VOLUME - 14, ISSUE - 05, MAY - 2025 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Orthopaedics

BEYOND THE CUT : PERIOPERATIVE STEPS TO FASTER HIP AND KNEE RECOVERY – AN EVIDENCE BASED REVIEW

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ABSTRACT The rising count of individuals undergoing total hip joint replacement (THA) or total knee joint replacement (TKA), alongside the swiftly expanding range of surgical methods and accessible treatments, has placed substantial demands on surgeons and other medical personnel to deliver outstanding results characterised by swift restoration of physical abilities and brief periods of hospitalisation. The prevailing financial conditions and limited healthcare funds further necessitate short inpatient stays while keeping expenses to a minimum. Structured care plans and guidelines implemented to realise these objectives encompass a diverse array of treatments administered around the time of surgery to meet patient expectations and achieve the intended results. In this overview, we offer a summary grounded in evidence regarding prevalent treatments available to promote enhanced recuperation, shorten the duration of hospital stays, and improve the results concerning physical abilities following THA and TKA. It encompasses educating and nourishing patients before surgery, administering pain relief in anticipation of surgery, employing electrical stimulation of muscles and nerves, utilising pulsed electromagnetic fields, providing rehabilitation around the time of surgery, using advanced wound coverings, employing conventional surgical procedures, utilising minimally invasive surgical techniques, and establishing specialised units for accelerated joint replacement recovery.

KEYWORDS : Knee, hip, joint replacement, surgical interventions, rehabilitation.

BACKGROUND

Joint replacement surgery (arthroplasty), particularly of the hip (THA) and knee (TKA), effectively reduces pain, improves function, and corrects deformities, significantly enhancing quality of life(1).

Globally, approximately 3.6 million replacements are performed each year. The United States accounts for nearly 40% of these procedures. Its increasing prevalence is linked to an aging population, increasing obesity rates, medical advancements and heightened awareness of the benefits of joint replacement surgery.

Early recovery and hospital discharge are crucial, especially given economic constraints. A 2004 study by Berend et al highlighted the benefits of holistic rapid-recovery programs in reducing hospital stays and readmissions after THA/TKA using non-operative methods, suggesting combining these with minimally invasive surgery for optimal outcomes(2).

Review

This review aims to provide an evidence-based summary of surgical and non-surgical measures to achieve early functional recovery, shorter hospital stays, and improved outcomes following THA/TKA.Various interventions, surgical and non-surgical, can be combined or integrated into care pathways to improve outcomes and reduce hospital stays.

Non-surgical Interventions

Modifiable Risk Factors (MRFs)

These MRFs include obesity, diabetes, tobacco use, opioid use, anaemia, malnutrition, poor dentition and vitamin D deficiency. There is a growing body of evidence that pre-operatively correcting these MRFs can reduce the incidence of post-operative complications(3,4).

Summary Of Recommendations For Modifiable Risk Factors

Obesity- Aim for a body mass index <40 kg/m2 prior to arthroplasty.

Diabetes mellitus- Aim for a glycated haemoglobin of ≤53 mmol/mol (≤7%) prior to arthroplasty.

Tobacco use- Aim for smoking cessation at least four weeks prior to arthroplasty.

Opioid use- The use of opioids for osteoarthritis should be avoided.

Anaemia- Haemoglobin should be routinely checked prior to arthroplasty. Anaemia should be corrected pre-operatively.

Malnutrition- Consider checking serum albumin prior to arthroplasty. For patients with serum albumin <3.5 g/dL, consider referral to a dietitian pre-operatively.

Poor Dentition- Patients with poor dentition should undergo a dental review prior to arthroplasty.

Vitamin D deficiency- Consider checking serum 25-hydroxyvitamin D (25OHD) prior to arthroplasty. For patients with low serum 25OHD, consider providing supplementation pre-operatively.

In addition to addressing MRFs, post-operative outcomes can be improved with prehabilitiation, focusing on patient education and exercise(5).

