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ORIGINAL ARTICLE

ERAS, length of stay and private insurance: a retrospective study

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Abstract

Purpose Hospital discharge after colorectal resection within an Enhanced Recovery After Surgery (ERAS) program occurs earlier compared to standard-care postoperative pathways but often later than what objective criteria of "readiness for discharge" could allow. The aim of this study was to analyse reasons and risk factors of such discharge delay.

Methods All elective patients admitted for colorectal resection at the regional Hospital of Lugano in 2014 and 2015 were included. The postoperative day on which patients fulfilled consensus agreed criteria (according to Fiore) for readiness for discharge (POD-F) and the effective day of discharge (POD-D) were determined. We analysed the reasons for discharge delay (POD-D>POD-F) and performed univariate and multivariate analysis to determine risk factors.

Results One hundred thirty-eight patients were included in the study. Median POD-F was 5 (2–48) days, POD-D was 6 (3–50) days. In 94 patients, POD-D occurred later than POD-F with a median delay of 1 (1–11) days. Reasons for discharge delay were insufficient social support in 13 (14%), patient's preference in 39 (41%) and medical team preference in 41 (44%). Private insurance (OR 2.61, 95%CI 1.08–6.34, $p = 0.034$) and patient discharged on a day other than Monday (OR 2.94, 95%CI 1.16–7.14, $p = 0.023$) were independent predictors for discharge delay.

Conclusion Even when objective criteria for readiness for discharge have been fulfilled, patients and/or doctors often do not feel comfortable with hospital discharge at this time point. Length of stay, even within an ERAS program, is still influenced by several non-medical factors and is therefore not a precise surrogate marker of outcomes.

Keywords ERAS · Length of stay · Time to readiness for discharge · Discharge delay · Healthcare insurance

Introduction

The Enhanced Recovery After Surgery (ERAS) protocol has been shown to decrease morbidity and length of stay (LOS) after colorectal surgery [1–8]. LOS reflects rapidity of postoperative recovery but besides the medical condition of the patient, it also depends on several subjective social and cultural factors which differ markedly across countries and institutions. [8–11]. Fiore et al., after a consensus conference involving expert ERAS and colorectal surgeons from different countries, identified objective criteria to determine the time of readiness for discharge, meaning the time when patients have reached short-term recovery and can be safely discharged home [12]. These criteria include tolerance of oral intake, recovery of lower gastrointestinal function, adequate pain control under oral analgesia, ability to mobilize and self-care, and clinical tests and laboratory findings with no signs of complications or untreated medical problems (Table 1) [12]. However, even if these criteria have been shown to be safe, hospital discharge often occurs later [11, 13].

The aim of this study was to analyse the reasons and risk factors of discharge delay, intended as discharge later than the day when the Fiore criteria for readiness for discharge [12] were fulfilled, after colorectal resections within an ERAS protocol in our institution.

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Table 1 Criteria to determine readiness for hospital discharge criteria according to Fiore et al. [12] following colorectal surgery

Criteria	Endpoints to determine when criteria can be considered to be achieved
Tolerance of oral intake	Patient is able to tolerate at least one solid meal without nausea, vomiting, bloating, or worsening abdominal pain. Patient drinks liquids actively (ideally > 800–1000 ml/day) and does not require intravenous fluids to maintain hydration
Recovery of lower gastrointestinal function	Patient has passed flatus
Adequate pain control with oral analgesia	Patient is 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 is ≤ 4 on a scale of 0–10) while taking oral analgesics
Ability to mobilize and perform self-care	Patient is able to sit up, walk, perform activities of daily living (e.g. go to the toilet, dress, shower, climb stairs if needed at home)—unless unable preoperatively
Clinical examination and laboratory tests show no evidence of complications or untreated medical problems	Oral temperature is normal Pulse, blood pressure and respiratory rate are stable and consistent with preoperative levels Serum hemoglobin concentration is stable within acceptable levels Patient is able to empty the bladder without difficulty or can match preoperative level of bladder function

