



# A close adherence to a stoma-therapeutic pathway improves immediate stoma-related outcomes and reduces the length of hospital stay

Michela Mineccia<sup>1</sup> · Antonio Valenti<sup>1</sup> · Federica Gonella<sup>1</sup> · Marco Palisi<sup>1</sup> · Paolo Massucco<sup>1</sup> · Andrea Ricotti<sup>2</sup> · Alessandro Ferrero<sup>1</sup>

Accepted: 3 June 2022 / Published online: 10 June 2022

© The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature 2022

## Abstract

**Purpose** New stoma creation is related to a wide range of implications and stoma-related complications could occur frequently. The aim was to assess the impact of a close stoma-therapeutic-care pathway (STCP) in terms of length of stay, autonomy in the management of the pouch, readmission rate, and stoma-related complications.

**Methods** Patients undergoing surgery for colorectal disease and first stoma creation from January 2017 to December 2020 were analyzed. All patients enrolled had joined the Enhanced Recovery after Surgery (ERAS) protocol.

**Results** Among 143 enrolled, 56 (40%) did not completely follow the STCP (group A), whereas 87 (60%) demonstrated strict compliance (group B). The hospital stay lasted 8 days in group B and 11.5 in group A ( $p=0.001$ ). The first look at the stoma needed 1 day in group B and 3 days in group A ( $p<0.001$ ), emptying the pouch 2 days in group B and 5 days in group A ( $p<0.001$ ). Finally, the ability to change the pouch was 3 days in group B and 6 days in group A ( $p<0.001$ ). Nine (16.1%) stoma-related complications were counted in group A and 16 (18.4%) in group B, and 30-day readmission was 10.1% in group B and 11.5% in group A ( $p=0.82$  and  $p=1$ , respectively, not significant).

**Conclusions** The STCP has been shown to reduce the hospital stay and to have a protective role making the patient autonomous in the management of the stoma.

**Keywords** Stoma-therapeutic path · Readmission · Hospital stay · Enhanced Recovery after Surgery (ERAS)

## Introduction

Stoma creation may cause discomfort in acceptance of the new physical and psychological condition [1]. Stoma-related complications occur in 20–70% of patients and it is believed knowledge and skills on behalf of the patients reduce such problems [2–4]. The stoma-therapeutic education currently represents an effective arm when provided by experienced and trained nurses, within a multidisciplinary team [5–7].

Recently, with the diffusion of enhanced recovery protocols (ERAS), the hospital stay, notably after colorectal

surgery, is somewhat reduced. Despite this, stoma creation represents a condition that could delay the hospital discharge and several authors indicate this condition as a frequent reason for readmission [8–10].

A rigorous stoma-therapeutic-care pathway (STCP) (from the preoperative assessment to the period after discharge) could prevent and reduce the stoma-related complications [11].

The aim of this study was to evaluate the impact of adherence to the STCP with strong educational component of patients undergoing colorectal surgery in ERAS context.

## Methods

The study population included all consecutive patients operated on for colorectal disease and first stoma creation at the Division of Oncologic and General Surgery of Mauriziano Hospital in Turin, from January 2017 to December

✉ Michela Mineccia  
mmineccia@mauriziano.it

<sup>1</sup> Department of Chirurgia Generale E Oncologica, Ospedale Mauriziano Umberto I, Largo Turati 62, 10100 Turin, Italy

<sup>2</sup> Clinical Trial Unit, Ospedale Mauriziano Umberto I, Largo Turati 62, 10100 Turin, Italy

2020. All patients enrolled joined the ERAS protocol and were divided into two groups. In group A, the patients were unable to fully complete the STCP, and in group B, the patients demonstrated full compliance for the STCP (over 70% of all items of the pathway). The items evaluated are shown in the Table 1.

