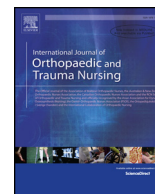




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## Does physiotherapy prehabilitation improve pre-surgical outcomes and influence patient expectations prior to knee and hip joint arthroplasty?

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## ABSTRACT

**Introduction:** Evidence supporting physiotherapy prior to hip or knee replacement for decreasing pain and improving function pre and post-operatively is equivocal. This observational cohort study used a mixed-methods approach to investigate whether 8 weeks of physiotherapy led exercise and education ('prehabilitation') would change pain and functional outcomes prior to surgery, and if patients' expectations and satisfaction post-surgery were influenced.

**Methods:** Participants awaiting THR or TKR were recruited (n = 75). Fifty two opted into the 'prehabilitation' group while twenty three opted for usual care. The prehabilitation group included a 45 min exercise and 15 min education session twice weekly for 8 weeks. All participants completed the WOMAC, NRS, Health Thermometer, 5xSTS and TUG outcome measures. Data were collected before and after prehabilitation and 6 weeks after surgery. Qualitative data were collected from 22 participants via telephone interviews and analysed inductively.

**Results:** Both groups improved post surgery. The prehabilitation group showed statistically significant improvements in all outcome measures after prehabilitation (pre-surgery). Participants' felt prehabilitation prepared them well for surgery and influenced expectations post-operatively. Group education talks and the experience of friends and family appeared highly valued information sources.

**Conclusion:** Prehabilitation improved patients' pain and function before hip or knee replacement surgery.

## Introduction

Osteoarthritis affects approximately 1 in 5 adults in western countries (Barbour, 2013) and is a major source of disability and lost productivity in New Zealand and internationally (Economics Access, 2010). Treatments, including joint arthroplasty, are effective in reducing disability and pain in hip and knee osteoarthritis, but approximately 20% of individuals post total knee replacement (TKR) and 9% post total hip replacement (THR) have adverse pain outcomes (Beswick et al., 2012).

Rates of TKR and THR surgery are increasing internationally so methods to optimise surgical outcomes are paramount (Losina et al., 2012). Physiotherapy rehabilitation before surgery (prehabilitation) has been proposed to optimise pre-operative function and strength, to prepare patients for, and hasten, recovery after surgery. Improving pre-operative capacity may assist patients in better tolerating surgical stress (Ditmyer et al., 2002), reducing complications and expediting recovery. In support of this Fortin et al., found pre-surgical function is a strong predictor of function at 6 months post-surgery (Fortin et al., 1999).

Pre-operative interventions afford an opportunity to influence individual psychological and social variables that impact recovery. Previous literature has found that pre-operative educational interventions may improve patient's locus of control (Hartley et al., 2012). Low locus of control has been correlated with poorer pain outcome in knee replacement (Lopez-Olivo et al., 2011). Pre-operative education may also mediate high patient anxiety (Fitzgerald and Elder, 2008) and fear of movement which have been associated with negative pain outcomes (McHugh et al., 2013), increased complications (Rasouli et al., 2016) and reduced function at 12 months (Filardo et al., 2016).

Studies investigating the efficacy of prehabilitation in reducing post-operative pain and improving recovery remain inconclusive with studies supporting (Santa Mina et al., 2014) and refuting the benefits of this intervention (Cabilan et al., 2015). Recent evidence indicates prehabilitation may lead to improvements in function, but these improvements may be too small to be clinically relevant (Wang et al., 2016).

Post-operative patient satisfaction is an important consideration in healthcare interventions. Patient satisfaction is related to patient

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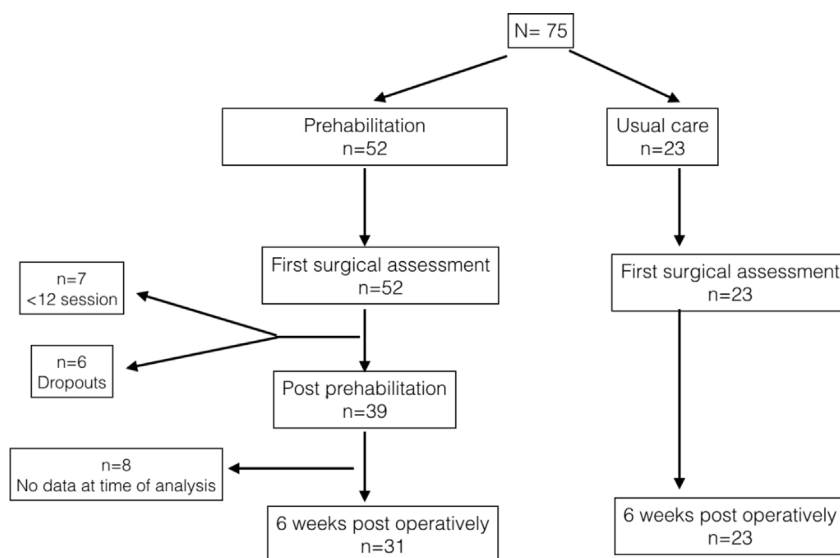