When the criteria are fulfilled, the patient is considered to have reached short-term postoperative recovery and can be considered ready for discharge. Discharge may take place as soon as the patient has adequate postdischarge support (family at home or nursing/rehabilitation facility) and is willing to leave the hospital. If the patient had a stoma constructed, he/she or the family must have received training on stoma care or had outpatient training arranged

Materials and methods

All patients admitted for elective colorectal resection at the Regional Hospital of Lugano, Switzerland, in 2014 and 2015 were included with their informed consent in the ERAS protocol and their data were inserted anonymously in the Encare provided ERAS Interactive Audit System (EIAS) database. Patients operated as emergencies were not included. Demographic data such as age, gender, healthcare insurance type, diagnosis of the lesion, resection type, protocol compliance, postoperative course, complications and re-admissions were recorded prospectively by a dedicated ERAS clinical nurse, based on medical charts and a specific diary documenting the patient's postoperative course.

The postoperative day on which patients fulfilled the Fiore criteria for readiness for discharge [12] (POD-F) and the effective day of discharge (POD-D), as well as the reasons for any discharge delay were determined retrospectively from January 2014 to June 2015 ("retrospective" cohort), based on the prospectively collected data on the patient's diary and medical charts.

In July 2015, the patient's diary was modified to collect prospectively also the Fiore criteria for readiness for discharge [12] and the reasons for any discharge delay. This measure was meant to sensitize our team in avoiding unnecessary lengthening of hospital stay. Patients included in the study after July 2015 were therefore identified as the "prospective cohort".

The safety of applying the Fiore criteria for readiness for discharge [12] was assessed by evaluating postdischarge complications and readmissions.

All patients were managed with a standard protocol according to the ERAS guidelines. Patients were counselled preoperatively and admitted on the day before surgery. Patients undergoing rectal resections received a full oral bowel preparation and left colon resections and received a 500 ml enema the day before and a micro-enema 2–3 h before the operation. No bowel preparation was given to patients undergoing other resections. All patients received thrombosis prophylaxis, maltodextrin drinks (colonic resections: Nutricia® 800 ml the evening before and 400 ml 2–3 h before the operation, rectal resections: Providextra® 400 ml the evening before and 200 ml 2–3 h before the operation), but no premedication. A single shot preoperative antibiotic prophylaxis with cefuroxime (or ciprofloxacin if allergic), and metronidazol was given upon induction of anaesthesia. Patients received a thoracic epidural block unless contra-indicated, total intravenous anaesthesia was performed with short-acting agents and postoperative nausea and vomiting prophylaxis was given. Intraoperatively, patients were actively warmed with the Thermacare system to maintain normothermia, fluids were given sparingly, and hypotension corrected with vasoconstricting drugs. Postoperatively, patients were given a liquid diet the evening after the operation, a light solid diet on postoperative day (POD) 1 and a normal diet from POD 2. The urinary catheter was removed on POD 1 except for patients undergoing rectal resections, in which it was kept until the removal of the epidural catheter.

Magnesium hydroxid was administered to all patients until passage of stool, except in patients with a diverting ileostomy. Patients were mobilized as soon as possible (POD 0 sitting out of bed and walking in the room if possible, POD 1 walking in the corridor).

Patients were seen by the operating surgeon at least once 1 month after surgery

The reasons for discharge delay were divided into three categories: (a) insufficient social support (e.g. patients unable to take care of themselves independently, needing a transfer to a postacute care facility), (b) patient's preference (patients who did not feel ready to go home even when declared medically fit for discharge by the attending physician) and (c) doctor's preference (when the attending physician deliberately chose to keep the patient in hospital for observation, despite Fiore criteria for readiness for discharge [12] being fulfilled).