The reasons for low compliance against the STCP were various: clinical, logistical, and occasionally due to difficulties in acceptance of new behavior. In most cases (70%), logistical reasons are related to problems in organization of counselling especially for patients who live far from the hospital. Patients whose operations fall on Fridays have to wait until Monday for the first postoperative counselling session. At least 30% did not attempt the STCP because of clinical reasons like nausea or difficulty in early enteral feeding in the first postoperative days.

Exclusion criteria were as follows:

- condition of mental or physical incapacity
- discharge to another hospital
- disagreement in attendance at follow-up

Clinical data from the Stoma Care Center were retrospectively extracted from a prospectively maintained institutional database that collects 60 variables including patients' history and characteristics like gender, age, body mass index (BMI), kidney failure, insulin-dependent diabetes mellitus (IDDM) or non-insulin-dependent diabetes mellitus (NIDDM), pulmonary disease, heart diseases, smoking habit, dietary path, and also the presence of rod bridge, level of independence in looking at the stoma and emptying the pouch, ability in stoma care, adherence to the STCP, hospital stay, 1-month readmission, and 3-month postoperative complications and stoma-related complications.

The study was approved by the local institutional review board.

**Table 1** Items considered to assess the STCP compliance

Attendance in stoma-therapeutic counselling
Preoperative stoma site marking
Attendance in stoma-therapeutic counselling in postoperative day 1
Attendance in stoma-therapeutic counselling in postoperative day 2
Attendance in stoma-therapeutic counselling in postoperative day 3
Attendance in stoma-therapeutic counselling in postoperative day 4
Achievement of educational objectives
Peristomal skin assessment with a standardized tool
Attendance in stoma-therapeutic follow-up
Attendance in $\geq 3$ stoma-therapeutic counsellings

## Stoma-therapeutic pathway

The STCP team includes the stoma therapist nurse and the surgeon, and takes care of the patients before admission.

The pathway provides:

- a first counselling (in pre-hospitalization assessment), aimed to expose to the patient and to the caregiver the educational objectives and providing instructions on the management of the stoma. The patients are told about their own role in rehabilitation so that they understand the importance of their own efforts. Pictures of stoma could be shown and the interviewer tries to highlight the importance of changes in relationships, sexual activity, and daily activities such as bathing and showering. During this examination, a first planning of the stoma site is made and reported on the clinical chart with anthropometric measurements. The duration of the first counselling is about 45–60 min.
- Information about stoma surgery are also given during a prior surgical examination.
- the day before surgery the stoma site marking is made.
- in postoperative day 1 (PD1), or the same day of surgery, the patient looks at the stoma for the first time and listens to instructions on how to change the pouch. In this specific counselling, the stoma therapist proposes an “educational agreement” aimed on focusing the goals. An informative booklet is provided as well.
- in PD 1 or 2, new session on teaching about real life with the stoma and first attempt at emptying the pouch under the direct supervision of the nurse.
- in PD 2–3, session on nutrition and physical activity. The patient changes the pouch on his own (under supervision too).
- in PD 4–5 session on early stoma-related complication and check of the knowledge, the patient is autonomous in management of the stoma device.

After discharge, the follow-up schedule provides:

After 3–4 days, the patient calls the stoma therapist according to the protocol and gives details on the trend of the stoma.

After 7–10 days, surgical and stoma-therapeutic examination

After 20–30 days, new stoma-therapeutic examination and dietological assessment

Every 3 months after surgery until stoma reversal or 1 year later with a stoma-therapeutic examination

The STC unit was created in 2003 and has grown close to the ERAS protocol. Each year, the stoma-therapeutic group takes care of 1300 patients operated on for major

colorectal surgery. The team also includes the urologist, the gastroenterologist, the dietician, the psychologist, a social worker, and nurses. From 2016, the team had formalized a rehabilitation program with a strong educational component dedicated to patients with stoma. The team offers patients an informative brochure specific for colostomy or ileostomy and for different shapes (end or loop stoma) and inherent to contacts to facilitate the counselling program, new body scheme, disease-related items, how to clean the stoma, how to manage the stoma devices and how to empty the bag, “real-life” problems (job, travels, clothing, showering), nutritional aspects, and indications for “patients’ associations.”

