Does pre-operative intervention improve post-surgical outcomes?

August 24, 2023
Ortho in Indy
PAOS

Disclosure

The views expressed in this presentation do not reflect official policy or position of the following:

- Installation Management Command JBSA-Fort Sam Houston
- Walter Reed National Military Medical Center
- Department of the Army
- Department of Defense
- U.S. Government

Learning Objectives

Define pre-operative intervention

Analyze proposed benefits to pre-operative intervention

Evaluate research regarding post-operative outcomes after presurgical intervention

Agenda

1. What is pre-operative intervention?

2. Why send patients for pre-operative intervention?

3. Research
   - Knee
   - Hip
   - Shoulder
   - Spine

4. Discussion

Speakers

Major Nicholas Koreerat

Lieutenant Colonel Peter Doyle

What is pre-operative intervention?

Why conduct prehabilitation before surgery?

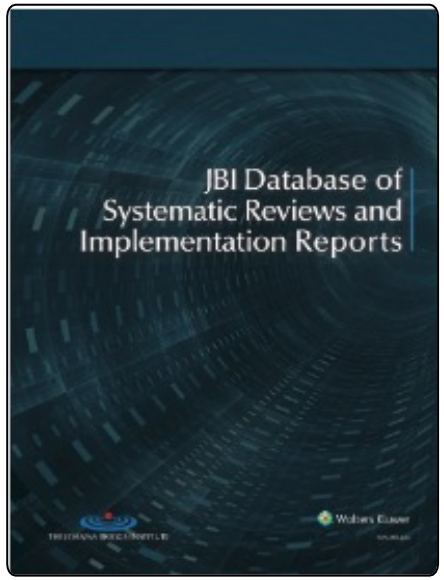
Optimize your patients

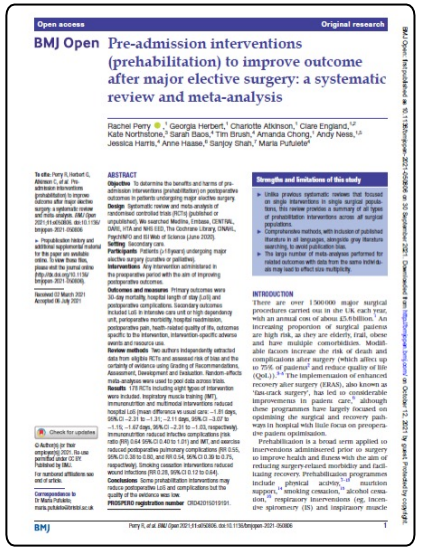
- Feasible and safe[1]
- Efficacy has been determined but the clinic effectiveness remains uncertain[1]
- Early data suggest a reduction in morbidity, length of stay, and improvement in quality of life[1]
- Multimodal prehabilitation is less well-evaluated[1]
- Therapeutic alliance[2]

[1]West, MA, *Best Pract Res Clin Anaesthesiol*, 2021
[2]Kinney, M, *Physiother Theory Pract*, 2020

What does the research demonstrate?

The Research





Open access Original research

BMJ Open

Pre-admission interventions (prehabilitation) to improve outcome after major elective surgery: a systematic review and meta-analysis

Rachel Perry, Georgia Herbert, Charlotte Atkinson, Clare England, Kate Northstone, Sarah Baos, Tim Brush, Amanda Chong, Andy Ness, Jessica Harris, Anne Haase, Sanjoy Shah, Maria Pufulete

ABSTRACT

Strengths and limitations of this study

INTRODUCTION

Cabilan, CJ, *JBI Database System Rev Implement Rep*, 2015

Perry, R, *BMJ Open*, 2021

The Research

Knee

Shoulder

Hip

Spine

Knee (TKA)

What should we do before surgery?