Pre-operative patient education

Pre-operative patient education is vital for lower limb arthroplasty and comprises group classes which cover the procedure, benefits, symptom management, risks, discharge planning, and post-acute services, utilising materials like booklets and videos to improve the patient journey and financial outcomes. Scott et al found that managing patient expectations through psychological and organisational preparation, including extended consultations, is crucial for satisfaction(6). Studies show discrepancies between patient and surgeon expectations, particularly regarding post-operative activity levels. Effective communication is key, as patient satisfaction correlates with fulfilled expectations regarding pain relief and functional improvement. Yoon et al. examined how an individualised pre-operative teaching program, either by phone or in person, can affect the hospital length of stay (LOS) after TKA and THA(7). They found that pre-operative education alone reduced LOS by 24 hours. Pre-operative information sessions can reduce pre-operative anxiety and pain, but not necessarily post-operative levels. Comprehensive pre- and post-operative education, including home visits, has shown shorter hospital stays and better outcomes. Further research on the cost-effectiveness of these programs is needed.

Pre-emptive analgesia for reducing post-operative pain remains debated. Mallory et al showed shorter hospital stays with specific multimodal regimens including pre- and post-operative COX-2 inhibitors(8). However, a systematic review found no significant improvement in early post-operative pain with pre-emptive analgesia(9). Its effectiveness in fast-track arthroplasty pathways needs further investigation.

Local anaesthetics for infiltration analgesia (LIA) and motor sparing USG guided nerve blocks involving injecting a local anesthetic mixture throughout the surgical field, has shown satisfactory post-operative pain control, early mobilization, and discharge in initial non-randomized studies(10). Another study reported decreased pain and morphine consumption, shorter LOS and increased patient satisfaction with LIA compared with no LIA after TKA(11). Currently, there are sophisticated motor-sparing peripheral nerve blocks that have shown significant effectiveness in preserving quadriceps motor function. These include the peri- capsular nerve block (PENG) [12], supra-inguinal fascia iliaca nerve block (s-FIC) [13] and sub-sartorial nerve blocks, such as the adductor canal nerve block.

Prevention of peri operative blood loss

To hinder blood loss during and immediately after surgery, the common guidelines advise giving tranexamic acid (TXA) to lessen surgical bleeding and decrease the necessity for blood transfusions from donors following the operation [14]. Joint replacement surgeries of the knee and hip are particularly linked with considerable blood loss. These issues bring about increased chances of surgical infections, slower rehabilitation, longer stays in the hospital, and greater risks of illness and death [15]. While the precise amount of TXA to use is still not definitively settled, considerable research backs its application in total joint arthroplasty, indicating it as a suggested practice.

Maintaining Normothermia

It's generally understood that experiencing dangerously low body temperature during and immediately after surgery presents a significant danger for the emergence of complications after the procedure, particularly affecting older individuals. This condition can cause issues with blood clotting and platelet activity, increase the likelihood of heart-related illnesses, elevate the chances of infections at the surgical site, and play a role in the formation of bedsores [16-24]. Various methods are employed during surgery, such as forced-air warming devices, non-air warming devices, reflective covers, and the infusion of warmed liquids. Giving these medications has been shown to shorten the period of unassisted breathing, the time until the eyes open, the return of awareness, and the removal of the breathing tube. Furthermore, their application has been linked to a reduction in postoperative shivering and mental impairment following the operation [16-24].

Neuromuscular electrical stimulation (NMES) applies current to stimulate muscle contractions and is used in pre- and rehabilitation for TKA to strengthen quadriceps. Muscle weakness post-surgery can hinder recovery. While a systematic review on NMES in TKA muscle strengthening was inconclusive due to study limitations(26), some studies showed pre-operative gains in functional tasks with NMES, but no difference in hospital stay(25). Combining NMES with physiotherapy after THR showed improved quadriceps strength, but no difference in walking speed or hospital stay in the short term. Further testing in fast-track recovery protocols is warranted.