The primary endpoint was the length of hospital stay. The discharge criteria were postoperative pain controlled with per-oral medication (VAS < 4), autonomy in mobilization, and out of bed more than 6 h/day, appropriate bowel function with accurate output counting and ability to tolerate solid food without nausea, and absence of conditions requiring in-hospital treatment.

Secondary endpoints were achieving autonomy in the management of the pouch (so that the patient is proficient enough) readmission rate and stoma-related complications.

### Statistical analysis

Categorical variables were compared using the chi-square test or Fisher’s exact test, as appropriate. Continuous variables were compared between groups using the Wilcoxon test. The Kaplan–Meier estimator, with no censored event, was used to estimate time to event probabilities, which were compared using the log-rank test. All *P* values were two-sided, and values of *P* < 0.05 were considered statistically significant. All statistical analysis was performed using SPSS Statistics.

The ethics committee approved data auditing and the study has been reported according to the Strengthening the Reporting of Observational Studies in Epidemiology [12].

**Table 2** Baseline characteristics

	No adherence to the STCP	Adherence to STCP	<i>p</i>
<i>n</i>	56	87	
Age (median [IQR])	66.00 [58.75, 74.00]	58.00 [46.00, 68.00]	0.006
BMI (median [IQR])	25.00 [22.10, 27.10]	24.10 [22.00, 26.50]	0.642
Sex = male (%)	26 (46.4)	36 (41.4)	0.606
Chronic kidney disease = 1 (%)	2 (3.6)	2 (2.3)	0.645
IDDM = NA (%)	1 (1.8)	0 (0.0)	0.392
NIDDM = 1 (%)	7 (12.5)	6 (6.9)	0.372
Pulmonary disease = 1 (%)	0 (0.0)	1 (1.1)	1.000
Cardiac disease = 1 (%)	22 (39.3)	28 (32.2)	0.473
More than 2 comorbidities = 1 (%)	4 (7.1)	5 (5.7)	0.737
Smoking habit = 1 (%)	19 (33.9)	18 (20.7)	0.083
Rod bridge = 1 (%)	6 (10.7)	2 (2.3)	0.057
Type of surgery (%)			0.349
Left colectomy	3 (5.4)	1 (1.1)	
Low anterior resection	22 (39.3)	29 (33.3)	
Abdominoperineal resection	7 (12.5)	8 (9.2)	
Hartmann procedure	2 (3.5)	5 (5.7)	
Ileocolic resection	0	1 (1.1)	
Total colectomy	7 (12.5)	11 (12.6)	
Total proctocolectomy + IPAA	8 (14.2)	15 (17.2)	
Stoma	7 (12.5)	17 (19.5)	
Laparoscopy = 1 (%)	51 (91.1)	73 (83.9)	0.313
Type_ostomy (%)			0.921
End ileostomy	7 (12.5)	14 (16.1)	
Loop ileostomy	33 (58.9)	48 (55.2)	
End colostomy	10 (17.9)	14 (16.1)	
Loop colostomy	6 (10.7)	11 (12.6)	
Preop site marking = 1 (%)	52 (92.9)	86 (98.9)	0.077
Preop nutrition = 1 (%)	43 (76.8)	75 (86.2)	0.178

## Results

Overall, among patients undergoing major colorectal surgery at the authors' institutions between 2017 and 2020, 143 patients underwent a first stoma creation. Patients were divided into two groups. Fifty-six patients (40%) did not completely follow the STCP (group A); 87 patients (60%) demonstrated strict compliance for the STCP (group B).

### Patient characteristics

Table 2 summarizes patients' history and characteristics. The two groups were similar in terms of gender, body mass index (BMI), kidney failure, insulin-dependent diabetes mellitus (IDDM) or non-insulin-dependent diabetes mellitus (NIDDM), pulmonary disease, heart diseases, smoking habit, dietary path, surgical procedures, type of stoma (ileostomy, colostomy, end, loop), and presence of supporting rod.

