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Enhanced Recovery After Surgery in elective total arthroplasty: the new standard of perioperative care

Since its inception at the end of the last century, Enhanced Recovery After Surgery (ERAS) programmes have achieved significant advances in perioperative care and have demonstrated clinical benefits to patients.[1] Spear-headed by Professor Henrik Kehlet, ERAS arose from addressing the question, 'by reducing the inflammatory response imposed by surgery, can we improve patient outcomes?'[2]

Attempts to answer this simple question through searching the best available evidence in the current literature and putting into practice has led to ERAS as it is today. Traditional care would have the surgeon and anaesthetist as the two key stake holders in a patient's care. In contrast, ERAS takes a much broader approach in which all staff have important parts to play in healthcare delivery. This collaborative approach is the cornerstone for ERAS implementation, sustainability and future directions.

It is well accepted that the demand for joint replacement surgery is rising and until researchers are able to safely regenerate articular cartilage, there is no sign of it slowing. By the year 2051, it is expected that the proportion of New Zealand's (NZ) population over the age of 60 years will increase from 16% to 31%.[3] A steady rise in hip and knee joint replacement surgeries across OECD countries since 2000 is reflective of this increasing, ageing population.[4] In NZ, the total annual cost of joint replacements, of which the majority were hip and knee replacement, was estimated at $191 million in 2007.[5] Hence, there is an element of urgency to address this rising burden in a coordinated and pragmatic fashion.

ERAS in orthopaedics has emerged out of a need to improve patient outcomes, reduce complications and curb the financial demands of arthroplasty. The physiological challenge in this type of surgery may not be as significant as bowel surgery; however, patients undergoing these operations are generally older with multiple comorbidities and are consequently less resilient to all types of surgery. For this reason, ERAS is an appropriate management strategy for patients undergoing joint replacement.

In bowel surgery, research has shown that regional anaesthesia, minimizing perioperative fasting periods, detailed preoperative education delivery, early mobilization, avoiding drains and limiting opioid analgesia are beneficial.[1] Delivered in isolation, each confers benefits for patients, but collectively, these interventions are valuable for patients above and beyond the sum of their individual merits.[6] Uncertainty remains regarding which of the evidence-based care interventions yields the most benefit as each care intervention influences psychological and/or physical aspects of well-being to varying degrees.[6]

Advocates of accelerated perioperative care pathways have suggested preoperative education and early, aggressive mobilization as contributing most to the observed results.[7] Some may argue that standing and mobilizing requires a complex interplay of physical and cognitive parameters to be in-check before this milestone can be achieved. In order for this to be reached, patients must be comfortable, without nausea and vomiting, and devoid of dizziness to engage with rehabilitation staff. Therefore, although early mobilization is an important milestone to attain, it is not as simple as it may first appear.

Larger series in the UK and Denmark have reported reductions in length of stay (LOS), morbidity and mortality.[7,8] In the largest series of ERAS in arthroplasty ($n = 6000$), Khan *et al*. showed a significant reduction in 30-day mortality (0.1% versus 0.5%, $P = 0.03$) as compared with traditional care. Similarly, the incidence of myocardial infarction dropped significantly (0.4% versus 0.9%, $P = 0.03$) in the ERAS group.

In early 2013, the National ERAS orthopaedic collaborative was established to help arthroplasty units around NZ improve patient outcomes, reduce complications and reduce day stay and costs. Since the introduction of ERAS in orthopaedics at Middlemore Hospital, we have seen a significant reduction in median hospital admission from 5 to 4 days for both THA and TKA. At the same time, we have observed reductions in complications and costs.[9]

ERAS in orthopaedic surgery was implemented with the support of the Breakthrough Series (BTS) methodology that aims to make small changes in clinical care and are refined or discarded as more patients are enrolled in the programme.[10] Driven by Plan, Do, Study and Act (PDSA) cycles, implementation of both medical and non-medical perioperative care interventions are then established as part of the ERAS programme. The preoperative education session at our hospital for patients undergoing THA and TKA is one such care intervention that has followed a series of PDSA cycles to establish itself as an integral part of the ERAS arthroplasty programme. One advantage of using the BTS methodology is that it allows for small changes to be made in quick succession and that these changes are sustainable and importantly do not incur additional cost. These changes are made with the premise that they occur within the current funding policies and are therefore cost neutral.

Some advocates of enhanced recovery protocols have proposed cost savings through reducing LOS.[11] However, cost reporting can often be difficult and is usually a secondary measure when evaluating such programmes.[11] Larsen *et al*. performed a cost-utility study of accelerated perioperative care in THA and TKA.[12] They captured indirect costs including quality of life data via the EuroQOL-5D (EQ-5D) questionnaire at multiple time points postoperatively. The accelerated intervention was less costly for both THA (ERAS:

(Danish Krone) DKK 87 657 ± 39 915; control: DKK 71 768 ± 41 544) and knee arthroplasty (ERAS: DKK 70 644 ± 38 437; control: DKK 95 367 ± 61 293). Determining cost needs to account for both direct and indirect costs. The latter is rarely reported in studies of ERAS protocols. The paper by Larsen *et al*. provides a useful template for future studies aiming to evaluate the cost-effectiveness of ERAS interventions in arthroplasty.

ERAS continues to grow and be adopted across many surgical specialties. The strength of ERAS lies in its collaborative approach and evidence base. Complemented by improvement methodology such as the BTS, or similar, these changes are sustainable. There is a wave of evidence to support its use heralding ERAS as the new standard of care that the majority of arthroplasty patients should receive, and all orthopaedic units should endeavour to deliver.

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