Editorial

Enhanced recovery for colorectal surgery during COVID-19

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Over the last decade, the improved delivery of high quality colorectal surgery has been possible due to advances in surgery and perioperative medicine, typified by the application of multidisciplinary, evidenced based care within initiatives such as enhanced recovery after surgery (ERAS) programmes. In this editorial we will suggest an increased relevance of ERAS and how its benefits may be extended to mitigate some of the serious problems in the current health crisis caused the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2 or COVID-19) COVID-19 pandemic.

COVID-19 has produced unheralded challenges for the delivery of healthcare. During its peak, clinical activity was directed to the management of patients acutely unwell with COVID-19, with all but the most urgent surgery suspended. Following this surge, the need to restart less urgent surgery, particularly major cancer surgery, and to tackle the backlog and ongoing need has been addressed by many UK professional bodies including surgeons and anaesthetists (1,2). Broadly similar themes run through the information supplied by two websites, including reconfiguration to provide adequate space, staff, and equipment with appropriate systems in place to ensure the safety of both patients and staff and all underpinned by strong leadership and delivering appropriate training. Of all these, a major issue revolves around patient safety during the pandemic, with the recognition that postoperative pulmonary complications (PPCs) occur in just over half of patients (51%) with perioperative COVID-19 infection, with an associated mortality of 38% in these patients, accounting for nearly 83% of deaths (3). Thus balancing the risks of when and what type surgery to undertake in those at risk can be a nuanced decision.

Prior to the pandemic, the numbers of patients undergoing colorectal surgery within ERAS programmes was increasing worldwide. The initial *raison d'être* of ERAS was to reduce hospital length of stay (LOS) popularised by Kehlet in both open and laparoscopic surgery colorectal over 25 years ago (4,5). Further work by Kehlet started a revolution in multimodal perioperative care. It was soon evident however that the benefits of ERAS extended far beyond a reduced LOS (6) and growing evidence has demonstrated that ERAS programmes have a profound impact, including a reduction in complications, long term cancer recurrence, cost of treatment and time to return to normal function (7), with much of the demonstrated benefits collected from colorectal surgery (8,9). Most recently a large meta-analysis confirmed the positive impact that ERAS pathways conferred on reducing PPCs, significantly reducing that risk more than any other of the interventions. The number of patients needed to treat (95% CI) on ERAS pathways was 8 (4.9–12.9) to provide this benefit (10).

Patients currently presenting for colorectal surgery require, now more than ever, excellence in multimodal perioperative care. The importance of guidelines adherence is crucial as there is good evidence that improved adherence confers greater benefits, including reduced complications (11) and improved cancer survival (12). The most recent ERAS® Society recommendations list 25 guideline elements (13)

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and whilst many of these may be applied in the usual manner, some require modification during the current pandemic.

Preoperatively

The preoperative period is the key time to optimise patients and delay in surgery has changed the landscape for patients. On the one hand, disease progression may have occurred, increasing the magnitude of the proposed surgery, yet it allows further time to undertake optimisation. The marked reduction of face-to-face consultations was unfamiliar territory to many frontline clinicians, but the pandemic has revolutionised this area, and the use of telemedicine has been described in many aspects of patient care including preoperative assessment (14). A number of barriers have to be faced including broadband quality, a secure platform, training for both staff and patients, and finally assistance for those with cognitive and hearing impairments.

Patient blood management has been revolutionised in the last 5 years. Patients presenting for surgery with anaemia are well recognised to require increased transfusions, increased LOS, more frequent intensive care admissions, infections, thromboembolic events, and mortality (15). The increase use of preoperative intravenous iron infusions is less practical during the pandemic, and oral preparations will have to be used more often. Whilst these are limited by gastrointestinal side effects, alternate day treatments and the use of newer agents (e.g., sucrosomial iron) may improve compliance (16).

A poor level of aerobic fitness and functional capacity is well recognised to play a key role in determining patient outcome for major surgery (17). Whilst this may be assessed subjectively (such as by a questionnaire), objective assessments for the patient categorised at higher risk via cardiopulmonary exercise testing has recently been re-evaluated. In addition to the issues concerning its reintroduction (i.e., staff safety during testing) there is little data on how to interpret results on patients who have suffered significant COVID-related lung injury (18). However, it is fundamental to make an assessment of fitness and functional capacity for all patients undergoing surgery, as those at high risk may need further input such as referral to high risk anaesthetic clinic or further input form the multidisciplinary team, so that appropriate shared decision making can be undertaken, with the patient triaged for their postoperative care. Whilst the evidence for prehabilitation is still emerging, preoperative exercise training (e.g., high intensity exercise training) may convey improvements in outcome, particularly for patients undergoing cancer surgery (17,19), and may even cause regression of colorectal tumour size prior to surgery (20). Whilst it is easier with lockdown restrictions reduced, the use of fitbit™ technology can theoretically permit a tailored approach to prehabilitation (21), although it is not known how feasible it is to deliver this training remotely. However, it is feasible to run online exercise classes for patients to improve their preoperative fitness and these resources should be harnessed. In addition, it must not be forgotten that prehabilitation also wider remits such as dietary improvements and also psychological support, and there is current interest in the latter (22) which is also feasible to supply remotely, such as with support classes or one to one interactions. Finally help can be targeted to reduce alcohol and nicotine intake too, although the effectiveness of virtual intervention is unknown.