The median age was significantly lower in group B (58) than in group A (66) ( $p=0.006$ ).

Statistically significant differences were observed in the hospital stay (8 days in group B vs 11.5 in group A,  $p=0.001$ ), in the postoperative day the patient was able to look at the stoma (1 day in group B vs 3 days in group A,  $p<0.001$ ), in the postoperative day the patient was able to empty the pouch (2 days in group B vs 5 days in group A,  $p<0.001$ ), and in the postoperative day the patient was able to change the pouch (3 days in group B vs 6 days in group A,  $p<0.001$ ).

Stoma-related complications did not show significant differences and were 9 (16.1%) in group B and 16 (18%) in group A ( $p=0.82$ ). Thirty-day readmission rate was 10.1% (6 patients) in group B and 11.5% (10) in group A ( $p=1.000$ ) (Table 3).

Time-to-event estimates of the same items are reported in Fig. 1.

**Table 3** Results

	No adherence to the STCP	Adherence to STCP	<i>p</i>
	56	87	
Hospital stay (median [IQR])	11.50 [8.00, 18.25]	8.00 [6.00, 13.50]	0.001
30-day readmission = 1 (%)	6 (10.7)	10 (11.5)	1.000
Postop day flatus (median [IQR])	1.00 [1.00, 2.00]	1.00 [1.00, 2.00]	0.908
Postop day open stool (median [IQR])	2.00 [1.00, 3.00]	2.00 [1.00, 3.00]	0.948
Postop day sitting on chair (median [IQR])	1.00 [1.00, 1.00]	1.00 [0.00, 1.00]	0.055
Tolerated fluid intake (median [IQR])	1.00 [0.00, 1.00]	1.00 [0.00, 1.00]	0.727
Urinary catheter (median [IQR])	4.00 [2.00, 7.50]	3.00 [2.00, 5.00]	0.194
Nasogastric tube removal (median [IQR])	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.389
Look at the ostomy, postoperative day (median [IQR])	3.00 [2.00, 3.00]	1.00 [1.00, 1.00]	<0.001
Emptying the pouch, postoperative day (median [IQR])	5.00 [4.00, 6.00]	2.00 [2.00, 2.00]	<0.001
Change the pouch, postoperative day (median [IQR])	6.00 [5.00, 7.00]	3.00 [2.00, 3.50]	<0.001
Peristomal skin disorder (%) SACS scale			0.502
0	51 (91.1)	83 (95.4)	
11t2	1 (1.8)	0 (0.0)	
11t23	1 (1.8)	1 (1.1)	
11t34	1 (1.8)	0 (0.0)	
11tv	2 (3.6)	1 (1.1)	
12t2	0 (0.0)	1 (1.1)	
12t2t3	0 (0.0)	1 (1.1)	
Stoma complications = 1 (%)	9 (16.1)	16 (18.4)	0.823
Complications (Clavien-Dindo) (%)			0.045
0	21 (37.5)	38 (43.7)	
1	1 (1.8)	3 (3.4)	
2	0 (0.0)	8 (9.2)	
2a	22 (39.3)	28 (32.2)	
3 a	8 (14.3)	4 (4.6)	
3 b	0 (0.0)	2 (2.3)	
3b	4 (7.1)	3 (3.4)	
4	0 (0.0)	1 (1.1)	