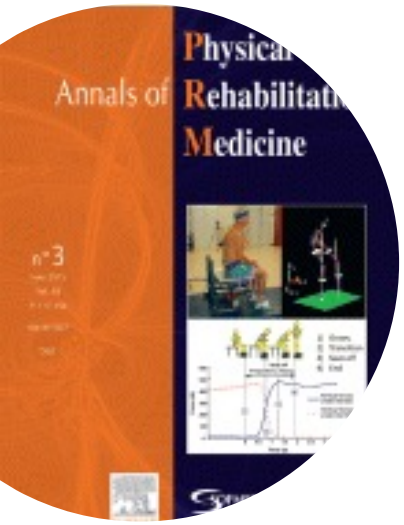
- Multidisciplinary rehabilitation program (at least PT and education)[1]
- Warm up exercise, mobility/flexibility/strength/balance, and relaxation exercise 2-5x/wk[2]

What happens if we do prehab before surgery?

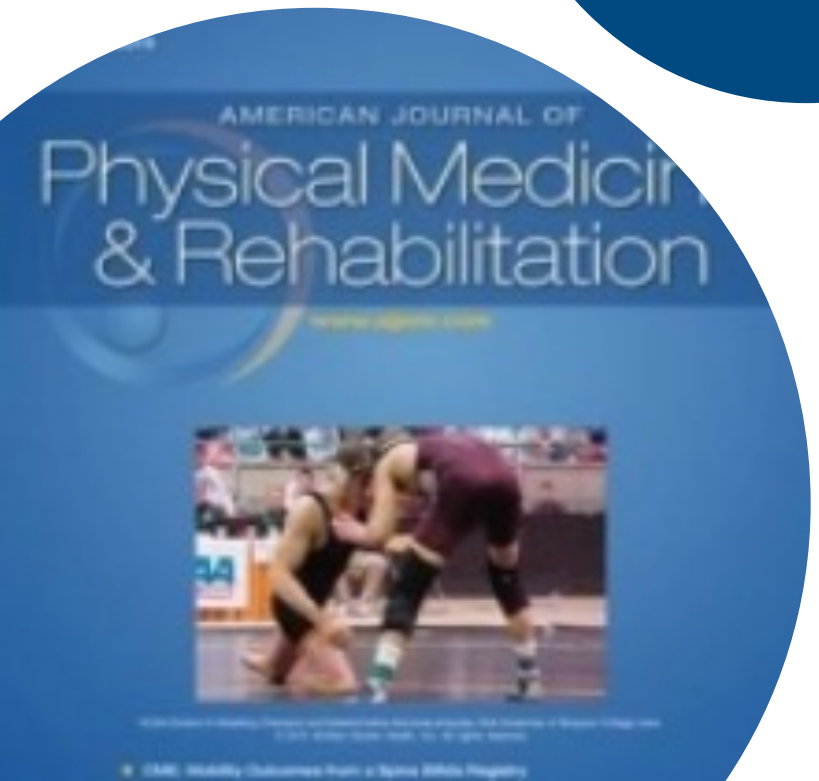
- Improved knee flexion and flexibility, muscular strength, joint function, quality of life of patients[2]
- Reduced inflammatory pain and stiffness[2]
- Shortened hospital stays[3]
- Not conclusive on improving postoperative functions[3]

Overall: Multidisciplinary approach – PT and education. Positive immediate post-operative experience. More evidence needed for postoperative functions.

[1]Coudeyre, E, *Ann Readapt Med Phys*, 2007
[2]Wang, D, *Ann Palliat Med*, 2021
[3]Su, W, *Orthop Surg Res*, 2022



JOSPT



The Research

Gränicher, P, *J Orthop Sports Phys Ther*, 2022
Vervullens, S, *Ann Phys Rehabil Med*, 2023
Konnyu, KJ, *Am J Phys Med Rehabil,* 2023

Knee (ACLR)

What should we do before surgery?

