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Enhanced recovery after surgery in arthroplasty

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The demand for arthroplasty surgery is growing exponentially, putting pressure on healthcare facilities to meet the growing demand.[1] Implementing systems (such as ERAS) that facilitate rapid readiness for discharge after surgery will therefore enable healthcare facilities to meet the growing demand without compromising quality of care and outcomes.[2]

Keywords: enhanced recovery, surgery, arthroplasty

Enhanced Recovery After Surgery (ERAS) is defined as: a care package of evidence-based interventions used in a multimodal, integrated clinical care pathway to achieve improved functional outcomes and rapid recovery. Although ERAS protocols were first published in 2005 and have 12 published guidelines from the ERAS Society available, there were no orthopaedics guidelines until 2019.[3]

The aims of ERAS protocols are:

- to reduce perioperative stress response
- maintain/support homeostasis and physiological function
- importantly accelerate the achievement of discharge criteria
- minimising complications

The general design of an ERAS protocol has three major components divided into preoperative, intraoperative and postoperative interventions (Figure 1). One of the core components of hip and knee replacement ERAS pathways is a standardised anaesthetic protocol.[4] Anaesthetic management plays a significant role in postoperative pain and early mobilisation in this group of patients.

In this article, the role played by the anaesthetists to facilitate enhanced recovery will be highlighted by addressing the following questions: 1. What anaesthetic management strategies affect postoperative recovery? 2. What are the effects of regional anaesthetic, peripheral nerve blocks on postoperative recovery? 3. How do anaesthetic modalities affect patients' hospital length of stay (LOS)?[5]

What anaesthetic management strategies affect postoperative recovery?

Arthroplasty surgery is a painful procedure, especially total knee replacement (TKR), suboptimal pain management amplifies stress response and hinders early mobilisation, putting patients at risk of developing venous thromboembolism (VTE) and pulmonary complications postoperatively, which undermines all that ERAS is meant to achieve. Multimodal analgesia which uses different classes of drugs that are opioid-sparing is the current favoured practice to achieve better outcomes, and limit risk of opioid dependency. There is no consensus on whether spinal anaesthesia is more favourable than general anaesthesia for this surgery. However, those who use general anaesthesia tend to use short-acting agents that enables rapid emergence; whether this has any benefits on outcomes is not well documented.

What are the effects of regional anaesthetic, peripheral nerve blocks on postoperative recovery?

Intrathecal morphine has emerged as an effective modality that can be used when spinal anaesthesia is given. There is some

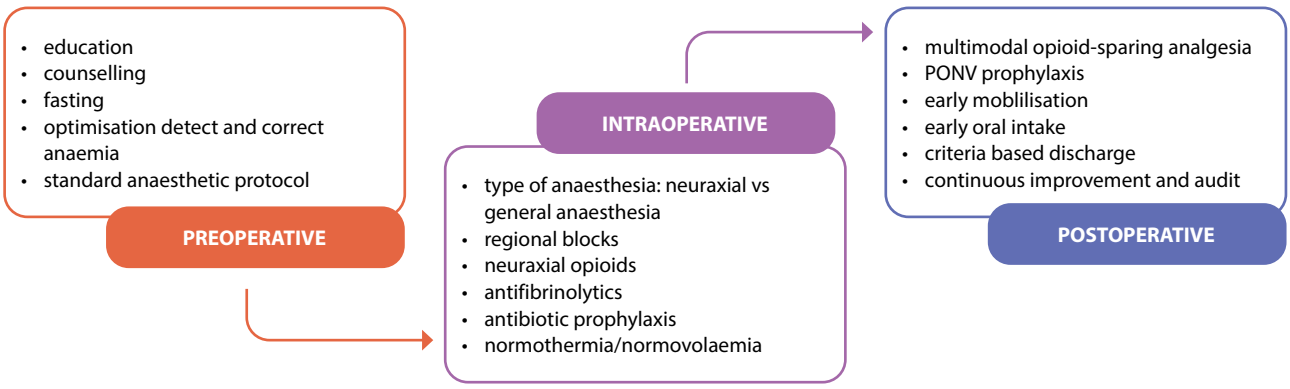

Figure 1: Principles of ERAS

data showing its benefits, but more robust evidence is needed and there is no standardised dose though some guidelines have recommendations. Local anaesthetic infiltration and peripheral blocks have both been shown to be effective in decreasing postoperative pain and opioid consumption; one has not shown to be superior to the other. The disadvantage of regional blocks is that it is associated with limb weakness postoperatively (especially continuous infusion catheter) and this may lead to delays in mobilisation and increased risk of falls, skill dependent and risk of catheter-associated complications while local anaesthetic infiltration is easy, readily available and cheap.