Pulsed electromagnetic fields (PEMFs) are a non-invasive treatment to aid bone repair and reduce inflammation by acting on inflammatory cell receptors. They can reduce swelling, pain, and recovery time and are well-tolerated. Studies show positive effects of PEMF after knee surgery, but limited data exist for hip arthroplasty(27,28,29). Some research suggests PEMFs improve functional recovery after revision hip surgery and reduce NSAID use after knee arthroscopy and ACL repair. While promising for rapid recovery, more research on PEMFs in arthroplasty is needed.

Peri-operative rehabilitation programs are crucial for accelerated recovery after joint replacement. While a meta-analysis questioned post-discharge physiotherapy after THA, another supported functional exercises for short-term benefits after TKA. Early, intensive physiotherapy (fast-track) is proposed. Pathway-controlled programs after TKA have shown enhanced recovery, reduced analgesic use, and shorter hospital stays. Enhanced Recovery Programs (ERPs), a concept introduced in 2008 in Glasgow, UK involve pre-operative education, early nutrition and mobilisation, and restricted opioid use to reduce nausea and ileus(30). Modifications to ERPs have shown reduced mortality, hospital stay, and transfusion needs. The Norwich Enhanced Recovery Programme (NERP) demonstrated reduced hospital stays with early mobilization under LIA(31). Yoga added to physiotherapy after TKA showed improved pain, stiffness, and function(32). Extensive, multimodal peri-operative rehabilitation effectively enhances recovery after hip or knee arthroplasty.

Modern wound dressings, an integral part of post-arthroplasty care, protect tissue, allow assessment, and absorb exudates(33). Concerns exist about traditional adhesive dressings regarding wear time, changes, blistering, and hospital stay. NICE guidelines show no evidence favoring one dressing type(33). A study found modern dressings(Aquacel Surgical) had longer wear times and less blistering than traditional ones(Mepore), without affecting hospital stay(34). Modern designs use viscoelastic and highly absorbent layers. Dressing-related complications can impact cost and recovery. More RCTs within ERPs are needed to assess dressing types. NICE recommends comparing island-interactive to standard adhesive dressings(33). Compression bandages combined with LIA after TKA have shown reduced early post-operative pain, and similar bandages have been linked to better range of motion at discharge and shorter hospital stays compared to crepe bandages(35).

Surgical interventions

Conventional Surgery

Knee joint: For the knee, the standard medial parapatellar approach offers good exposure but can affect the extensor mechanism and patellar blood supply. The midvastus approach aims to preserve quadriceps function and has shown improved early flexion and pain scores but limited exposure. The subvastus approach also preserves the quadriceps mechanism and is linked to faster rehabilitation and better pain scores but can compromise exposure, especially in obese patients. Studies comparing these approaches show varying results on quadriceps strength and early knee scores, with no clear superiority regarding fast-track protocols.

Hip Joint : For the hip, the posterior approach is most common, but literature lacks comparative evidence on different approaches (anterolateral, direct lateral, anterior) regarding enhanced recovery, with a recent review on minimally invasive vs. conventional surgery being inconclusive.

Minimally invasive surgery

Knee joint: Minimally invasive surgery (MIS) in knee replacement involves smaller incisions and less disruption to the quadriceps and patella. While popular for potential cosmetic and recovery benefits, studies comparing it to conventional TKR show no significant differences in post-operative scores or early complications(36).

Hip joint: In hip replacement, MIS uses smaller incisions with minimal soft-tissue damage, potentially leading to less pain, smaller scars, better mobility, shorter stays, and fewer transfusions. Mini-incision posterior approaches have shown reduced blood loss and shorter stays(37). While two-incision MIS for THA initially showed faster ambulation and shorter stays, it had longer operation times and more complications.

The direct anterior approach to the hip is gaining interest for potentially reducing rehabilitation time but has a longer learning curve and potential for more complications(38). Presently, the direct front entry to the hip joint, a technique outlined by Kennon and colleagues in 2003 (39), is attracting increasing attention. This method is believed to shorten the recovery period following surgery due to its potential to lessen damage to the muscles and tissues surrounding the joint. Nevertheless, surgeons face a considerably more extended period of training to master this technique, and a higher incidence of difficulties might arise. While MIS shows promise for faster recovery, especially combined with other enhanced recovery methods, minimizing soft-tissue trauma and ensuring proper component placement are crucial.