### Discussion

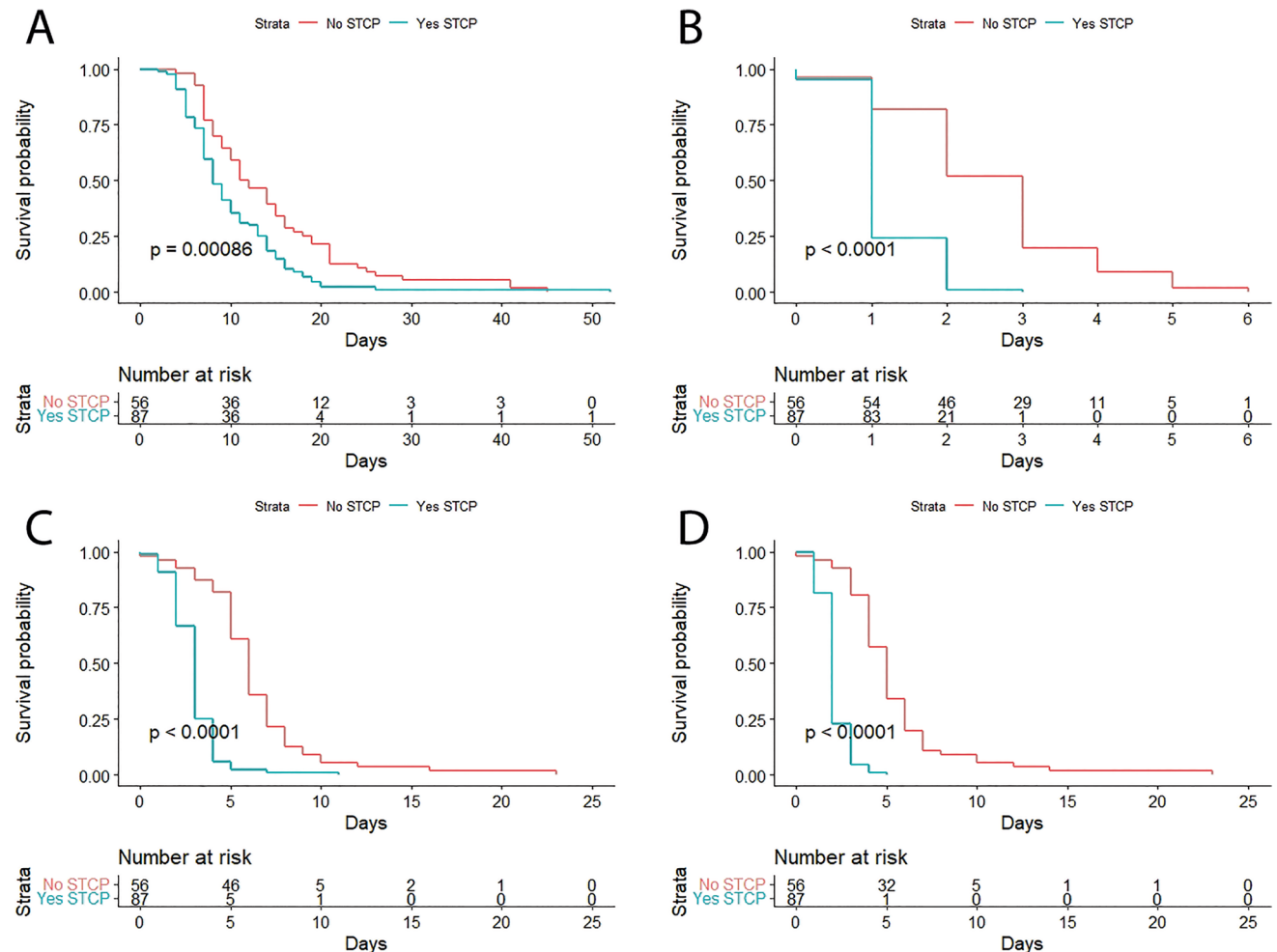
The creation of the stoma is related to a wide range of complications and implications and new stoma patients have to face significant physical, psychological, and body image settings [13], all this in addition to the concern caused by the disease itself. It could be difficult for the ward nursing staff to properly assist the patients during the hospital stay as well as after the discharge.

The strong application of STCP showed better results in terms of the length of hospital stay and the level of independence when compared with patients who did not attempt the path despite the inclusion in the ERAS protocol.

