the treating surgeon to accept or facilitate discharge. The efficient way of handling this is to prepare patients and their families for early discharge when pre-operative information is being discussed with them; if pa-

Fig. 2. Percentage of patients discharged (dark grey) and having all discharge criteria (light grey) in time. X-axis: day of evaluation (from 2 days before to 5 days after target day of discharge). Y-axis: cumulative percentage of patients, all patients, n = 114.

Fig. 3. Percentage of patients undergoing rectum resections that are discharged (dark grey) and having all discharge criteria (light grey) in time. X-axis: day of evaluation (from 2 days before to 5 days after target day of discharge). Y-axis: cumulative numbers of patients, n = 16.

tients are well aware of discharge criteria even before the operation is performed, then the return home will probably be more anticipated by them, they would be better prepared, and it would be easier for the treating physician to make the announcement about the discharge [8–10]. On the one hand, doctor's being reason for the delay in discharge should not occur in the framework of safe discharge criteria; on the other hand, restricted resources (beds, costs), especially within an ERAS pathway, should not be the reason for delayed discharge. Better surgeon education and prospective audit institutional outcomes

are probably the most effective and enduring ways of convincing the surgical staff to follow the perioperative care pathway including standardized discharge criteria [13].

The 'early birds' merit particular attention; patients fulfilling all discharge criteria within 24–48 h of the operation were not encouraged to go home during the study period. This group constituted 51% of all patients with delayed discharge, and we feel this reason for delayed discharge is based more on a subjective perception of potential risks associated with early discharge. Surgeons were concerned about complications that were likely to occur after discharge,

possibilities of 'bloody discharge' and prevalence of high readmission rates. Indeed, in one study, a correlation was found between shorter hospital stay and higher readmission rates [14]. In this study, complications occurred only in 9.5% patients with a prolonged hospitalization despite having achieved all discharge criteria. Fortunately, most studies agree that early discharge (described variably between POD 1 and 5) is safe after colorectal surgery, with readmission rates reported to be 4–14% [16–20]. When patients are aware of the criteria for safe discharge, and they have a 24/24 h-telephone number, rapid discharge is feasible and results in high patient satisfaction [15].

However, most studies did not specifically describe the timing of complete medical recovery with discharge criteria in relation to the actual discharge date. This is a strong aspect of our prospective study, in which for every patient and for every day, all 5 discharge criteria were documented. Discharge criteria were also documented in the study by Maessen et al. [13] about discharge trends in patients in a colorectal enhanced recovery pathway. In their cohort, 87% of patients were not discharged on the day that all discharge criteria were fulfilled. They deemed 69% of these prolonged hospitalizations inappropriate, and concluded that the organization played an important role in achieving reduced hospital lengths, and not just the implementation of enhanced recovery pathways. In a study conducted in 2013, a 3-day delay in discharge was shown in colorectal ERAS patients, and only 14% of patients were discharged on the day they reached full recovery [21]. This again demonstrated that discharge planning is a true challenge for enhanced recovery programs.

Several studies have attempted to predict prolonged length of stay. Some found age to be a risk factor [22], but others found no relation [17, 19]. In this study, no relation between age and delayed discharge was observed, and the same was true for other plausible reasons like comorbidities and surgical approach.

Target Day for Discharge

It remains to be said that a 'target day' for discharge simply does not fit for every patient; therefore, patients fulfilling all criteria for safe discharge after 2 days of the target discharge date, should be discharged, while medical recovery in other patients will occur only 1 or 2 days after the 'target day'. The length of the anticipated hospital stay differs widely from one country to the other. Hence, it is still a challenge to define the ideal target day avoiding unnecessary delay in 'early birds' on the one hand and frustration for 'delayed discharge' on the other hand, if the target day for discharge was set with unrealistic ambitiousness.

A limitation of this study was that discharge criteria were documented for every patient daily until POD 9 in colon surgery and POD 10 in rectum surgery but not until hospital discharge for patients hospitalized longer. Therefore, a minority of patients dropped out of the study observation period. For such patients, this study could not determine whether they were discharged on the day all discharge criteria were met. These were mainly patients presenting complications where discharge was typically decided by the resolution of the complication rather than by the fulfillment of standardized discharge criteria for an uncomplicated course. The study sample is modest and heterogeneous, but patients are unselected and consecutive. Furthermore, social and cultural country-based particularities make extrapolation of the present findings to other health care systems difficult. Despite the limitations, this study provides a prospective documentation of all discharge criteria and reasons for delayed discharge within a fully implemented ERAS pathway; this information is an important complement to the increased length of stay, which is seen as a problematic outcome measure [13, 21]. It remains speculative whether readmission rates would increase if a higher percentage of patients would leave hospital on the day of their medical recovery, as it was observed in the initial works by Andersen et al. [14].

Conclusion

Only 30% of patients were discharged on the day of medical recovery. The main reason for delayed discharge was medical recovery occurring before the institution target day of discharge. Surgeon-related perception of potential risks associated with early discharge led to continued hospitalization. However, low complication rates refuted these concerns. Target days of discharge do not fit every patient, but consequent application of standardized discharge criteria appears to be a safe strategy to avoid prolonged hospital stay.