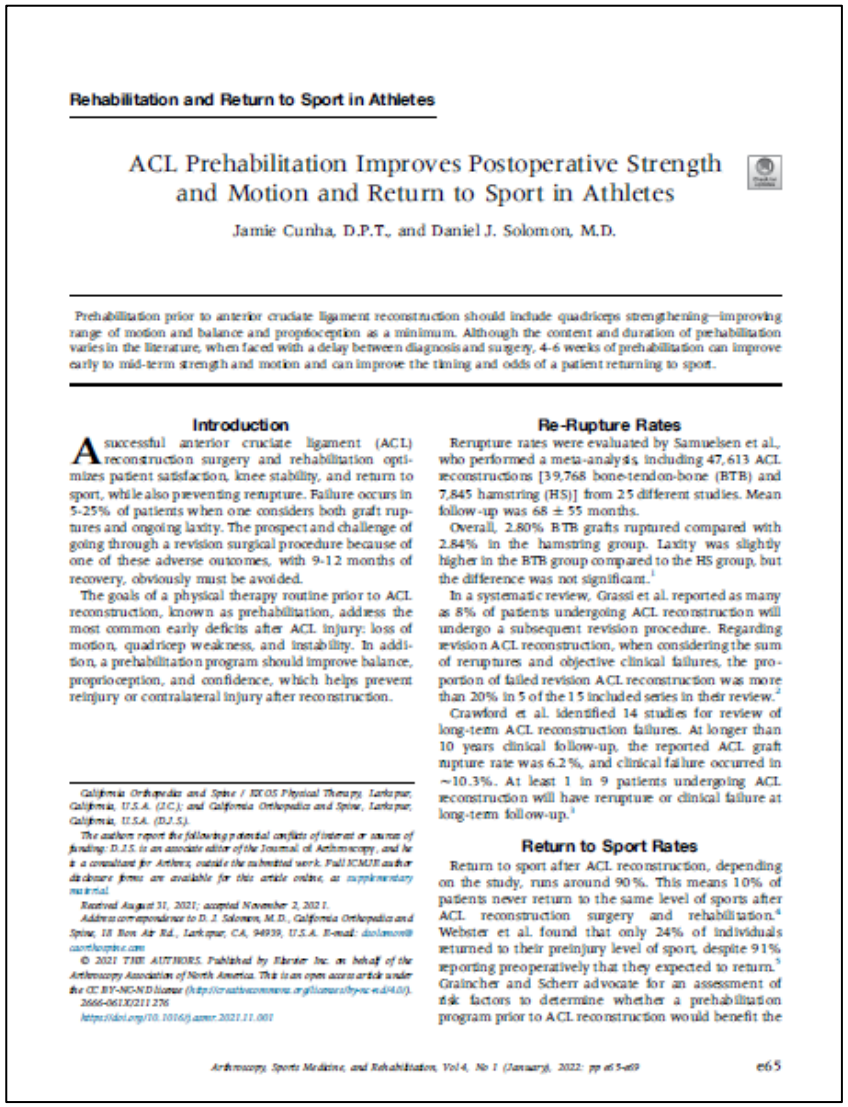
- Strengthening and neuromuscular training[1]
- Best predictor of postoperative ROM is preoperative ROM[2]
- No consensus on optimum prehab program content, frequency, and length[3]

What happens if we do prehab before surgery?

- Greater functional outcomes and return to sport rates 2 years after ACLR[1]
- Small benefit to quad strength and SL hop at 3 months compared to no prehab[3]

Overall: Encouraging early results – Focus on strength and neuromuscular training

[1]Failla, MJ, *AM J Sports Med*, 2016
[2]Peebles, LA, *Sports Med Arthrosc Rev*, 2019
[3]Carter, HM, *BMC Musculoskelet Disord*, 2020



Rehabilitation and Return to Sport in Athletes

ACL Prehabilitation Improves Postoperative Strength and Motion and Return to Sport in Athletes

Jamie Cunha, D.P.T., and Daniel J. Solomon, M.D.