Implant alignment and rotation in TKA are critical; malalignment can cause abnormal wear, premature loosening and patellofemoral problems(40). Studies suggest that low cumulative alignment errors and femorotibial mismatches are associated with shorter hospital stays, although sample sizes were small. These parameters are important for better functional outcomes and reduced hospital stays.

Fast-track arthroplasty units (FTAUs) integrate rapid recovery pathways to optimise peri-operative care and accelerate functional recovery after TKA/THA, aiming to reduce hospital costs and morbidity. They often involve multidisciplinary pre-operative clinics, multimodal pain treatment, and early mobilisation with well defined discharge criteria. Studies from Denmark show successful implementation of fast-track pathways, reducing average hospital stays by over 6 days(41). However, factors like pain, dizziness, weakness, anemia, and logistical delays can hinder discharge in FTAUs(42). Addressing post-operative knee swelling and optimizing blood loss management could further reduce hospital stays. More research on improving these areas is needed.

Conclusion And Future Directions: Enhanced recovery, good functional outcomes, and short hospital stays after THA/TKA are achievable through multimodal clinical pathways. Combining discussed peri-operative measures can help reach these goals. Dedicated elective centers adopting these pathways could improve outcomes and reduce costs. Multicenter RCTs should compare these centers to conventional hospitals. Outpatient THA/TKA might even be possible with effective peri-operative interventions.