How do anaesthetic modalities affect patients' hospital length of stay (LOS)?

ERAS is able to reduce LOS mostly by reducing the incidence of Grade 1 and Grade 2 complications, which include postoperative nausea and vomiting (PONV), pain, pulmonary infections and surgical wound infections. These complications are linked to pain or analgesic technique and mobilisation. This demonstrates why a standardised anaesthetic protocol is one of the core components of an ERAS protocol.

Consensus statement for perioperative care in total hip replacement and total knee replacement surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations.[3]

Anaemia

Preoperative anaemia should be identified, investigated, and corrected prior to hip and knee replacement.

Preoperative fasting

Intake of clear fluids until 2 hours before the induction of anaesthesia, and a 6-hour fast for solid food is recommended.

Preoperative carbohydrate loading

In hip and knee replacement, carbohydrate loading may improve patient well-being and metabolism, but it has not been shown to accelerate the achievement of discharge criteria or reduce complications, and so it is not currently recommended as an essential routine intervention.

Pre-anaesthetic medication

The routine administration of sedatives to reduce anxiety preoperatively is not recommended.

The use of general versus central neuraxial anaesthesia

Modern general anaesthesia and neuraxial techniques may both be used as part of multimodal anaesthetic regimens.

Spinal (intrathecal) opioids

Spinal opioids are not recommended for routine use.

Epidurals

Epidural analgesia is not recommended for routine use in hip and knee replacement because of the potential for adverse effects which delay recovery.

Use of local anaesthetics for nerve blocks and infiltration analgesia

Local infiltration analgesia (LIA) is recommended for knee replacement but not for hip replacement within a multimodal opioid-sparing regimen. Nerve block techniques provide equal analgesia; however, when compared with LIA, prolonged motor blockade may limit early and safe mobilisation. Nerve blocks are therefore not recommended as an essential ERAS component.

Postoperative nausea and vomiting

Evidence supports the use of screening for and multimodal PONV prophylaxis and treatment for patients undergoing hip and knee replacement.

Prevention of perioperative blood loss—tranexamic acid

Tranexamic acid is recommended to reduce perioperative blood loss and the requirement for postoperative allogenic blood transfusion.

Multimodal analgesia

The routine use of paracetamol is recommended.

The routine use of nonsteriodal anti-inflammatory drugs (NSAIDs) is recommended for patients without contraindications.

Gabapentinoids are not currently recommended as an adjunct in a multimodal analgesia regime, although further studies are indicated.

The use of supplemental opioid analgesia

ERAS programmes seek to minimise the use of opioids. However, opioids such as oxycodone may be used when required as part of a multimodal approach.

Maintaining normothermia

Normal body temperature should be maintained peri- and postoperatively through pre-warming and the active warming of patients intraoperatively.

Antimicrobial prophylaxis

Patients should receive systemic antimicrobial prophylaxis in accordance with local policy and availability.

Summary of recommended interventions for the perioperative care of hip and knee replacement