Prehabilitation prior to anterior cruciate ligament reconstruction should include quadriceps strengthening—improving range of motion and balance and proprioception as a minimum. Although the content and duration of prehabilitation varies in the literature, when faced with a delay between diagnosis and surgery, 4-6 weeks of prehabilitation can improve early to mid-term strength and motion and can improve the timing and odds of a patient returning to sport.

Introduction

A successful anterior cruciate ligament (ACL) reconstruction surgery and rehabilitation optimizes patient satisfaction, knee stability, and return to sport, while also preventing rerupture. Failure occurs in 5-25% of patients when one considers both graft ruptures and ongoing laxity. The prospect and challenge of going through a revision surgical procedure because of one of these adverse outcomes, with 9-12 months of recovery, obviously must be avoided.

The goals of a physical therapy routine prior to ACL reconstruction, known as prehabilitation, address the most common early deficits after ACL injury: loss of motion, quadricep weakness, and instability. In addition, a prehabilitation program should improve balance, proprioception, and confidence, which helps prevent reinjury or contralateral injury after reconstruction.

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Re-Rupture Rates

Rerupture rates were evaluated by Samuelsen et al., who performed a meta-analysis including 47,613 ACL reconstructions [39,768 bone-tendon-bone (BTB) and 7,845 hamstring (HS)] from 25 different studies. Mean follow-up was 68 ± 55 months.

Overall, 2.80% BTB grafts ruptured compared with 2.84% in the hamstring group. Laxity was slightly higher in the BTB group compared to the HS group, but the difference was not significant.[1]

In a systematic review, Grassi et al. reported as many as 8% of patients undergoing ACL reconstruction will undergo a subsequent revision procedure. Regarding revision ACL reconstruction, when considering the sum of reruptures and objective clinical failures, the proportion of failed revision ACL reconstruction was more than 20% in 5 of the 15 included series in their review.[2]

Crawford et al. identified 14 studies for review of long-term ACL reconstruction failures. At longer than 10 years clinical follow-up, the reported ACL graft rupture rate was 6.2%, and clinical failure occurred in ~10.3%. At least 1 in 9 patients undergoing ACL reconstruction will have rerupture or clinical failure at long-term follow-up.[3]

Return to Sport Rates

Return to sport after ACL reconstruction, depending on the study, runs around 90%. This means 10% of patients never return to the same level of sports after ACL reconstruction surgery and rehabilitation.[4] Webster et al. found that only 24% of individuals returned to their preinjury level of sport, despite 91% reporting preoperatively that they expected to return.[5] Grainchet and Scherr advocate for an assessment of risk factors to determine whether a prehabilitation program prior to ACL reconstruction would benefit the

The Research

Cunha, J, *Arthrosc Sports Med Rehabil*, 2022

Hip (THA)

What should we do before surgery?

- Land-based resistance exercises: Open/closed chain exercises, stretching/mobility, sensorimotor training, cardiovascular training, and functional training
  - 1-5x per week for 3-12 weeks

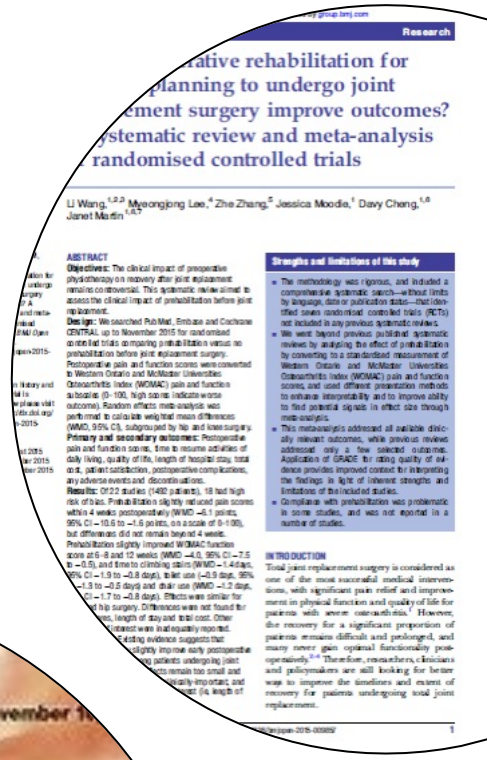
What happens if we do prehab before surgery?