REFERENCES

1. Ethgen O, Bruyere O, Richy F, Dardennes C, Reginster JY: Health-related quality of life in total hip and total knee arthroplasty. A qualitative and systematic review of the literature. J Bone Joint Surg Am 2004, 86- A:963-974.
2. Berend KR, Lombardi AV Jr, Mallory TH: Rapid recovery protocol for peri-operative care of total hip and total knee arthroplasty patients. Surg Technol Int 2004, 13:239-247.
3. Bernstein DN, Liu TC, Winegar AL, et al. Evaluation of a preoperative optimization protocol for primary hip and knee arthroplasty patients. J Arthroplasty 2018;33(12):3642–48. doi: 10.1016/j. arth.2018.08.018.
4. Dlott CC, Moore A, Nelson C, et al. Preoperative risk factor optimization lowers hospital length of stay and postoperative emergency department visits in primary total hip and knee arthroplasty patients. J Arthroplasty 2020;35(6):1508–15.e2. doi: 10.1016/j.arth.2020.01.083.
5. Moyer R, Ikert K, Long K, Marsh J. The value of preoperative exercise and education for patients undergoing total hip and knee arthroplasty:A systematic review and meta-analysis. JBJS Rev 2017;5(12):e2. doi: 10.2106/JBJS.RVW.17.00015.
6. Scott CE, Bugler KE, Clement ND, MacDonald D, Howie CR, Biant LC: Patient expectations of arthroplasty of the hip and knee. J Bone Joint Surg Br 2012, 94:974-981.
7. Yoon RS, Nellans KW, Geller JA, Kim AD, Jacobs MR, Macaulay W: Patient education before hip or knee arthroplasty lowers length of stay. J Arthroplasty 2010, 25:547-551.
8. Mallory TH, Lombardi AV Jr, Fada RA, Dodds KL, Adams JB: Pain management for joint arthroplasty: preemptive analgesia. J Arthroplasty 2002, 17:129-133.
9. Moiniche S, Kehlet H, Dahl JB: A qualitative and quantitative systematic review of preemptive analgesia for postoperative pain relief: the role of timing of analgesia. Anesthesiology 2002, 96:725-741.
10. Kerr DR, Kohan L: Local infiltration analgesia: a technique for the control of acute postoperative pain following knee and hip surgery: a case study of 325 patients. Acta Orthop 2008, 79:174-183.
11. Essving P, Axelsson K, Kjellberg J, Wallgren O, Gupta A, Lundin A: Reduced morphine consumption and pain intensity with local infiltration analgesia (LIA) following total knee arthroplasty. Acta Orthop 2010, 81:354-360.
12. Girón-Arango L, Peng PWH, Chin KJ, Brull R, Perlas A(2018) Pericapsular Nerve Group (PENG) block for hip fracture. Reg Anesth Pain Med 43, 859–863.
13. Hebbard P, Ivanusic J, Sha S (2011) Ultrasound-guided supra- inguinal fascia iliaca block: a cadaveric evaluation of a novel approach. Anaesthesia 66, 300–305.
14. Wainwright TW, Gill M, McDonald DA, Middleton RG, Reed M, Sahota O, Yates P, Ljungqvist O (2020) Consensus statement for perioperative care in total hip replacement and total knee replacement surgery: Enhanced Recovery After Surgery (ERAS!) Society recommendations. Acta Orthop 91, 3–19.
15. Levine BR, Haughom B, Strong B, Hellman M, Frank RM (2014) Blood management strategies for total knee arthroplasty. J Am Acad Orthop Surg 22, 361–371.
16. Yi J, Liang H, Song R, Xia H, Huang Y (2018) Maintaining intraoperative normothermia reduces blood loss in patients undergoing major operations: a pilot randomized controlled clinical trial. BMC Anesthesiol 18, 126.
17. Casati A, Fanelli G, Ricci A, Musto P, Cedrati V, Altimari G, Baroncini S, Pattono R, Montanini S, Torri G (1999) Shortening the discharging time after total hip replacement under combined spinal/epidural anesthesia by actively warming the patient during surgery. Minerva Anestesiol 65 (7–8), 507–514.
18. de Brito PovedaV, Clark AM, Galvão CM (2013) A systematic review on the effectiveness of prewarming to prevent periop- erative hypothermia. J Clin Nurs 22, 906–918.
19. Xu H, Xu G, Ren C, Liu L, Wei L (2019) Effect of forced-air warming system in prevention of postoperative hypothermia in elderly patients: a prospective controlled trial. Medicine 98 (22), e15895.
20. McGovern PD, Albrecht M, Belani KG, Nachtsheim C, Partington PF, Carluke I, Reed MR (2011) Forced-air warming and ultra-clean ventilation do not mix: an investigation of theatre ventilation, patient warming and joint replacement infection in orthopaedics. J Bone Joint Surg Br 93 (11), 1537–1544.
21. Kümin M, Deery J, Turney S, Price C, Vinayakam P, Smith A, Filippa A, Wilkinson-Guy L, Moore F, O'Sullivan M, Dunbar M, Gaylard J, Newman J, Harper CM, Minney D, Parkin C, Mew L, Pearce O, Third K, Shirley H, Reed M, Jefferies L, Hewitt-Gray J, Scarborough C, Lambert D, Jones CI, Bremner S, Fatz D, Perry N, Costa M, Scarborough M (2019) Reducing Implant Infection in Orthopaedics (RIIiO): results of a pilot study comparing the influence of forced air and resistive fabric warming technologies on postoperative infections following orthopaedic implant surgery. J Hosp Infect 103, 412–419.
