Sustainability of an Enhanced Recovery After Surgery initiative for elective colorectal resections in a community hospital

Background: In March 2016, an Enhanced Recovery After Surgery (ERAS) initiative was implemented for all elective colorectal resections at an urban hospital in St. John’s, Newfoundland and Labrador, Canada. An ERAS coordinator supervised and enforced guideline compliance for 6 months. The aim of this study was to evaluate the sustainability of the ERAS program after supervision of guideline compliance was eliminated.

Methods: Patient outcomes and guideline compliance were compared between surgeries performed under standard practice (April 2014 to March 2015) and those performed during and after the implementation of the ERAS initiative (March 2016 to August 2016 was the implementation phase and September 2016 to February 2017 was the sustainability phase).

Results: Hospital length of stay decreased from 7.26 days at baseline to 5.44 days during the implementation phase of the ERAS program (p < 0.001). There was no significant difference between length of stay at baseline and during the 6-month sustainability phase of the ERAS program (7.10 d). There were no significant differences in rates of readmission or mortality during and after implementation. Rate of ileus decreased significantly from 13.8% during the implementation phase to 4.6% during the sustainability phase (p = 0.036). Total guideline compliance increased from 52.2% at baseline to 80.7% during the implementation phase (p < 0.001), and decreased to 74.7% during the sustainability phase (p < 0.001). Adherence to postoperative guidelines regressed: 79.2% in the implementation phase and 68.6% in the sustainability phase (p < 0.001).

Conclusion: Hospital length of stay decreased when the ERAS program was implemented and the ERAS coordinator was present on the surgical ward. Methods for sustaining guideline implementation are vital to the success of similar programs in the future.

Contexte : En mars 2016, une initiative de récupération améliorée après la chirurgie (RAAC) a été mise en place pour toutes les résections colorectales électives effectuées dans un hôpital urbain de St. John’s, à Terre-Neuve-et-Labrador, au Canada. Un coordonnateur du projet de RAAC a supervisé l’application des directives pendant 6 mois. Cette étude visait à évaluer la viabilité du programme une fois que l’application des directives n’était plus surveillée.

Méthodes : Nous avons comparé les issues pour les patients et le respect des directives pour les chirurgies réalisées selon les pratiques habituelles (avril 2014 à mars 2015) et pour celles réalisées pendant et après l’adoption du programme de RAAC (mars 2016 à août 2016 — mise en œuvre — et septembre 2016 à février 2017 — évaluation de la viabilité).

Résultats : La durée du séjour à l’hôpital est passée de 7,26 jours à 5,44 jours pendant la phase de mise en œuvre du programme (p < 0,001). Il n’y avait pas de différence significative entre la durée du séjour au début du programme et pendant les 6 mois de la phase d’évaluation de la viabilité (7,10 jours). Les taux de réadmission et de mortalité avant et après la mise en place du programme n’ont pas changé de manière significative. Le taux d’iléus a connu une baisse significative, passant de 13,8% pendant la phase de mise en œuvre à 4,6% pendant l’évaluation de la viabilité (p = 0,036). Le respect des directives est passé de 52,2% au début de la mise en œuvre à 80,7% pendant cette même phase (p < 0,001), pour ensuite descendre à 74,7% pendant la phase suivante (p < 0,001). Le respect de lignes directrices postopératoires a régressé : il était de 79,2% pendant la phase de mise en œuvre et de 68,6% pendant la phase d’évaluation de la viabilité (p < 0,001).

Conclusion : La durée des séjours à l’hôpital a diminué après l’adoption du programme de RAAC, lorsque le coordonnateur du programme était présent. Les méthodes de maintien des lignes directrices après leur adoption seront cruciales au succès de programmes similaires à l’avenir.
Enhanced Recovery After Surgery (ERAS) guidelines are best practice guidelines that direct the perioperative pathway, and they have been shown to improve patient outcomes after major surgery. Records in the provincial discharge abstract database in Newfoundland and Labrador indicate that approximately 1000 colorectal resections are performed annually. The majority of these procedures are for treatment of colorectal tumours; a small proportion are for treatment of inflammatory bowel diseases such as Crohn disease and colitis. In March 2016, Eastern Health (1 of 4 regional health authorities in Newfoundland and Labrador) implemented a quality-improvement initiative whereby all elective colorectal resections at St. Clare’s Mercy Hospital were to take place using ERAS guidelines. A full-time ERAS coordinator (E.B.) supervised and enforced guideline compliance in the first 6 months of the initiative. After this period, the coordinator began implementing ERAS programs for other procedures in other surgical units and no longer actively supervised colorectal surgeries to ensure compliance with the guidelines. The current study evaluates the sustainability of an ERAS program after the initial guideline-enforced implementation phase has ended.

