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Original Article

Comparison of a Patient-Centered Weight Loss Program starting before versus after knee replacement: A pilot study[☆]

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ABSTRACT

Background: Most patients risk gaining weight in the years after knee replacement, adding further concern to a population that is mostly overweight/obese prior to surgery.

Objective: Via a randomised pilot study, we assessed changes in weight during a Patient Centered Weight Loss Program (PACE) initiated either before or after knee replacement, while simultaneously examining the feasibility of recruiting and retaining participants over 26 weeks.

Methods: Recruitment outreach was made to 133 patients scheduled for knee replacement. Sixteen participants were randomised to a 14-session weight loss program that started either ≤ 6 weeks before surgery (PACE) or at 12 weeks post-op (Delayed PACE). Repeated measures ANOVAs were used to examine preliminary changes in weight, function, patient-reported outcomes, and physical activity across time (baseline/pre-op, 12 and 26 weeks after surgery) and group.

Results: Retention was 75% and 69% at 12 and 26 weeks after surgery, respectively. Weight significantly decreased across the 26 weeks ($P < 0.001$). A group by time interaction ($P = 0.03$) demonstrated Delayed PACE [-7.6 ± 5.9 kg ($-7.9 \pm 5.9\%$)] lost significantly more weight than PACE [-2.5 ± 2.7 kg ($-2.6 \pm 2.6\%$)] participants at 26 weeks. Significant improvements across time were seen for all function and patient reported outcomes, however activity did not change.

Conclusion: Conducting a behavioural intervention was challenging but feasible in a knee replacement population, with preliminary evidence suggesting that initiating a program 12 weeks after surgery produces greater weight losses at 26 weeks compared to a program starting before knee replacement.

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Introduction

Osteoarthritis is the leading cause of disability in the United States (US) [1]. Estimates indicate that half of patients diagnosed with knee osteoarthritis will need a total knee replacement during

their lifetime [2]. Of patients who need a knee replacement, 80–95% are overweight or obese [3,4]. Physicians often recommend weight loss, as each unit increase of body mass index (BMI) results in an 8% increased risk of surgically-related adverse events, including joint infection and deep-vein thrombosis [5]. Obesity also is linked with poorer outcomes following knee replacement and increased risk of undergoing joint replacement revision [6,7].

Prior to surgery, many patients are encouraged by healthcare providers to lose weight [8], yet few attempts result in a clinically significant weight loss ($\geq 5\%$) [9]. Immediately after surgery, patients may experience some weight loss, yet by 2 years, patients

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demonstrate a net weight gain [10]. Several studies have suggested that more than 50% of patients will gain weight after surgery [11,12]. Reducing body weight both before and/or after surgery would lower the risk of surgical and medical complications and improve pain and functional outcomes, yet the optimal time to initiate a weight loss program remains unknown. Immediately before the elective surgery may be an opportune teachable moment to initiate behaviour changes [13]. Conversely, waiting to start a program after the intensive rehabilitation is completed may be less overwhelming to patients.

Similar to the lack of weight loss observed following surgery, physical activity levels often remain unchanged. Prior to knee replacement, pain is one of the primary barriers to physical activity [14]. Following knee replacement, patients typically report significant reductions in pain and improved function [15] but corresponding increases in physical activity are uncommon [16–18]. Losina et al. [19] recently demonstrated that telephone health coaching and financial incentives could increase knee replacement patients' steps and physical activity at 6 months, but it is unclear if patients focusing on weight loss would also demonstrate comparable increases in activity.

Guided by knee replacement patients (pre- and post-operative) and healthcare professionals (i.e., orthopedic surgeon, physical therapist) input [8], we developed a 14-week Patient-Centered Weight Loss Program (PACE) specifically for knee replacement patients. During a pilot randomised study comparing changes in weight between patients who started the program up to 6 weeks before knee replacement (PACE) and patients who started 12 weeks after surgery (Delayed PACE), we examined the feasibility of recruiting and retaining patients during a 26-week behavioural intervention. The secondary aims of the study were to examine changes in patient-reported outcomes, physical function, and physical activity. Gaining a better understanding of when to offer a weight loss program to knee replacement patients will help to inform clinician recommendations and the development of future weight loss trials to maximise the long-term effectiveness of the knee replacement.