- Very low-quality evidence: Not associated with higher self-reported physical function at 4 weeks, 26 weeks, or 1 year compared with usual care or no/minimal intervention
- Moderate certainty: Not associated with hospital length of stay compared with usual care or no/minimal intervention

Overall: Prehab is not associated with higher function or lower hospital length of stays

Saueressig, T, *JAMA Netw Open*, 2021

The Research



Wang, L, *BMJ Open,* 2016

Saueressig, T, *JAMA Netw Open*, 2021

Widmer, P, *Medicina (Kaunas)*, 2022

Shoulder (TSA)

What should we do before surgery?

- General lack of evidence
- Shoulder ROM[1,2]: Greater preoperative ROM is the principal predictor for postoperative ROM

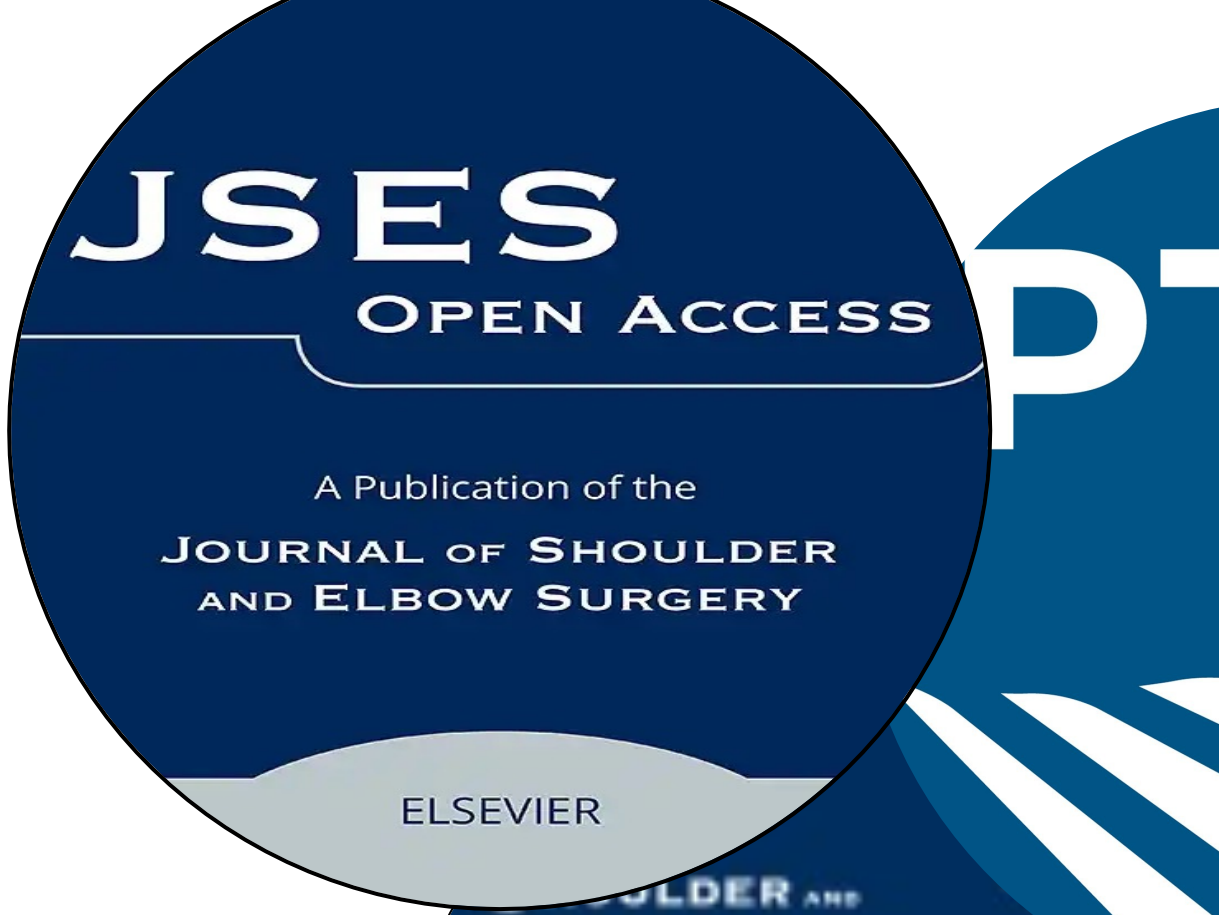
What happens if we do prehab before surgery?