Chaudhri published in 2005 the first randomized trial comparing the application of an intensive, community-based stoma education-based pathway with traditional postoperative care. The intensive stoma educational pathways were planned through counselling at the home of patients and improved all outcomes measured, including time to stoma

proficiency, hospital stay, and unplanned stoma-related community intervention [14].

A recent paper describes a “clinical 4-day in-hospital educational stoma pathway.” This pathway hesitated in improving the “level of independence” (LOI) of new stoma patients and significantly reducing the need for “home nursing care services” with an impact on cost-benefit analysis [15]. In this paper, however, the authors did not analyze data about hospital stay or readmission. The data collected demonstrates that a close adherence to STCP hesitated in better results in terms of hospital stay and management of the stoma. The aforementioned paper stated that nurses were instructed to engage patients and caregivers in their “stoma care pathway” and guide them to become independent as soon as possible. Our STCP, instead, is carried out by dedicated stoma therapists. This evidence could represent a limitation to reproducibility in other non-specialized surgical settings, but is an advantage for patients in this contest and after the discharge from the hospital. These considerations, focused on educational



**Fig. 1** Time-to-event estimates of length of hospital stay in days (A), the postoperative day the patient was able to look at his stoma (B), the postoperative day the patient was able to empty the pouch (C), and the postoperative day the patient was able to change the pouch (D)

objectives and adapting to the new condition, were already described by other authors [16] as being key to justifying the active presence of stoma therapist.

The readmission rate was not significantly reduced by the strict adherence to the path but remains much lower than that observed in the literature [17]. The reason for this evidence is that the STCP protocol includes a close telephone follow-up made by the stoma therapist after the discharge and focused on the assessment of stoma patients' water balance. Based on the balance, the stoma therapist, following the protocol and under the supervision of the physician, manages the condition in order to reduce the necessity of readmission [18].

Stoma-related complications did not differ among the two groups but the global count (16.1% in group A and 18.4% in group B,  $p = 0.823$ ) is much lower than that observed in the literature [19, 20]. Out of 143 patients, just 5 did not receive the preoperative site mark of the stoma (3%). In a large number of papers, the preoperative site marking is significantly associated with lower rate of stoma-related and skin complications [21]. Baykara et al. published a multicenter retrospective study and found higher complication rates among patients without stoma site marking than among those whose stoma site had been marked [22]. Furthermore, the quality of life for the patients whose stoma sites had been preoperatively marked was significantly better than that of the unmarked patients as shown by a recent systematic review [23].

The rod bridge was rarely used in our center (5%) and patients without the rod are immediately suitable of close STCP. In the two groups, the rod was placed in 6 patients in group B (10.7%) and in 2 (2.3%) in group A. The presence of the rod prevents the possibility of early educational direction and increases the risk of peristomal skin complications [24].

A recent controlled, randomized trial compared patients treated with ERAS program and extended stoma education and patients treated with standard care and current stoma education. The authors concluded that the length of stay after elective colorectal surgery with the need for stoma creation can be reduced significantly with perioperative education and guidance by dedicated stoma nurses as part of an ERAS care pathway if compared to current stoma education in a traditional standard care pathway [25]. The substantial difference between this study and previous studies is that the reduction in hospital stays observed is completely due to adherence to the STCP because all patients analyzed had followed the ERAS protocol with all its items.

The present study has several limitations. First, it was a retrospective analysis, even if data were collected prospectively. The other bias is the younger age observed in group B, where patients were largely in finer physical shape for early discharge from the ward and more willing to comply with autonomous management of the stoma. However, even

if age represents a risk factor for stomal and peristomal complications [26], there are no significant differences between the two groups in terms of complications; thus, the better outcomes observed seem to be related to a possible protective role of the STCP.