Statistical analysis was performed on SPSS® 19 (IBM, Armonk, NY, USA). Groups were compared using chi-square or Fisher's exact test for categorical data, *t* tests or Mann-Whitney analysis for continuous variables depending on distribution. All statistical tests were two-sided, and a level of 0.05 was considered statistically significant. A logistic regression model was built for multivariate analysis of risk factors for discharge delay; one-way ANOVA and linear regression were used for multivariate analysis of risk factors for the duration for discharge delay.

Results

We included 138 patients, 72 (52%) were female, median age was 69 (20–89) years. Thirty-one (22%) patients underwent a right colon resection, 61 (44%) a left colon resection and 46 (33%) a rectal resection. Surgery was performed in laparoscopy in 126 (91%) patients, 3 (2%) of which were converted, and in primary laparotomy in 12 (9%). Fifty-one (37%) patients were operated for a benign disease and 87 (63%) for carcinoma. Thirty-eight (28%) patients had a new stoma (one of these patients had an early ileostomy closure (on POD 15) because of high output. The overall compliance to the ERAS protocol was 72% (pre-op 94%, intra-op 81% and postop 57%).

Median POD-F was 5 (2–48) days; median POD-D was 6 (3–50) days. Only 44 patients (32%) were discharged on POD-F. Median additional stay after POD-F was 1 day (range 1–11). Reasons for discharge delay were: insufficient social support in 13 (14%), patient's preference in 39 (41%) and medical team preference in 41 (44%). In one patient, hospital stay was extended to allow a neurosurgical intervention.

Private insurance (OR 2.61, 95%CI 1.08–6.34, $p = 0.034$) and patient discharged on a day other than Monday (OR 2.94, 95%CI 1.16–7.14, $p = 0.023$) were independent predictors for discharge delay (Table 2).

Private insurance patients did not differ significantly from non-private patients for demographic data and for the reasons for discharge delay (data not shown). Although private insurance predicted a discharge delay (POD-D>POD-F), the LOS was similar to non-private patients (POD-D private 6 (3–50) days vs. non-private 6 (3–27) days, $p = 0.997$), as private patients tended to reach POD-F earlier (POD-F private 4 (2–48) days vs. non-private 5 (2–27) days, $p = 0.718$).

The reason for discharge delay significantly predicted the length of delay. Insufficient social support caused the longest delay (mean 3.8 days, 95%CI 1.87–5.67, $p < 0.001$) (Table 3).

There were 19 (14%) unplanned attendances to the emergency department (8 patients had been discharged on POD-F, 12 (63%) could be managed as outpatients or had no pathological findings and 7 (37%) needed hospitalisation. Of these, 4 patients had anastomosis-related complications: 3 patients had a pelvic abscess, which resolved after surgical drainage in two and percutaneous drainage in one. One patient had a late anastomotic leak (on POD 24) after early closure of an ileostomy, treated with laparoscopic lavage and the construction of a new ileostomy. Three needed in-hospital fluid resuscitation because of an acute renal failure following high-output ileostomy. No patient developed any complications between POD-F and POD-D.

Discussion

In our study, patients undergoing colonic or rectal resection were discharged with a median delay of 1 day after fulfilling objective criteria for readiness for discharge [12]. The reason for that was mostly physicians' choice or patient's sense of insecurity to leave the hospital, less often the absence of postdischarge support. Our findings support previous reports and, in addition, show that having a private insurance and being discharged on a day other than Monday may also favour a delay in discharge.

Although several authors have published studies proving the feasibility and safety of discharging patients within 2 days postoperatively [14–16], in most series, the median LOS is in the range of 4 to 6 days. [3, 8, 11, 13, 17, 18] The strongest predictor of prolonged LOS is the occurrence of postoperative complications. However, even within an ERAS protocol, LOS depends on several other factors [19–22] some of which can to some extent be influenced (compliance to the ERAS protocol, length of surgery, surgical access, socio-economic and logistic factors), whereas others cannot (ASA score, age, type of colectomy). Therefore, LOS cannot be seen as a precise surrogate marker of quality of care and outcomes, unlike Fiore's criteria for readiness for discharge, which represent a more objective and reproducible measure, easily recordable, with high acceptability for comparing outcomes in colorectal surgery [12].