Successful implementation of and adherence to major change in clinical practice is undeniably difficult. A systematic review of 18 evaluations of postimplementation sustainability revealed that interventions were fully sustained in only 61% of cases. A common theme of sustainability research is that after the initial phase of training, supervision or monitoring, compliance with the intervention decreases considerably. Consequently we were concerned about what would happen when procedures were no longer being supervised to ensure guideline compliance.

In 2015, Gillissen and colleagues evaluated the sustainability phase of a project in 10 hospitals in the Netherlands that had experienced initial success with implementing ERAS initiatives. The authors described a slight, but statistically insignificant, increase in length of stay (LOS) and decrease in guideline compliance after the implementation period. To our knowledge, the current study is the first evaluation of ERAS sustainability in Canada.

**Methods**

**Study design**

An interrupted time-series design was used to compare patient outcomes and compliance with best practice guidelines between surgeries that took place at St. Clare’s Mercy Hospital in the 2014/15 fiscal year (baseline year; 2 years before ERAS) and the 2016/17 fiscal year (ERAS year). The ERAS year was divided into 2 6-month intervals (implementation and sustainability phases, respectively) to assess the impact of (a) supervision and enforcement of guideline compliance and (b) withdrawal of supervision.

**Patients**

Patients were identified by searching the surgical database of St. Clare’s Mercy Hospital for 12 International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) codes representative of elective colorectal resections (Appendix 1, Supplemental Table S1, available at canjsurg.ca/016018-a1).

**Intervention**

The intervention consisted of implementing an ERAS initiative for all elective colorectal resections at St. Clare’s Mercy Hospital. Specifically, 19 guidelines were identified from the ERAS Society recommendations (Table 1).

The implementation plan surrounding the rollout of the ERAS guidelines involved several key strategies to try to enhance long-term sustainability of the ERAS program. Once the health authority determined that an ERAS program would begin, the coordinator set up multiple face-to-face meetings with key stakeholders, including surgeons, anesthesiologists, managers, perioperative care nurses/staff and the director of surgical services. Buy-in was obtained from representatives at all levels by facilitating ongoing discussions pertaining to individual and systemic issues. These barriers were addressed as they arose (e.g., minor edits were done to published guidelines to operationalize the guidelines in the local context). The ERAS coordinator provided ongoing training and support throughout the implementation phase, including providing print and online materials for staff, producing patient education materials, ensuring that up-to-date operating room (OR) monitoring equipment was available and generating audit and feedback reports. Additionally, the coordinator facilitated the standardization of postoperative order sets and converted clinical pathways to an electronic format on the hospital’s electronic health record system. The coordinator measured guideline compliance by conducting a manual retrospective chart review for all phases (baseline [control year], implementation and sustainability phases).

**Outcomes**

The primary outcome was LOS. Date and time of patient admission and discharge were recorded for all procedures, and LOS was the amount of time that a patient remained in hospital for the procedure and recovery. Other outcomes included compliance with ERAS guidelines (proportion of the 19 identified guidelines that were followed), complication rate (proportion of patients in a particular surgery...
group who experienced a complication during or after surgery), 30-day readmission rate (proportion of patients who were readmitted to hospital within 30 d of their initial discharge, including readmissions to sites other than St. Clare’s Mercy Hospital and 30-day mortality rate (proportion of patients who died within 30 d of their surgery).

Complications were grouped into the following 7 categories: cardiovascular, delirium/psychiatric, infectious, nephrologic, respiratory, surgical and other. A complete list of all complications considered in this study can be found in Appendix 1, Supplemental Table S2.