In conclusion, the STCP demonstrated to have had a protective role in making the patient and the caregiver (if present) autonomous and reducing the length of hospital stay. Even if not significantly, the stoma-related complications, and the readmission rates appear much lower than those showed in recent papers.

**Author contribution** Michela Mineccia and Antonio Valenti designed the study and wrote the manuscript. Federica Gonella with Marco Palisi and Paolo Massucco filled the dataset and wrote the manuscript. Andrea Ricotti did the statistical analysis. Alessandro Ferrero supervised and wrote the manuscript.

**Data availability** The dataset generated and analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

**Competing interests** The authors declare no competing interests.

## References

- Alenezi A, McGrath I, Kimpton A, Livesay K (2021) Quality of life among ostomy patients: a narrative literature review. *J Clin Nurs* 30(21–22):3111–3123. <https://doi.org/10.1111/jocn.15840>
- Murken DR, Bleier JI (2019) Ostomy-related complications. *Clin Colon Rectal Surg* 32(3):176–182. <https://doi.org/10.1055/s-0038-1676995>
- Carlsson E, Fingren J, Hallén AM et al (2016) The prevalence of ostomy-related complications 1 year after ostomy surgery: a prospective, descriptive, clinical study. *Ostomy Wound Manage* 62(10):34–48
- Kylie Porritt BN, GradDipNursSc(Cardiac), MNsc, PhD (2019) Evidence summary. Stoma care: post-operative patient assessment and education. The Joanna Briggs Institute EBP Database JBI@Ovid.; JBI21698
- Danielsen AK, Rosenberg J (2014) Health related quality of life may increase when patients with a stoma attend patient education – a case control study. *PLoS One* 9. <https://doi.org/10.1371/journal.pone.0090354>
- REGISTERED NURSES' ASSOCIATION OF ONTARIO (RNAO) (2019) Supporting adults who anticipate or live with an ostomy- Second edition. <https://rnao.ca/bpg/guidelines/ostomy>. Accessed 14 Feb 2022
- Millard R, Cooper D, Boyle MJ (2020) Improving self-care outcomes in ostomy patients via education and standardized discharge criteria. *Home Healthc Now* 38(1):16–23. <https://doi.org/10.1097/NHH.0000000000000816>
- Van Butsele J, Bislenghi G, D'Hoore A, Wolthuis AM (2021) Readmission after rectal resection in the ERAS-era: is a loop ileostomy the Achilles heel? *BMC Surg* ;21(1):267. <https://doi.org/10.1186/s12893-021-01242-y>

