Systematic review

Active physiotherapy interventions following total knee arthroplasty in the hospital and inpatient rehabilitation settings: a systematic review and meta-analysis

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Abstract

Background Physiotherapy is a routine component of postoperative management following total knee arthroplasty (TKA). As the demand for surgery increases it is vital that postoperative physiotherapy interventions are effective and efficient.

Objectives Determine the most beneficial active physiotherapy interventions in acute hospital and inpatient rehabilitation for improving pain, activity, range of motion and reducing length of stay for adults who have undergone TKA.

Data sources Electronic databases MEDLINE, CINAHL, PUBMED and EMBASE.

Study eligibility criteria Randomised controlled trials investigating the effect of active physiotherapy interventions in the acute hospital or inpatient rehabilitation setting for adults who have undergone TKA.

Study appraisal and synthesis methods Risk of bias for individual studies was assessed using the Physiotherapy Evidence Database (PEDro) scale. Standardised Mean Differences (SMD) or Mean Differences (MD) and 95% confidence intervals were calculated and combined in meta-analyses. Quality of meta-analyses was assessed using the Grades of Research, Assessment, Development and Evaluation approach.

Results Accelerated physiotherapy regimens were effective for reducing acute hospital length of stay (MD -3.50 days, 95% CI -5.70 to -1.30). Technology-assisted physiotherapy did not show any difference for activity (SMD -0.34, 95% CI -0.82 to 0.13). From high quality individual studies pain, activity and range of motion improved with accelerated physiotherapy regimens and activity improved with hydrotherapy.

Limitations Lack of blinding and small sample sizes across the included trials.

Conclusion After TKA, there is low level evidence that accelerated physiotherapy regimens can reduce acute hospital length of stay.

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Introduction

Total knee arthroplasty (TKA) is a cost effective intervention for end-stage knee osteoarthritis, with demonstrable benefits for improving pain, activity and quality of life [1,2]. As the population ages, it is anticipated the number of people electing for TKA will continue to rise [3], consequently placing an increasing burden on health care systems.

Physiotherapists play a role in the acute hospital and inpatient rehabilitation settings by facilitating independence in transfers and ambulation, and achieving functional goals for people after TKA. Despite trend to very early discharge after TKA [4], the average hospital length of stay (LOS) following TKA is reported as 5.50 days (range 2.10 to 9.50 days) in Australia [5] and 6.60 days in the United Kingdom [6]. It is therefore essential that physiotherapy interventions provided in the acute and inpatient rehabilitation settings are worthwhile and efficient in producing these important patient outcomes, in order to further minimise LOS and health

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care costs. However, there are currently no evidence-based guidelines in these settings to advise the most effective physiotherapy interventions following TKA, including the type, timing, and dosage of interventions [3,7].

Two systematic reviews [8,9] investigating TKA rehabilitation in the outpatient setting have been conducted. The first, a systematic review [8] and meta-analysis of six trials demonstrated small to moderate benefits for activity with physiotherapy interventions involving mostly functional exercises (SMD 0.33, 95% CI 0.07 to 0.58). The second systematic review [9] of 19 trials concluded physiotherapy should comprise strengthening and intensive functional exercises delivered via land-based or aquatic programs.

Therefore, the research question of this systematic review was what are the most beneficial active physiotherapy interventions and regimens in acute hospital and inpatient rehabilitation for improving pain, activity, range of motion (ROM) and reducing LOS for adults who have undergone TKA?

Method

Search strategy

The electronic databases MEDLINE, CINAHL, PUBMED and EMBASE were searched from earliest available time until July 2014. The concepts of population, intervention, outcome and design were combined with the 'AND' operator. Population was defined as participants who had a TKA. Intervention was defined as any form of active physiotherapy in an acute hospital or inpatient rehabilitation setting following TKA. Primary outcomes were pain, activity and LOS. Knee ROM was the secondary outcome. The design was randomised controlled trials. Synonyms were searched for each concept and combined with the 'OR' operator (Appendix A).

All articles were imported to bibliographic software and screened for duplicates. Two reviewers independently screened title and abstract of each article using predetermined eligibility criteria. Discrepancies were resolved via discussion. Full text copies were retrieved for articles that were not excluded based on title and abstract and eligibility criteria applied by the same reviewers. Disagreements unable to be resolved via discussion were taken to a third reviewer to achieve consensus. Reference lists of included articles were hand-searched and citation tracking applied using Google Scholar to identify any further articles for inclusion.

Eligibility criteria

The review included randomised trials if at least 85% of the sample had a primary TKA due to osteoarthritis, the outcomes included at least one of pain, activity or LOS, and the experimental intervention involved any form of active physiotherapy intervention, such as strengthening or active ROM, performed in an acute hospital or inpatient rehabil-

itation setting. Studies investigating the effects of passive interventions such as continuous passive motion or manual therapies, could only be included if the passive modality was not the primary difference between the therapy provided to experimental and control groups. Studies that included neuromuscular electrical stimulation were considered passive if the participant was not required to produce a voluntary contraction of the muscle prior to the device delivering electrical stimulation. The comparison intervention was standard physiotherapy, defined as usual physiotherapy management in acute hospital or rehabilitation, or another form of active physiotherapy intervention. Studies that compared two or more different regimens of exercise were also included to investigate the ideal intensity and postoperative commencement of exercise. Studies were excluded if the samples included participants who had a unicompartmental knee arthroplasty or revision TKA. Studies that included participants with total hip arthroplasty and TKA and did not report outcomes separately were also ineligible. Studies written in languages other than English were excluded.

Data collection and analysis

A predesigned data collection form was used to extract data on participants, setting, interventions, outcome measures and results. Investigators were contacted to confirm data where required. SMDs and 95% confidence intervals were calculated from postintervention means and standard deviations for pain and activity outcomes. Mean differences (MD) and 95% confidence intervals were calculated for LOS and ROM outcomes. *P*-values were used to estimate standard deviations where these data were not reported. Mean values were extrapolated from graphs if not reported elsewhere in the article. Medians were converted to means where required [10]. Effect sizes of <0.20 were considered small, 0.50 considered moderate and >0.80 considered a large effect size [11]. A negative SMD or MD indicated that the outcome favoured the intervention group for activity, pain and LOS measures. A positive MD indicated that the outcome measure favoured the intervention group in ROM. Studies were grouped according to similar interventions for analysis purposes. 'Accelerated physiotherapy' was defined as physiotherapy intervention commencing within 24 hours of surgery, and occurring more than 24 hours prior to standard care. 'Technology-assisted physiotherapy' was defined as physiotherapy intervention delivered via use of a robotic training system or computer-based electronic device. Meta-analyses were conducted if two or more studies were clinically homogeneous, where common population, intervention and outcome measures were used. Meta-analyses were performed using the inverse variance method and random effects model [12]. Studies that did not demonstrate sufficient clinical homogeneity to be combined in meta-analyses were reported in tables and descriptive format.