Fig. 1. Flow diagram; demonstrating time points for data collection and participant numbers across the prehabilitation and usual care groups.

expectations (McKinley et al., 2002). No previous studies have investigated the effect of prehabilitation on patient expectations and satisfaction post-operatively.

This mixed methods study prospectively follows a cohort of patients awaiting THR and TKR. The study aimed to investigate the effect of prehabilitation on patient outcomes. Specific objectives were to investigate the influence of prehabilitation on participants pre-operative pain and function. Furthermore, to explore the influence of prehabilitation on participants' expectations of surgery, satisfaction and the overall patient experience.

## Methods

This observational cohort study used a mixed methods approach. Participants were recruited from an orthopaedic waiting list at a hospital in the lower North Island of New Zealand between March 2015 and May 2016. All patients awaiting elective THR and TKR due to osteoarthritis by two surgeons were eligible. Orthopaedic nursing staff provided eligible participants with an information sheet on study aims, possible risks and benefits and the components of prehabilitation. Participants were included if they provided informed consent to take part in the study. Participants were excluded if they were undergoing acute surgery for fracture or failed to meet British Association of Cardiac Rehabilitation criteria for safe participation in an exercise programme (appendix 1). Participants self-selected into either the 'prehabilitation' or 'usual care' groups.

Usual care consisted of an educational booklet containing information about the surgery alongside a one-hour group multi-disciplinary education talk 2–4 weeks prior to surgery. The education talk involved an orthopaedic nurse, pain specialist nurse, occupational therapist and physiotherapist. Participants were presented with information on surgery, hospital stay, discharge and recovery and were encouraged to ask questions.

The prehabilitation group underwent usual care, plus a one-hour exercise and education session, twice weekly, for 8 weeks. The exercise component involved a 45-min strengthening and stretching class. The class included 13 exercise stations with 2 min spent at each station. Participants were asked to work to muscular fatigue or failure. Exercises were graded in terms of difficulty from 1 to 3 (easiest to hardest). Participants started on level 1 with encouragement to increase the level of difficulty as able. It was determined a-priori that participants should attend at least 12 out of 16 prehabilitation sessions for their results to be included in the final analysis. This frequency and

volume of exercise has previously been found to lead to improvements in strength (Candow and Burke, 2007) and is recommended within position statements for resistance training in untrained individuals (Kraemer et al., 2002). The education sessions consisted of 15 min classroom based talks and addressed concepts previously identified to be important in prehabilitation literature (Herck et al., 2010; Wainwright and Middleton, 2010; Yoon et al., 2010). Topics included early mobilisation, discharge planning, pain control, benefits of exercise for arthritis, dietary education and post-operative rehabilitation.

## Quantitative measures

Well validated quantitative outcome measures were used to reduce likelihood of bias through measurement error. Pain was assessed using a 10 point numerical rating scale (NRS) (Price et al., 1983), and functional status using the Western Ontario and McMaster Universities Arthritis Index (WOMAC) questionnaire (Bellamy et al., 1988). Physical function was assessed using the Timed Up and Go (TUG) (Kennedy et al., 2005) and Five Times Sit to Stand tests (5xSTS) (Bohannon, 2011). The 0–100 Health Thermometer from EuroQol 5D (EuroQol, 1990) 0–100 was used to quantify participants' perceived quality of life. Data on hospital length of stay were collected post-operatively as a secondary outcome measure. Data were collected pre and post prehabilitation and 6 weeks post-operatively for the intervention group, and pre-operatively and 6 weeks post-operatively for the usual care group. See Fig. 1.

## Quantitative data analysis

Data from outcome measures pre to post prehabilitation were compared using a paired *t*-test. A repeated measures ANOVA was used for a secondary analysis investigating if changes in outcome measures post-surgery between prehabilitation and usual care groups were significantly different. A change of  $p < 0.05$  (two tailed) pre to post intervention was accepted as a statistically significant finding. A Mann Whitney *U* test was used to investigate differences between hospital length of stay between groups.

## Qualitative measures

Semi-structured phone interviews were completed between 3 and 9 months post-operatively. Interviewers were independent from the design and delivery of the prehabilitation intervention. This was deemed

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