The distribution of patients across comorbidity classes was compared between the 3 phases of the study. The comorbidity variable in this study is based on the extent to which treating a patient with another comorbid condition affects resource consumption associated with their surgery. This was determined by a team of medical record coders at Eastern Health, using Canadian Institute for Health Information (CIHI) methodology. The CIHI comorbidity classes are defined as follows: 0 indicates no significant comorbidity (0%–24% impact on resource consumption), 1 indicates level 1 comorbidity (25%–49% impact on resource consumption), 2 indicates level 2 comorbidity (50%–74% impact on resource consumption), 3 indicates level 3 comorbidity (75%–124% impact on resource consumption), 4 indicates level 4 comorbidity (125% or higher impact on resource consumption) and 8 indicates level 8 comorbidity (comorbidity level not applicable).

**Data collection**

A retrospective electronic database audit was conducted to obtain all relevant patient data for analysis. Data on age, sex, comorbidities, 30-day readmissions, 30-day mortality and complications were obtained for each patient, as well as time and date of admission and discharge. Medical charts were also reviewed by the ERAS coordinator to determine adherence to each ERAS guideline using the definitions provided in Table 1. A thorough review of both paper-based charts and electronically documented data on the hospital’s electronic health record system was performed to accurately determine compliance rates for each of the 19 guidelines in the baseline, implementation and sustainability phases.

| Table 1. Enhanced Recovery After Surgery guidelines used in the intervention |
|---|---|
| Period | Guideline |
| Preoperative | Patient is provided with written patient education material before surgery. |
| | Patient consumes a carbohydrate-rich beverage 3 h before surgery. |
| | Patient does not receive bowel preparation. |
| | Patient receives antibiotic prophylaxis before surgery. |
| | Patient receives low-molecular-weight heparin preoperatively and mechanical thromboprophylaxis via compression stockings or intermittent pneumatic compression. |
| Intraoperative | Patient receives short-acting anesthetic agents (i.e., short-acting induction agents) such as propofol combined with a short-acting opioid such as fentanyl, alfentanil or remifentanil. |
| | Patient receives intraoperative midthoracic epidural anesthesia/analgesia (for open surgery). |
| | Patient receives goal-directed fluid therapy: fluid administration guided by optimization of hemodynamic measurements including stroke volume, flow time corrected, pulse pressure variation or stroke volume variation. Total amount of fluids should be limited to < 8 mL/kg/h.* |
| | Patient receives laparoscopic surgery. |
| | Patient remains normothermic (first measured temperature on arrival to after anesthesia care unit ≥ 36.0°C/96.8°F). |
| Postoperative | Patient has intravenous fluids discontinued within 24 h following surgery. |
| | Patient does not have prophylactic nasogastric tubes inserted postoperatively. |
| | Patient is provided with multimodal postoperative nausea and vomiting management such as antemetics, or dexamethasone, or omission of nitrous oxide, or total intravenous anesthesia with propofol and remifentanil. |
| | Patient has urinary catheter removed within 24 h following surgery. |
| | Patient receives clear liquids within the first 24 h following surgery. |
| | Patient consumes solid food within 48 h following surgery. |
| | Patient receives multimodal pain management: NSAID, acetaminophen, ketamine, glucocorticoids, IV lidocaine, TEA, spinal analgesia, regional blocks. |
| | Patient mobilizes twice a day beginning on postoperative day 1. |
| | Patient chews gum for 5 minutes 3 times a day. |

*IV = intravenous; NSAID = nonsteroidal antiinflammatory drug; TEA = thoracic epidural analgesia.

*A goal-directed therapy monitor (Edwards Lifesciences) was used to monitor fluids.
**Statistical analysis**

SPSS version 23 was used for all statistical analyses. Median LOS between groups was compared using the Mann–Whitney U test. Rates of complications, 30-day readmissions and 30-day mortality were compared using independent t tests. Compliance with ERAS guidelines was compared using Fisher exact and Pearson χ² tests. Significance was set at a p value of less than 0.05.

**RESULTS**

**Patient characteristics**

We identified and included 158 patients in the analysis for the baseline year and 174 patients for the ERAS year (87 in the implementation phase and 87 in the sustainability phase). There were no significant differences in patient characteristics (age, sex, comorbidity level, surgery technique, or operation type) between any of the phases (Table 2).