Number	Item	Recommendation	Evidence level	Recommendation grade
		Preoperative		
1	Preoperative information, education and counselling	Patients should routinely receive preoperative education	Low	Strong
2	Preoperative optimisation	4 weeks' or more smoking cessation is recommended prior to surgery	Smoking: High	Strong
		Alcohol cessation programmes are recommended for alcohol abusers. Anaemia should be actively identified, investigated, and corrected preoperatively	Alcohol: Low Anaemia: High	Strong
3	Preoperative fasting	Clear fluids should be allowed up to 2 h and solids up to 6 h hours prior to induction of anaesthesia	Moderate	Strong
		Intraoperative		
4	Standard anaesthetic protocol	General anaesthesia and neuraxial techniques may both be used as part of multimodal anaesthetic regimens	General anaesthesia: Moderate Neuraxial techniques: Moderate	Strong
5	Use of local anaesthetics for infiltration analgesia and nerve blocks	Within a multimodal opioid-sparing analgesic regimen, the routine use of LIA is recommended for knee replacement but not for hip replacement Nerve block techniques have not shown clinical superiority over LIA	LIA in knee replacement: High	Strong
6	Postoperative nausea and vomiting	Patients should be screened for and given multimodal PONV prophylaxis and treatment	Moderate	Strong
7	Prevention of perioperative blood loss	Tranexamic acid is recommended to reduce perioperative blood loss and the requirement for postoperative allogenic blood transfusion	High	Strong
8	Perioperative oral analgesia	A multimodal opioid-sparing approach to analgesia should be adopted	Paracetamol: Moderate	Strong
		The routine use of paracetamol and NSAIDs is recommended for patients without contraindications	NSAIDs: High	Strong
9	Maintaining normothermia	Normal body temperature should be maintained peri- and postoperatively	High	Strong
10	Antimicrobial prophylaxis	Patients should receive systemic antimicrobial prophylaxis	Moderate	Strong
11	Antithrombotic prophylaxis treatment	Patients are at increased risk of VTE and should undergo pharmacologic and mechanical prophylaxis in line with local policy	Moderate	Strong
12	Perioperative surgical factors	There is no conclusive evidence that choice of surgical approach accelerates the achievement of discharge criteria therefore no recommendation can be given	High	Strong
13	Perioperative fluid management	Fluid balance should be maintained to avoid over- and under-hydration	Moderate	Strong
		Postoperative		
14	Postoperative nutritional care	An early return to normal diet should be promoted	Low	Strong
15	Early mobilisation	Patients should be mobilised as early as they are able in order to facilitate early achievement of discharge criteria	Moderate	Strong
16	Criteria-based discharge	Team-based functional discharge criteria should be used to facilitate patient discharge directly to their home	Low	Strong
17	Continuous improvement and audit	Routine internal and/or external audit of process measures, clinical outcomes, cost-effectiveness, patient satisfaction/ experience, and changes to the pathway is recommended	Low	Strong

Antithrombotic prophylaxis treatment

Patients should be mobilised as soon as possible post-surgery and receive antithrombotic prophylaxis treatment in accordance with local policy.

Outcomes

An outcome is a measure of the impact of an intervention on clinical or functional status, and it is used to assess the effectiveness of the intervention.

May be categorised into three phases:

- The early phase looks at the post-anaesthesia phase (end of surgery to PACU)
- The intermediate phase (PACU to discharge from hospital)
- Late phase (return to normal function)

The efficacy of any ERAS protocol relies heavily on continuous audit and evaluation to assess its performance, whether the aims of the protocol are met, and identify areas of improvement or advancement**.** Prior to the publication of arthroplasty guidelines there had long been movement towards applying ERAS principles in arthroplasty surgery.[6] Many centres had developed their own ERAS protocols and demonstrated benefit from this practice. In a study by Vendittoli et al.,[7] the implementation of ERAS protocol resulted in statistically significant reduction of Grade 1 and Grade 2 complications. A decrease in LOS by 2.8 days for THR and 3.9 days for TKR, as well as an increase in cost savings. Similarly, Cassard et al.,[8] reported that the rate of readmission and complications at 30 days was not higher in the enhanced recovery group (outpatient arthroplasty) compared to inpatient group provided there is suitable patient selection. It is possible that the growing body of evidence demonstrating positive outcomes inspired the formulation of the first ERAS guidelines for arthroplasty surgery by ERAS society.

Take note

There seems to be conflict in recommendations between the analgesia-anaesthesia arthroplasty guidelines and ERAS guidelines. While ICAROS and PROSPECT recommend neuraxial anaesthesia over general anaesthesia for both hip and knee arthroplasty, ERAS states that one is not superior to the other.[9,10]

PROSPECT recommends that when spinal anaesthesia is used, intrathecal morphine 0.1 mg may be considered for postoperative analgesic benefit,[10] while ERAS says neuraxial opioids should not be used routinely.[3]

These must be taken into consideration when designing ERAS protocols that are adapted to the resources available for individual health institutions.

Limitations

These guidelines are based on literature from developed countries, it may be difficult to implement in low- to middle-income countries.

There is some conflict between these guidelines and the analgesia/anaesthesia guidelines which may lead to inconsistencies in clinical practice.

These limitations are observations by this author; they are not official.

Conclusion

The past has proven time and again the benefits of bundled care, and its ability to standardise practice globally. Perioperative care of arthroplasty patients can only get better moving forward.

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