- Moderately associated with improved strength, ROM, and outcome scores[1]

Overall: Focus on shoulder strength and ROM before Total Shoulder Arthroplasty

[1]Levy, JC, *J Shoulder Elbow Surg*, 2016
[2]Friedman, RJ, *JSES*, 2019

The Research



Hao, KA, *J Shoulder Elbow Surg*, 2022
Michener, LA Phys Ther, 2023

Spine Surgery

What should we do before surgery?

- PT training[1]
- Smoking intervention[1]
- Alcohol intervention[1]
- Pain management[1]
- Cognitive behavioral therapy[2]

What happens if we do prehab before surgery?

- Lack of significant evidence[1]
- Very low certainty to low certainty of no additional effect on outcomes[2]

Overall: No additional benefit

[1]Gometz, A, *Cureus*, 2018
[2]Janssen, ERC, *J Orthop Sports Phys Ther*, 2020

Spine Surgery

Total health care utilization at 12 months post-op	Experimental group (n = 28)	Control group (n = 33)
Imaging	$1,158.57	$1,915.76
Diagnostic tests	$19.64	$295.45
MD visits	$790.00	$1,121.82
PT visits	$389.29	$1,212,12
Chiro visits	$108.18	$62.50
Other	$180.15	$258.57
Total costs	$2,678.57	$4,833.48
Total cost per patient	$95.66	$146.47
# of X-rays	17	47
# of PT visits	113	394

TABLE 5: Economic cost, Louw.

PT: Physical therapy

Table 6

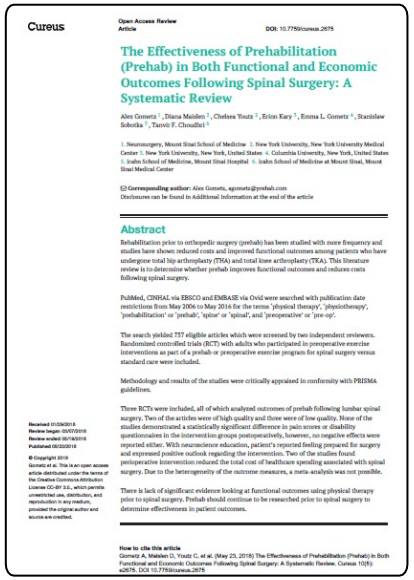
Economic cost, Nielsen.

hr: hour; PT: Physical therapy; pt: patient; d: day.