Materials and methods

Study design and subjects

Patients from nearby orthopedic clinics who had recently scheduled a knee replacement were recruited to participate. Recruitment strategies included placing recruitment postcards in pre-operative packets, referrals from physicians and staff, and direct mailings and emails to potential patients. Interested patients were instructed to visit the study website or contact staff to complete the screening procedures.

Patients were required to: (1) be 40–79 years of age, (2) have a body mass index (BMI) between 25–45 kg/m², (3) have a scheduled knee replacement (including primary, staged or independent bilateral, or revision) \geq 1 week away from baseline assessment (modified from 6 weeks before surgery due to challenges with recruitment), (4) obtain physician approval to participate, (5) be English speaking, and (6) willing to attend 3 assessments. Patients were excluded if they (1) had any contraindications to diet or weight loss, (2) were undergoing simultaneous bilateral knee replacement or had a scheduled or anticipated knee replacement for the contralateral knee within the next 26 weeks, (3) had a mobility limiting comorbidity besides the knee replacement (e.g., spinal stenosis), (4) were taking anti-obesity medications, (5) were enrolled in a formal weight loss program, (6) had or were planning to have bariatric/gastric/lapband surgery, (7) were planning to relocate out of the area in the next year.

Eligible patients were invited to an in-person session to complete the informed consent process. Following baseline, participants were randomised to a weight loss program that either started prior to surgery (PACE) or 12 weeks after surgery (Delayed PACE). Randomisation was stratified by age (<65 years and \geq 65 years) and sex. All procedures were approved by the Northwestern University Institutional Review Board and participants provided written informed consent prior to completing any procedures.

PACE intervention

The PACE intervention is a 14-week Patient-Centered Weight Loss Program that was modelled off the Diabetes Prevention Program [20] and Look AHEAD [21] and refined based on input from knee replacement patients, orthopedic surgeons, and physical therapists [8,22]. Participants randomised to PACE started the weight loss program 1–6 weeks before their knee replacement and continued for 12 weeks after surgery. During the first session, participants were provided with program materials and were given a 5% weight loss goal based on their baseline body weight. Participants received a calorie goal between 1200–2000 kcal/day to facilitate a 1–2 lb weight loss each week. Patients were also given personalised physical activity (e.g., steps/day, minutes of moderate-to-vigorous activity) goals, which were tailored according to patient preference, comfort, and pre-/post-rehabilitation progress.

Participants were encouraged to monitor their dietary intake and physical activity with their preferred modality (e.g., paper, website, smartphone application, activity tracker). They were provided with paper diaries and a calorie counter reference book, access to an online program or smartphone application, and/or a Fitbit. Study coaches had real-time access to participants' web or Fitbit physical activity and dietary data; those using paper diaries were asked to mail in diaries regularly. Participants could also opt to receive three text messages a week. Text messages targeted topics relating to diet, activity, recovery from surgery, and behaviour change.

Participants had up to 14 sessions with their coach either in-person or over the telephone on a weekly or bi-weekly basis, based on preference. To standardise the number of sessions between PACE and Delayed PACE and ensure both could receive up to 14 sessions, regardless of when PACE patients were randomised (between 1–6 weeks pre-surgery), participants only received 2 coaching sessions before surgery. Coaches were either bachelors or doctoral level in fields relating to exercise science or psychology and had experience coaching using motivational interviewing. During each coaching session, coaches reviewed participants' progress with recovery from surgery, discussed behavioural lessons, and provided feedback on participants' self-monitoring. PACE participants entered a maintenance period between 12 and 26 weeks after surgery and did not have any contact with coaches.

Delayed PACE

Participants randomised to Delayed PACE received the same intervention as PACE, however, participants started the program 12 weeks after surgery and continued until 26 weeks. Delayed PACE participants did not have any contact with study staff and coaches between baseline and 12 weeks.

Outcomes

Outcomes were assessed at baseline (between 1–6 weeks before knee replacement) and at 12 and 26 weeks after surgery. Participants received \$20 for completing the 12 and 26-week assessments.

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