22. Tjoakarfa C, David V, Ko A, Hau R (2017) Reflective blankets are as effective as forced air warmers in maintaining patient normothermia during hip and knee arthroplasty surgery. J Arthroplasty 32 (2), 624–627.
23. LiuS,PanY,ZhaoQ,FengW,HanH,PanZ,SunQ(2019) The effectiveness of air-free warming systems on perioperative hypothermia in total hip and knee arthroplasty: a systematic review and meta-analysis. Medicine (Baltimore) 98, e15630.
24. MaH,LaiB,DongS,LiX,CuiY,SunQ,LiuW,JiangW,Xu F, Lv H, Han H, Pan Z (2017) Warming infusion improves perioperative outcomes of elderly patients who underwent bilateral hip replacement. Medicine 96 (13), e6490.
25. Walls RJ, McHugh G, O'Gorman DJ, Moyna NM, O'Byrne JM: Effects of preoperative neuromuscular electrical stimulation on quadriceps strength and functional recovery in total knee arthroplasty. A pilot study. BMC Musculoskelet Disord 2010, 11:119.
26. Monaghan B, Caulfield B, O'Mathuna DP: Surface neuromuscular electrical stimulation for quadriceps strengthening pre and post total knee replacement. Cochrane Database Syst Rev 2010, 1:CD007177.
27. Moretti B, Notarnicola A, Moretti L, Setti S, De Terlizzi F, Pesce V, Patella V: I-ONE therapy in patients undergoing total knee arthroplasty: a prospective, randomized and controlled study. BMC Musculoskelet Disord 2012, 13:88.
28. Zorzi C, Dall'Oca C, Cadossi R, Setti S: Effects of pulsed electromagnetic fields on patients' recovery after arthroscopic surgery: prospective, randomized and double-blind study. Knee Surg Sports Traumatol Arthrosc 2007, 15:830-834.
29. Benazzo F, Zanon G, Pederzini L, Modonesi F, Cardile C, Falez F, Ciolli L, La Cava F, Giannini S, Buda R, Setti S, Caruso G, Massari L: Effects of biophysical stimulation in patients undergoing arthroscopic reconstruction of anterior cruciate ligament: prospective, randomized and double blind study. Knee Surg Sports Traumatol Arthrosc 2008, 16:595-601
30. Dwyer AJ, Tarassoli P, Thomas W, Porter P: Enhanced recovery program in total hip arthroplasty. Indian J Orthop 2012, 46:407-412.
31. Smith TO, McCabe C, Lister S, Christie SP, Cross J: Rehabilitation implications during the development of the Norwich Enhanced Recovery Programme (NERP) for patients following total knee and total hip arthroplasty. Orthop Traumatol Surg Res 2012, 98:499-505.
32. Bedekar N, Prabhu A, Shyam A, Sancheti K, Sancheti P: Comparative study of conventional therapy and additional yogasanas for knee rehabilitation after total knee arthroplasty. Int J Yoga 2012, 5:118-122.
33. National Institute for Health and Clinical Excellence (NICE). [http://publications.nice.org.uk/surgical-site-infection-cg74].
34. Hopper GP, Deakin AH, Crane EO, Clarke JV: Enhancing patient recovery following lower limb arthroplasty with a modern wound dressing: a prospective, comparative audit. J Wound Care 2012, 21:200-203.
35. Charalambides C, Beer M, Melhuish J, Williams RJ, Cobb AG: Bandaging technique after knee replacement. Acta Orthop 2005, 76:89-94.
36. Luring C, Beckmann J, Haibock P, Perlick L, Grifka J, Tingart M: Minimal invasive and computer assisted total knee replacement compared with the conventional technique: a prospective, randomised trial. Knee Surg Sports Traumatol Arthrosc 2008, 16:928-934.
37. Khan RJ, Fick D, Khoo P, Yao F, Nivbrant B, Wood D: Less invasive total hip arthroplasty: description of a new technique. J Arthroplasty 2006, 21:1038-1046.
38. Lutzner J, Gunther KP, Kirschner S: Functional outcome after computer-assisted versus conventional total knee arthroplasty: a randomized

controlled study. Knee Surg Sports Traumatol Arthrosc 2010, 18:1339-1344.
39. Kennon RE, Keggi JM, Wetmore RS, Zatorski LE, Huo MH, Keggi KJ: Total hip arthroplasty through a minimally invasive anterior surgical approach. J Bone Joint Surg Am 2003, 85-A(Suppl 4):39-48.
40. Longstaff LM, Sloan K, Stamp N, Scaddan M, Beaver R: Good alignment after total knee arthroplasty leads to faster rehabilitation and better function. J Arthroplasty 2009, 24:570-578.
41. Husted H, Jensen CM, Solgaard S, Kehlet H: Reduced length of stay following hip and knee arthroplasty in Denmark 2000-2009: from research to implementation. Arch Orthop Trauma Surg 2012, 132:101-104.
42. Husted H, Lunn TH, Troelsen A, Gaarn-Larsen L, Kristensen BB, Kehlet H: Why still in hospital after fast-track hip and knee arthroplasty? Acta Orthop 2011, 82:679-684.