	Experimental group (n = 28)	Control group (n = 32)
Pre-op:		
• Introduction • PT 1 hr • Physician 0.16 hr • Nurse 0.25 hr	28 Euros (PT and physician)	8 Euros (nurse)
• PT training (PT 0.5 hr)	27 Euros	
• Smoking intervention • Nurse 2.8 hr • Equipment/meds	15 Euros (Three patients)	0 Euros
• Alcohol intervention • Nurse 2.8 hr • Equipment/meds	0	0
• Optimized pain treatment • Physician 0.25 hr	9 Euros	0
• TOTAL Pre-op:	79 Euros	8 Euros
Post-op hospital:		
• PT training	135 Euros (1 hr 5x)	95 Euros (0.5 hr 7x)
• Pain treatment	44 E (0.16 hr nurse, 0.16 hr specialist)	29 E (0.16 hr nurse, 0.08 hr specialist)
• Hospital stay • Bed price: 164 Euro/d	820 Euros (five days)	1,148 Euros (seven days)
• Secondary surgery	0	258 E (1 pt: 8,247 Euros)
• TOTAL post-op hospital:	999 Euro	1,530 Euros
Post-op primary care:		
• General practitioner • 14 Euro/contact	22 Euros (total 43 contacts)	27 Euros (total 61 contacts)
• Emergency contact • 24 Euro/contact	2 Euros (total 3 contacts)	8 Euros (total 10 contacts)
• Private PT (45 Euro/hour)	32 Euros (20 hr total)	94 Euro (total 67 hr)
• Medical treatment	40 Euros	1 Euros
• TOTAL post-op primary:	96 Euros	130 Euros
TOTAL Direct Costs per patient	1,174 Euros	1,668 Euros

Gometz, A, *Cureus*, 2018

The Research



Cureus

Open Access Review Article

DOI: 10.7759/cureus.2675

The Effectiveness of Prehabilitation (Prehab) in Both Functional and Economic Outcomes Following Spinal Surgery: A Systematic Review

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Disclosures can be found in Additional Information at the end of the article

Abstract

Rehabilitation prior to orthopedic surgery (prehab) has been studied with more frequency and studies have shown reduced costs and improved functional outcomes among patients who have undergone total hip arthroplasty (THA) and total knee arthroplasty (TKA). This literature review is to determine whether prehab improves functional outcomes and reduces costs following spinal surgery.

PubMed, CINHAL via EBSCO and EMBASE via Ovid were searched with publication date restrictions from May 2006 to May 2016 for the terms 'physical therapy', 'physiotherapy', 'joint replacement' or 'prehab', 'spine' or 'spinal', and 'preoperative' or 'pre-op'.

The search yielded 757 eligible articles which were screened by two independent reviewers. Randomized controlled trials (RCT) with adults who participated in preoperative exercise interventions as part of a prehab or preoperative exercise program for spinal surgery versus standard care were included.

Methodology and results of the studies were critically appraised in conformity with PRISMA guidelines.

Three RCTs were included, all of which analyzed outcomes of prehab following lumbar spinal surgery. Two of the articles were of high quality and three were of low quality. None of the studies demonstrated a statistically significant difference in pain scores or disability questionnaires in the intervention groups postoperatively, however, no negative effects were reported either. With neuroscience education, patient's reported feeling prepared for surgery and expressed positive outlook regarding the intervention. Two of the studies found perioperative intervention reduced the total cost of healthcare spending associated with spinal surgery. Due to the heterogeneity of the outcome measures, a meta-analysis was not possible.

There is lack of significant evidence looking at functional outcomes using physical therapy prior to spinal surgery. Prehab should continue to be researched prior to spinal surgery to determine effectiveness in patient outcomes.

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Published 05/23/2018

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Journal of Orthopaedic & Sports Physical Therapy

JOSPT

Gometz, A, *Cureus*, 2018
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The Research

McIsaac, DI, *Br J Anaesth*, 2022
Baimas-George, M, *World J Surg*, 2020
Noronha, J, *F1000Res*, 2021
Liu, C, *Aging Clin Exp Res*, 2022

Future Research

- Refine interventions[1]
- Establish minimum dosage[1]
- Interrogate interactions between therapies[1]
- Low risk of bias[2]

[1]West, MA, *Best Pract Res Clin Anaesthesiol*, 2021
[2]McIsaac, DI, *Br J Anaesth*, 2022

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Questions and Discussion

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