**Patient outcomes and compliance with ERAS guidelines**

Upon implementation of ERAS, there was a statistically significant decrease in median LOS in comparison with the baseline year (7.26 to 5.44 d; p < 0.001) (Table 3). There were no statistically significant differences in any other patient outcomes (complication rate, 30-day readmission rate or 30-day mortality rate) between these 2 groups. There was a significant increase in median LOS (5.44 to 7.10 d; p = 0.010) and a significant decrease in the rate of ileus (13.8% to 4.6%; p = 0.036) between the implementation and sustainability phases of ERAS (Table 3).

There was a significant increase in compliance with preoperative guidelines (63.9% to 90.3%; p < 0.001), intraoperative guidelines (62.9% to 73.6%; p < 0.001) and postoperative guidelines (39.9% to 79.2%; p < 0.001) with implementation of ERAS (Table 4). Compliance with guidelines concerning preoperative carbohydrate beverage administration, bowel preparation, use of venous thromboembolism prophylaxis, intraoperative fluid restriction, discontinuation of intravenous fluids on postoperative day 1 (POD1), removal of Foley catheter on POD1, administration of clear fluids on postoperative day 0 (POD0), initiation of solid food consumption on POD1, utilization of multimodal pain management, initiation of mobilization on POD1 and postoperative gum chewing all increased significantly with ERAS implementation (Table 5). Overall compliance increased significantly from 52.2% at baseline to 80.7% during ERAS implementation (p < 0.001) (Table 4).

Compared with the implementation phase, during the sustainability phase there was a significant decrease in compliance with postoperative guidelines (79.2% to 68.6%; p < 0.001) (Table 4). Specifically, compliance with guidelines concerning intravenous fluid discontinuation on POD1, administration of clear fluids on POD0, mobilization on POD1 and postoperative gum

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**Table 2. Comparison of demographic and prognostic factors in patients in the baseline, implementation and sustainability phases**

| Factor              | No. (%) of patients,* study phase | p value |
|---------------------|----------------------------------|---------|
|                     | Baseline n = 158 | Implementation n = 87 | Sustainability n = 87 |
| Sex                 |                     |                     |                     |
| Male                | 87 (65.1)           | 52 (60.9)           | 42 (48.3)           | NS       |
| Female              | 71 (44.9)           | 35 (40.2)           | 45 (51.7)           |          |
| Age, yr, mean ± SD  | 60.76 ± 14.35       | 63.87 ± 11.98       | 65.54 ± 12.28       | NS       |
| No. of comorbidities† |                     |                     |                     |
| 0                   | 102 (64.6)          | 54 (62.1)           | 54 (62.1)           | NS       |
| 1                   | 32 (20.2)           | 13 (15.0)           | 11 (12.6)           |          |
| 2                   | 15 (9.5)            | 15 (17.2)           | 15 (17.2)           |          |
| 3 or 4              | 9 (5.6)             | 5 (5.8)             | 5 (5.8)             |          |
| Surgical technique  |                     |                     |                     |
| Laparoscopic        | 19 (12.1)           | 15 (17.2)           | 12 (13.8)           | NS       |
| Open                | 139 (87.9)          | 72 (82.8)           | 75 (86.2)           |          |
| Operation type      |                     |                     |                     |
| Colon               | 111 (70.3)          | 66 (75.9)           | 61 (70.1)           | NS       |
| Rectum              | 47 (29.7)           | 21 (24.1)           | 26 (29.9)           |          |

NS = nonsignificant; SD = standard deviation.
*Unless indicated otherwise.
†There was no significant difference between any 2 groups.
chewing all decreased when guideline supervision was withdrawn (Table 5). There was no significant difference in compliance with preoperative or intraoperative guidelines (Table 4).

There were no differences in patient outcomes between the baseline and sustainability phases (Table 3). However, compliance with preoperative guidelines (63.9% to 89.0%; $p < 0.001$), intraoperative guidelines (62.9% to 71.1%; $p = 0.01$) and postoperative guidelines (39.9% to 68.6%; $p < 0.001$) was significantly higher in the sustainability phase than in the baseline phase (Table 4). Specifically, compliance with guidelines concerning preoperative carbohydrate beverage administration, bowel preparation, fluid restriction, discontinuation of intravenous fluids on POD1, removal of Foley catheter on POD1, administration of clear fluids on POD0, multimodal pain management, mobilization on POD1 and postoperative gum chewing was significantly higher in the sustainability phase than in the baseline phase. Compliance with the guidelines concerning diet as tolerated on POD1, however, decreased significantly (Table 5).