9. Liu C, Bhat S, Sharma P, Yuan L, O'Grady G, Bissett I (2021) Risk factors for readmission with dehydration after ileostomy formation: a systematic review and meta-analysis. *Colorectal Dis* 23(5):1071–1082. <https://doi.org/10.1111/codi.15566>
10. Moon J, Pang A, Ghitulescu G, Faria J, Morin N, Vasilevsky CA, Boutros M (2022) Early discharge after colorectal cancer resection: trends and impact on patient outcomes. *Surg Endosc* 6. <https://doi.org/10.1007/s00464-021-08923-y>
11. Miller D, Pearsall E, Johnston D, Frecea M, McKenzie M. Ontario Provincial ERAS Enterostomal Therapy Nurse Network (2017). Executive summary: Enhanced Recovery After Surgery: best practice guideline for care of patients with a fecal diversion. *J Wound Ostomy Continence Nurs* 44(1):74–77. <https://doi.org/10.1097/WON.0000000000000297>
12. von Elm E, Altman DG, Egger M et al (2007) The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet* 370:1453–7. <https://doi.org/10.1016/j.ijvsu.2014.07.013>
13. Petersén C, Carlsson E (2021) Life with a stoma—coping with daily life: experiences from focus group interviews. *J Clin Nurs* 30(15–16):2309–2319. <https://doi.org/10.1111/jocn.15769>
14. Chaudhri S, Brown L, Hassan I, Horgan AF (2005) Preoperative intensive, community-based vs. traditional stoma education: a randomized, controlled trial. *Dis Colon Rectum* 48(3):504–9. <https://doi.org/10.1007/s10350-004-0897-0>. PMID: 15768181
15. Van Loon YT, Clermonts SHEMA, Belt R, Nagle D, Wasowicz DK, Zimmerman DDE (2020) Implementation of an easy in-hospital educational stoma pathway results in decrease of home nursing care services after discharge. *Colorectal Dis* 22(9):1175–1183. <https://doi.org/10.1111/codi.15034>
16. Bryan S, Dukes S (2010) The Enhanced Recovery Programme for stoma patients: an audit. *Br J Nurs* 19(13):831–4. <https://doi.org/10.12968/bjon.2010.19.13.48859>. PMID: 20606612
17. Fish DR, Mancuso CA, Garcia-Aguilar JE, Lee SW, Nash GM, Sonoda T, Charlson ME, Temple LK (2017) Readmission after ileostomy creation: retrospective review of a common and significant event. *Ann Surg* 265(2):379–387. <https://doi.org/10.1097/SLA.0000000000001683>
18. Gonella F, Valenti A, Massucco P, Russolillo N, Mineccia M, Fontana AP, Cucco D, Ferrero A (2019) A novel patient-centered protocol to reduce hospital readmissions for dehydration after ileostomy. *Updates Surg* 71(3):515–521. <https://doi.org/10.1007/s13304-019-00643-2>
19. Maglio A, Malvone AP, Scaduto V, Brambilla D, Denti FC (2021) The frequency of early stomal, peristomal and skin complications. *Br J Nurs* 30(22):1272–1276. <https://doi.org/10.12968/bjon.2021.30.22.1272>
20. Malik TAM, Lee MJ, Harikrishnan AB (2018) The incidence of stoma related morbidity—a systematic review of randomised controlled trials. *Ann R Coll Surg Engl* 100(7):501–508. <https://doi.org/10.1308/rcsann.2018.0126>
21. Arolfo S, Borgiotto C, Bosio G, Mistrangelo M, Allaix ME, Morino M (2018) Preoperative stoma site marking: a simple practice to reduce stoma-related complications. *Tech Coloproctol* 22(9):683–687. <https://doi.org/10.1007/s10151-018-1857-3>
22. Baykara ZG, Demir SG, Karadag A, Harputlu D, Kahraman A, Karadag S, Hin AO, Togluk E, Altinsoy M, Erdem S, Cihan R (2014) A multicenter, retrospective study to evaluate the effect of preoperative stoma site marking on stomal and peristomal complications. *Ostomy Wound Manag* 60(5):16–26
23. Kim YM, Jang HJ, Lee YJ (2021) The effectiveness of preoperative stoma site marking on patient outcomes: a systematic review and meta-analysis. *J Adv Nurs* 77(11):4332–4346. <https://doi.org/10.1111/jan.14915>
24. Gialamas E, Meyer J, Abbassi Z, Popeskou S, Buchs NC, Ris F (2021) The use of a stoma rod/bridge to prevent retraction: a systematic review. *J Wound Ostomy Continence Nurs* 48(1):E1. <https://doi.org/10.1097/WON.0000000000000730>
25. Forsmo HM, Pfeffer F, Rasdal A, Sintonen H, Körner H, Erichsen C (2016) Pre- and postoperative stoma education and guidance within an Enhanced Recovery After Surgery (ERAS) programme reduces length of hospital stay in colorectal surgery. *Int J Surg* 36:121–126. <https://doi.org/10.1016/j.ijvsu.2016.10.031>
26. Zelga P, Kluska P, Zelga M, Piasecka-Zelga J, Dziki A (2021) Patient-related factors associated with stoma and peristomal complications following fecal ostomy surgery: a scoping review. *J Wound Ostomy Continence Nurs* 48(5):415–430. <https://doi.org/10.1097/WON.0000000000000796>

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.