We were interested to understand the causes of delay between objective readiness to be discharged and actual discharge. Insufficient support caused delay only in 13% of our patients, despite long waiting lists for postacute care, as most

Table 2 Risk factors for discharge delay

	N	Univariate			Multivariate		
		OR	95%CI	*p*-value	OR	95%CI	*p*-value
Age (constant)		1.02	0.99-1.05	0.228	1.02	0.99-1.06	0.196
Gender				0.475			0.712
Female	66	1.00			1.00		
Male	72	1.30	0.63-2.66		1.17	0.52-2.62	
Insurance				0.018			0.034
Non-private	90	1.00			1.00		
Private	48	2.76	1.191-6.39		2.61	1.08-6.34	
DiagnosisMalignant				0.633			0.194
Benign	51	1.00			1.00		
	87	1.20	0.57-2.54		1.91	0.72-5.05	
Location				0.418			0.112
Right	31	1.00			1.00		
Left	61	0.58	0.22-1.50		0.39	0.13-1.18	
Rectum	46	0.88	0.32-2.47		1.04	0.33-3.29	
Complication				0.198			0.110
Yes	46	1.00			1.00		
No	92	1.63	0.77-3.44		1.95	0.86-4.42	
Day of discharge				0.036			0.023
Monday	29	1.00			1.00		
Other	109	2.44	1.06-5.70		2.94	1.16-7.14	

colorectal patients do not need rehabilitation. Many patients were uncomfortable leaving the hospital on POD-F, and this was a cause of discharge delay in 41% of our cohort, much more than the 3% reported by Fiore [23]. More surprising, and similar to the other publications [23, 24], is the finding that in 44% the reason for delaying discharge was a medical decision. Overall, however, our study suggests that discharge on POD-F is safe, as no complication occurred between POD-D and POD-F. Fourteen percent of our patients had an unplanned readmission to the emergency department of which only one third needed readmission to the ward. Surgeons may often be attached to subjective criteria when assessing the "well-being" of a patient and his readiness for discharge [25]. We hoped that raising awareness on the Fiore criteria for readiness for discharge [12] by discussing them with the nursing staff and introducing them on the patient's ERAS diary would help decrease the discharge delays. We did not observe however any difference between the retrospective and prospective cohort neither for the rate of patients with discharge delay, nor for the distribution of the reasons for the delay. This may be due to the short period and small number of patients compared, but also on insufficient patient counselling, and since analysis of the present data, we are now raising this question directly with the patients in the preoperative visit.

In the cohort of Fiore et al. [23], the Fiore criteria were fulfilled on the 6th postoperative day but the median LOS was 7 days (IQR 6–8); 50% of patients remained in hospital after POD-F, the reason being medical team's preference in 43%. Maessen et al. [11] reported a discharge delay after colon resection in 87% of patients, with a median delay of 1 (0–9) day. In 69% of cases, the reason for delay was identified as medically inappropriate. Slieker et al. [24], in a cohort of 90 ERAS patients undergoing colon, stoma or rectal surgery, using the same definition of POD-F, also found a median delay of 1 (IQR 0–2) day between POD-F and the actual day of discharge. Only 30% of patients were discharged on POD-F. The delay was an "organisational reason" in only 20%, and patient's and/or surgeon's reluctance in the rest of the cases. The authors could not identify any significant predictor of discharge delay. Gillissen et al. found a median discharge delay of 3 days after functional recovery (defined as adequate pain control with oral analgesia only, adequate food intake and independent mobility sufficient to perform activities of daily living at the preoperative level). Only 14% of patients were discharged on the day they reached functional recovery [18].