**DISCUSSION**

This study shows the success of an ERAS program for colorectal surgery in reducing LOS in its initial implementation phase, but it also shows that much of this improvement in LOS was lost when guideline supervision was removed.

Implementation of the ERAS initiative was associated with a significant increase in compliance with preoperative, intraoperative and postoperative guidelines (Table 4). These results are relatively consistent with a meta-analysis of 13 randomized controlled trials of ERAS versus traditional care for colorectal cancer resections, which showed a decrease in LOS of 2.44 days and a
decrease in complication rate (relative risk 0.71) but no change in rates of readmission or mortality. 9

Although implementation of the ERAS program did not significantly decrease rates of complications, 30-day readmission or 30-day mortality, it is still meaningful that these rates did not increase. Compliance with ERAS guidelines was associated with earlier discharge without an increase in adverse outcomes (complications, readmissions, or mortality). If patients had been discharged earlier than they should have been, one could plausibly have expected increased rates of adverse outcomes.

When we compared the implementation and sustainability phases, we found that compliance with postoperative guidelines decreased significantly. This was presumably due to the absence of guideline supervision in the sustainability phase. Evidence suggests that although compliance with preoperative and intraoperative guidelines is important, compliance with postoperative guidelines within an ERAS pathway is most important as it most significantly predicts and influences LOS. 10 This is probably an explanation for our finding that LOS was higher in the sustainability phase than in the implementation phase and also an explanation for why there was no difference in LOS between the baseline and sustainability phases. Compliance with 4 postoperative guidelines decreased significantly when supervision was withdrawn: intravenous fluid discontinuation on POD1, administration of clear fluids on POD0, mobilization on POD1 and postoperative gum chewing.

It has been demonstrated that providing no more intravenous fluids than necessary to maintain normal fluid balance can reduce the rate of postoperative complications by 18%. 11 In 1 study, deviation from this guideline increased the odds of prolonged LOS by a factor of 2.20. 12 As the goal of initiation of oral fluid intake on POD0 is to facilitate the removal of intravenous fluids on POD1, 13 the significant decrease in compliance with both of these guidelines after withdrawal of supervision is logical.

Postoperative mobilization reduces muscle deterioration and several postoperative complications that are associated with prolonged bed rest. 7 Deviation from this guideline has been shown to increase the odds of prolonged LOS by a factor of 4.31. 12 The lack of compliance with the guideline on mobilization on POD1 observed in the current study may, in part, be a consequence of the 7% reduction in compliance with the guideline on removal of the urinary catheter on POD1 (although this reduction was not statistically significant).

Immobility of the bowel after major abdominal surgery is common; chewing gum postoperatively has been shown to decrease time of bowel paralysis by 20.8 hours and LOS by 2.4 days. 14 The reduction in compliance with this guideline after supervision withdrawal in the current study probably contributed to the increase in LOS.

The comparison of complications between the implementation and sustainability phases demonstrated a significant decrease in the rate of ileus. Between these 2 periods, there was a significant decrease in compliance