Intraoperatively

The reliable availability of anaesthetic drugs was feared an initial concern at the onset of the pandemic, leading to a return to older style volatile anaesthetics, such as isoflurane. Generally, this has not been the case, although there have been local shortages of drugs for total intravenous anaesthesia (TIVA), due to their prioritised use for critical care patients. This has rekindled the debate as to the optimum general anaesthetic—volatile or TIVA—for patients undergoing oncological surgery. Whilst there is a wealth of theoretical evidence and an interest in increasing long-term survival after some cancer surgeries (such as breast and oesophageal cancer), there is not enough evidence to recommend a wholesale switch to TIVA from volatile anaesthesia (23,24). Meticulous adherence to the intraoperative protocolised pathways such as avoidance of hypothermia, correct fluid therapy, multimodal opioid sparing analgesia and avoidance of hyperglycaemia are also required (13). Confirming adequate reversal form neuromuscular blockade is essential to minimise the incidence of PPCs and Sugammadex has an emerging role in this area (25), as well as within its place to reverse deep neuromuscular blockade (DNB—see below)

The relative merits of laparoscopic surgery compared to open surgery caused controversy during the pandemic, as both have the potential to release and disseminate viral particles, either from uncontrolled release of pressurized gas (in laparoscopic surgery) or the use of electrocautery (in open surgery) and advice has recently been published on

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how to reduce risk of both techniques (26). However, there is no doubt in terms of overall patient outcome, that skilled laparoscopic surgery offers the best way forward and recent advice suggests that laparoscopic surgery provides a safe option with the creation of a closed circuit and providing ultra low particulate air (ULPA) filters, necessary to entrap the virus (0.06–0.14 μm). Moreover, the risk can be reduced further by using low flow rates (5–10 L/min of CO_2) and lower intraperitoneal pressures (8–10 mmHg), the latter enabled by the use of DNB (27). Whilst the place of DNB is not yet confirmed, early studies suggest lower pain scores, earlier return of gastrointestinal function overall improved surgical space and with no difference in operative times (27), with preservation of cardiac output (28). The most recent data suggests that an individualised rather than a standardised approach to pneumoperitoneum may ultimately prove to be the most useful, with reduced complications and reduced inflammation (29).

At the start of the pandemic there were opinions and indeed guidance recommending open surgery rather than laparoscopic surgery with some even considering stoma formation rather than primary anastomosis to reduce the risk of complications that might necessitate the use of intensive care in the post-operative period (30). The evidence in favour of this strategy was mostly theoretical and really failed to recognise the huge adverse impact on the patients recovery and well-being. It is difficult to strike a balance between the theoretical increased risk to staff from aerosolised virus particles during laparoscopic surgery on the one hand and the considerable disadvantage to patient recovery on the other. The balance of risk between well conducted laparoscopic surgery and open surgery with potentially increased blood contact and diathermy smoke is uncertain however action to mitigate the risk by isolating and screening patients, using appropriate PPE and using well recognised strategies to reduce the aerosol risk has led to most clinicians continuing with the laparoscopic approach where appropriate (31).

Postoperatively

Recently, there has been focus on the postoperative period for colorectal patients within ERAS programmes, where it is advocated that this time has the greatest potential impact and was independently associated with optimal recovery, defined as discharge within 5 days of surgery, no major complications nor readmissions to hospital nor mortality (32). This paper by Aarts *et al*. encouraged the early removal or avoidance of urinary catheters, assistance with patient mobilization and early feeding (water on day of surgery and solids on day one). Whilst these are recognized as often the most difficult areas to implement, they were nevertheless the area that conveyed most success to their patients. In an accompanying editorial to the Aarts' paper, Kehlet focuses our attention not so much on the multitude of ERAS elements, but instead on the few he outlined three decades ago: preoperative patient information, thoracic epidural anaesthesia in open (but not laparoscopic) colonic surgery, avoidance of both fluid overload and hypovolemia, no nasogastric tube, and early oral feeding and mobilization. These steps were enough to deliver high quality ERAS with a low LOS (2 to 4 days after open colonic surgery) (33) and with patient selection and fastidious adherence to these few principals in high quality laparoscopic surgery can deliver even lower LOS (8,34).

The highest risk environment for COVID-19 is the hospital, so even when operating at clean or COVID-light sites any safe reduction in length of hospital stay will reduce the chances of contact and infection. The judicious early discharge supported by telephone contact and support of the patient and carers can help reduce this risk.

Other areas

Some surgeries are taking place after a considerable delay and as a result, there may be significant disease progression since the decision to operate. In addition, the infrastructure for working in unfamiliar environments (such as cancer hubs) requires meticulous administrative input to ensure patients' notes, imaging and other test results are readily available. Finally, the necessity for feedback and audit results are essential to implement changes and improvements and to sustain high-level care (13).

Conclusions

Aarts' paper reminds is that optimal recovery is significantly associated with laparoscopic surgery and overall compliance with ERAS recommendations. Other areas independently associated with optimal recovery are colon instead of rectal surgery and surgery for cancer compared with inflammatory bowel disease or diverticular disease. Delayed recovery was associated with preoperative anaemia, older age, ASA status of greater than 2 and creation of a stoma (32).

In the next few months, colorectal services are working against two opposing constraints: reduced theatre capacity

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and bed availability versus the requirement to save costs. This scenario is ideal for ERAS to flourish at a time when its benefits have never been more valuable to patients, healthcare professionals and society. Further benefits for patients will then rely on the impact of sound political and organisational improvements, such as a low COVID-19 prevalence in the community with effective testing and sufficient trained staff and resources, including PPE and ICU beds (3).

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