In our study, private insurance was a significant and independent risk factor for discharge delay. In

Table 3 Mean delay of discharge and risk factor analysis

	N	Mean (days)	95%CI mean	*p* value
Age (linear regression)		0.031	0.011–0.051	0.248
Gender				0.430
Male	66	1.17	0.97–1.78	
Female	72	1.38	0.84–1.49	
Insurance				0.110
Non-private	90	1.12	0.83–1.42	
Private	48	1.56	1.06–2.07	
Diagnosis				0.737
Benign	51	1.33	0.82–1.85	
Malignant	87	1.24	0.95–1.53	
Location				0.344
Right	31	1.52	0.93–2.10	
Left	61	1.07	0.73–1.41	
Rectum	46	1.39	0.87–1.91	
Complication				0.669
Yes	46	1.20	0.67–1.73	
No	92	1.32	1.02–1.61	
Day of discharge				0.346
Monday	29	1.03	0.45–1.62	
Other	109	1.34	1.05–1.63	
Reason noted for delay				< 0.001
Patient preference	39	1.72	1.45–1.99	
Physician preference	41	1.44	1.22–1.66	
Insufficient social support	13	3.77	1.87–5.67	

Switzerland, all citizens must have a compulsory health insurance contract with a private insurance company that guarantees benefits as determined by federal law. The standard insurance covers the costs for the hospitalisation based on a diagnosis-related-group (DRG)-system with flat-rate payments. Patients may choose to take an additional private insurance, which covers hospital costs on an individual basis and offers benefits such as single room accommodation in the hospital and care by a consultant surgeon who may charge their postoperative visits in the ward. To some extent, a discharge delay of private patients is economically advantageous for both the hospital and the consultant in charge, so there may be a bias in favour of keeping these patients longer. Also, these patients pay substantial fees for private insurance and may feel entitled to prolong their stay until they feel more fit than the Fiore criteria require [12]. These potential bias that are overall economically detrimental were hidden by the fact that LOS for private patients was not longer than for non-private patients, because private patients tended to reach the Fiore criteria in median 1 day earlier, on POD 4 (even if the difference was not statistically significant). We found no difference in the distribution of the reasons for discharge delay between private and non-private patients. The fact that private patients tended to reach short-term recovery earlier than non-private is interesting. It could be related to a higher socio-economic level, which may allow a better implementation of the ERAS program due to better involvement of the patients in the care process.

Our data showed that patients discharged on Monday had significantly less discharge delay than on other days. This could be explained by internal organisational reasons: the main operating days for colorectal resections in our clinic were Wednesday and Thursday, so patients tended to reach the Fiore criteria [12] on Monday (POD 4–5). Monday is the day when main ward round is made and seniors more ready to take the decision to discharge the patients. Ihedioha et al. [26] found a longer median LOS for patients operated at the end vs the beginning of the week (8 (IQR 5–11) vs 6 (IQR 4–10) days, $p = 0.045$). Romain et al. [27] however found no significant difference in LOS between patients operated on Monday-Tuesday vs. Thursday-Friday (6 days vs. 5 days, $p = 0.52$).

Our study has some limitations. The cohort is small, and even though it is based on a high-quality prospective ERAS database, the Fiore criteria for readiness for discharge [12] and the reasons for discharge delay were collected retrospectively for most patients. However, there was no difference between the reasons of delay in the retrospective and prospective cohort. Also, the reasons for discharge delay may sometimes overlap and cannot always be clearly defined.

In conclusion, our study suggests that complications do not occur in the period when patients or doctors prefer to delay discharge despite objective criteria allowing it and that insurance aspects may play a substantial role in this preference; a bias hidden by the fact that despite private patients reach the discharge criteria 1 day earlier, they leave the hospital after the same length of stay. So far, length of stay appears therefore as an unreliable marker of postoperative outcome in colorectal surgery, especially when comparing data from different countries and institutes [8–11, 25, 28–31]. Continuous efforts to change mentalities including more focused pre-operative counselling may help to reassure patients and doctors and to further decrease unnecessary stay [11, 13].

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the ethics

committee of Ticino (2019–00941 /CE 3482) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent In accordance with the ethics committee of Ticino, Switzerland, an individual informed consent of all participants was not considered necessary.

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