| Table 5. Comparison of compliance with individual guidelines before, during and after implementation of the intervention |
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| **Guideline** | **Compliance, %; study phase** | **p value** | **Baseline v. implementation** | **Implementation v. sustainability** | **Baseline v. sustainability** |
| | Baseline | Implementation | Sustainability | Baseline | Implementation | Sustainability | Baseline | Implementation | Sustainability |
| Patient education | 99.4 | 100 | 100 | NS | NS | NS | NS | NS | NS |
| Carbohydrate beverage | 0.00 | 71.3 | 70.1 | < 0.001 | NS | < 0.001 | NS | < 0.001 |
| No bowel preparation | 29.1 | 82.8 | 79.3 | < 0.001 | NS | < 0.001 | NS | < 0.001 |
| Antibiotic prophylaxis | 98.1 | 97.7 | 100 | NS | NS | NS |
| VTE prophylaxis | 93.6 | 100 | 97.7 | 0.016 | NS | NS |
| Short-acting anesthetic agents | 98.7 | 98.9 | 96.6 | NS | NS | NS |
| Epidural (for open surgery) | 85.2 | 87.8 | 81.6 | NS | NS | NS |
| Fluid restriction | 22.3 | 67.8 | 69.0 | < 0.001 | NS | < 0.001 |
| Laparoscopy | 12.1 | 17.2 | 13.8 | NS | NS | NS |
| Normothermia | 99.4 | 98.8 | 95.4 | NS | NS | NS |
| IV fluids discontinued on POD1 | 15.2 | 83.7 | 62.1 | < 0.001 | < 0.001 | < 0.001 |
| No NG tubes | 100 | 100 | 100 | NS | NS | NS |
| Multimodal PONV management | 93.6 | 94.3 | 96.6 | NS | NS | NS |
| Foley catheter | 14.7 | 64.0 | 57.0 | < 0.001 | NS | < 0.001 |
| Clear fluids on POD0 | 43.6 | 80.5 | 69.0 | 0.002 | 0.08 | < 0.001 |
| DAT on POD1 | 98.7 | 64.4 | 62.1 | < 0.001 | NS | < 0.001 |
| Multimodal pain management | 79.1 | 94.1 | 96.6 | 0.002 | NS | < 0.001 |
| Mobilization on POD1 | 12.0 | 63.2 | 45.3 | < 0.001 | 0.02 | < 0.001 |
| Chewing gum | 0 | 69.0 | 28.7 | < 0.001 | < 0.001 | < 0.001 |

DAT = diet as tolerated; IV = intravenous; NG = nasogastric; NS = nonsignificant; POD = postoperative day; PONV = postoperative nausea and vomiting management; VTE = venous thromboembolism.
with 4 guidelines (intravenous fluid discontinuation on POD1, administration of clear fluids on POD0, mobilization on POD1 and postoperative gum chewing) and no significant change in compliance with any other guidelines. Thus, our data are not able to provide a clear explanation for this trend.

A follow-up program focused on implementation has begun to identify the barriers and facilitators to guideline adherence among the front-line surgical ward staff at St. Clare’s Mercy Hospital. Interviews and focus groups will be used to assess the status quo and develop solutions to overcome barriers in collaboration with the front-line staff. Preliminary data indicate that issues pertaining to shifting culture within nursing units present significant barriers to behaviour change. As the cost of providing a person to sustain ERAS is prohibitive, a technology-based solution, such as an electronic visual management system, to maintain adherence to postoperative guidelines is envisaged.

**Limitations**

There are several limitations of this study. The first is that the study was statistically underpowered to demonstrate significant decreases in rates of complication, readmission or mortality because it had a relatively low number of patients compared with the aforementioned meta-analysis.10 We also acknowledge that there is potential for collection bias as the person responsible for collecting compliance data, the ERAS coordinator, was also responsible for promoting adherence to these guidelines to patients and health care providers. Before the initiation of the ERAS program, surgeons, anesthesiologists and nurses came to consensus as to which of the ERAS Society’s recommended guidelines would be included in the local initiative. A total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted. As health care providers aim to stay up to date with the most recent initiatives, a total of 19 guidelines were adopted.

**CONCLUSION**

Implementation of an ERAS initiative for elective colorectal surgery resulted in a substantial improvement in adherence to perioperative guidelines and was associated with a reduction in LOS of 1.82 days. However, the reduction in LOS was not sustained after guideline supervision was eliminated; this change was associated with deterioration in compliance with postoperative guidelines. Guideline compliance in the sustainability phase was nevertheless appreciably better than before ERAS began, but interventions to sustain the ERAS initiative are still needed.

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**Contributors:** A. Norman, K. Mahoney, E. Ballah, J. Pridham, C. Smith and P. Parfrey designed the study. A. Norman, K. Mahoney, E. Ballah, J. Pridham and C. Smith acquires the data, which A. Norman, K. Mahoney, E. Ballah, J. Pridham and C. Smith analyzed. A. Norman, K. Mahoney, E. Ballah wrote the article, which all authors critically reviewed. All authors gave final approval of the version to be published.

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