Disclosure Statement

The authors report no proprietary or commercial interest in any product mentioned or concept discussed in this article. This applies to all the authors.

Sources of Funding

None.

References

- Lee L, Mata J, Ghitulescu GA, Boutros M, Charlebois P, Stein B, et al: Cost-effectiveness of enhanced recovery versus conventional perioperative management for colorectal surgery. *Ann Surg* 2015;262:1026–1033.
- Stowers MD, Lemanu DP, Hill AG: Health economics in enhanced recovery after surgery programs. *Can J Anaesth* 2015;62:219–230.
- deFreitas DJ, Kasirajan K, Ricotta JJ 2nd, Veeraswamy RK, Corriere MA: Preoperative inpatient hospitalization and risk of perioperative infection following elective vascular procedures. *Ann Vasc Surg* 2012;26:46–54.
- Rosman M, Rachminov O, Segal O, Segal G: Prolonged patients' in-hospital waiting period after discharge eligibility is associated with increased risk of infection, morbidity and mortality: a retrospective cohort analysis. *BMC Health Serv Res* 2015;15:246.
- Tess BH, Glenister HM, Rodrigues LC, Wagner MB: Incidence of hospital-acquired infection and length of hospital stay. *Eur J Clin Microbiol Infect Dis* 1993;12:81–86.
- Gustafsson UO, Scott MJ, Schwenk W, Demartines N, Roulin D, Francis N, et al: Guidelines for perioperative care in elective colonic surgery: Enhanced Recovery After Surgery (ERAS[®]) Society recommendations. *World J Surg* 2013;37:259–284.
- Roulin D, Donadini A, Gander S, Griesser AC, Blanc C, Hübner M, et al: Cost-effectiveness of the implementation of an enhanced recovery protocol for colorectal surgery. *Br J Surg* 2013;100:1108–1114.
- Henderson A, Zernike W: A study of the impact of discharge information for surgical patients. *J Adv Nurs* 2001;35:435–441.
- Holland DE, Mistiaen P, Bowles KH: Problems and unmet needs of patients discharged 'home to self-care'. *Prof Case Manag* 2011;16:240–250; quiz 251–252.
- McMurray A, Johnson P, Wallis M, Patterson E, Griffiths S: General surgical patients' perspectives of the adequacy and appropriateness of discharge planning to facilitate health decision-making at home. *J Clin Nurs* 2007;16:1602–1609.
- Fiore JF Jr, Bialocerkowski A, Browning L, Faragher IG, Denehy L: Criteria to determine readiness for hospital discharge following colorectal surgery: an international consensus using the Delphi technique. *Dis Colon Rectum* 2012;55:416–423.
- Dindo D, Demartines N, Clavien PA: Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg* 2004;240:205–213.
- Maessen JM, Dejong CH, Kessels AG, von Meyenfeldt MF: Enhanced Recovery After Surgery (ERAS) Group: Length of stay: an inappropriate readout of the success of enhanced recovery programs. *World J Surg* 2008;32:971–975.
- Andersen J, Hjort-Jakobsen D, Christiansen PS, Kehlet H: Readmission rates after a planned hospital stay of 2 versus 3 days in fast-track colonic surgery. *Br J Surg* 2007;94:890–893.
- Levy BF, Scott MJ, Fawcett WJ, Rockall TA: 23-Hour-stay laparoscopic colectomy. *Dis Colon Rectum* 2009;52:1239–1243.
- Francis NK, Luther A, Salib E, Allanby L, Messenger D, Allison AS, et al: The use of artificial neural networks to predict delayed discharge and readmission in enhanced recovery following laparoscopic colorectal cancer surgery. *Tech Coloproctol* 2015;19:419–428.
- Gash KJ, Greenslade GL, Dixon AR: Enhanced recovery after laparoscopic colorectal resection with primary anastomosis: accelerated discharge is safe and does not give rise to increased readmission rates. *Colorectal Dis* 2012;14:1287–1290.
- Hoffman RL, Bartlett EK, Ko C, Mahmoud N, Karakousis GC, Kelz RR: Early discharge and readmission after colorectal resection. *J Surg Res* 2014;190:579–586.
- Keller DS, Bankwitz B, Woconish D, Champagne BJ, Reynolds HL Jr, Stein SL, et al: Predicting who will fail early discharge after laparoscopic colorectal surgery with an established enhanced recovery pathway. *Surg Endosc* 2014;28:74–79.
- Lawrence JK, Keller DS, Samia H, Ermlich B, Brady KM, Nobel T, et al: Discharge within 24 to 72 hours of colorectal surgery is associated with low readmission rates when using enhanced recovery pathways. *J Am Coll Surg* 2013;216:390–394.
- Gillissen F, Hoff C, Maessen JM, Winkens B, Teeuwen JH, von Meyenfeldt MF, et al: Structured synchronous implementation of an enhanced recovery program in elective colonic surgery in 33 hospitals in The Netherlands. *World J Surg* 2013;37:1082–1093.
- Boulind CE, Yeo M, Burkill C, Witt A, James E, Ewings P, et al: Factors predicting deviation from an enhanced recovery programme and delayed discharge after laparoscopic colorectal surgery. *Colorectal Dis* 2012;14:e103–e110.