Inpatient rehabilitation did not positively affect 6-month patient-reported outcomes after hip or knee arthroplasty

Adam G. Hutchinson
Benjamin Gooden
Matthew C. Lyons
Justin P. Roe
Michael D. O'Sullivan

See next page for additional authors

Follow this and additional works at: https://researchonline.nd.edu.au/med_article

Part of the Medicine and Health Sciences Commons

This article was originally published as:

Original article available here:
10.1111/ans.14814
This is the peer reviewed version of the following article:


This article has been published in final form at: -
https://doi.org/10.1111/ans.14814

This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for self-archiving.
Inpatient rehabilitation did not positively affect 6-month patient reported outcomes after hip or knee arthroplasty.

Running head: Rehabilitation after Arthroplasty

Adam G Hutchinson*, BRT
Benjamin Gooden*, PhD, FRACS
Matthew C Lyons*, MBBS, FRACS
Justin P Roe*, MBBS, FRACS
Michael D O’Sullivan*, MBBS, FRACS
Lucy J Salmon*, BAppSci(Physio), PhD
Kaka Martina#, BN
Leo A Pinczewski** MBBS, FRACS.

*University of Notre Dame, Sydney
*North Sydney Orthopaedic & Sports Medicine Centre,
#The Mater Hospital, Sydney

No of Figures: 2
No of Tables: 1
Abstract word count: 217
Body word count: 3344

Corresponding Author:
Dr Lucy Salmon
*North Sydney Orthopaedic and Sports Medicine Centre
The Mater Clinic Suite 2, 3 Gillies St Wollstonecraft NSW 2065 Australia
Tel: +612 9409 0500
Fax: +612 9437 9595
Email: lsalmon@nsosmc.co.au
ABSTRACT

Aim:
The aim of this study was to compare patient reported outcomes 6 months after hip or knee arthroplasty in subjects who were discharged to home compared to those who attended inpatient rehabilitation.

Methods: 748 consecutive total hip or knee replacement patients were identified from a prospective database. Preoperative and 6-month postoperative patient reported outcome measures were recorded. 44 patients discharged directly to home were cohort matched by age, gender, procedure and surgeon to 44 patients from the cohort who received inpatient care. Patient outcomes were compared using SPSS version 24 software.

Results: Both cohorts saw significant improvements from baseline at 6 months. Median length of stay for the inpatient group was 7 days (6-14). There was no significant difference between the groups based on patient reported outcomes. There was a clinically significant difference (p=0.047) in the body mass index of the Home Group (mean = 27) to Rehab Group (mean = 29).

Conclusion: Our study has shown that inpatient rehabilitation after hip or knee arthroplasty did not positively affect 6-month patient reported satisfaction, expectation, pain, quality of life, ADL scores, when compared with subjects who were discharged direct to home. A significant average saving of $5,600 per patient with the use of home discharge is a promising avenue for health cost reduction, and health resource distribution.

Key words:
Patient Discharge
Length of Stay
Patient Reported Outcome Measures
Arthroplasty, Replacement, Knee
Arthroplasty, Replacement, Hip
Arthroplasty, Replacement, Hip/rehabilitation*
Arthroplasty, Replacement, Knee/rehabilitation*
Hospital Costs
Introduction

Over two million Australians suffer from osteoarthritis (OA), rising to 8.1% of the population in the 2014-15 period, with the majority of diagnoses occurring at 45 years of age and older. In 2015 there were 44,710 total hip replacements and 57,687 knee replacements reported to the National Joint Replacement Registry (NJRR), with 60-70% of these performed within private practice. With both an ageing population and an obesity epidemic, osteoarthritis is set to become an even larger issue with joint replacements an effective treatment option. The growing practice of joint replacement has heralded advancements in all domains of care as improved surgical techniques, pain management, early mobilization and rehabilitation programs decrease length of stay (LOS).

After arthroplasty, postoperative inpatient rehabilitation is used to varying degrees nationally and internationally. Canada reports use of such services between 3-79% for THR and TKR postoperative care, whilst in Australia recent reports suggest public and private use of inpatient rehabilitation for TKR reaches 20% and 40% respectively. Private data has shown significant variability of inpatient rehabilitation uptake across Australian states. THR inpatient care was used as little as 6% in Tasmania and as high as 57% in the Northern Territory, whilst TKR inpatient care ranged from 9% (Tasmania) to 75% (Northern Territory). Early discharge to home with home-based rehabilitation has been associated with reduced cost, improved clinical outcomes and increased patient satisfaction and can safely and feasibly occur with a length of stay (LOS) in hospital of 4 days or less in up to 90% of TKR and THR subjects. There is now a growing evidence base to use outpatient rehabilitation where appropriate to decrease costs without sacrificing outcomes.

The aim of this study was to compare patient reported outcomes 6 months after THR or TKR in subjects who were discharged to home compared to those who attended inpatient rehabilitation.
Methods

In the 2016 financial year, 748 consecutive patients treated at the Mater Private Hospital, Sydney for primary elective THR or TKR under the care of the investigating surgeons were entered into a prospective database of hip and knee arthroplasty and formed the study group. Of these, 643 (86%) patients completed preoperative and 6-month postoperative Patient Reported Outcome Measures (PROMs). The PROMs included the Hip Osteoarthritis and Outcome Score (HOOS) and Knee Osteoarthritis and Outcome Score (KOOS) which use 42 and 40 questions respectively, to determine quality of life, pain, symptoms and activities of daily living. The EQ-5D index is widely used as a generic measure of health status, measuring mobility, self-care, activity, pain and anxiety. The satisfaction and expectation components of the Knee Society score were included, as well as 2 additional questions relating to satisfaction: would they have the same surgery again under the same circumstances, and a grading of their satisfaction with results of surgery on a 5 point Likert Scale from very disappointed to very satisfied.

After arthroplasty, 44 patients were discharged direct to home (Home Group). These subjects were matched for age, gender, procedure, and surgeon to 44 patients who attended inpatient rehabilitation (Rehab Group).

The primary endpoint of the study was the comparison between the Home Group and the Rehab Group of the 6 month mean scores on the HOOS/KOOS subscales, and patient satisfaction. Descriptive statistics are presented as means and standard deviations for continuous variables such as mean patient reported scores, and counts and percentages for categorical variables. Means were compared between treatment groups with independent t tests. Difference in proportions of patients between treatment groups was assessed with the Chi test (χ2 test). Statistical significance was set at p=0.05. Analysis was performed using SPSS version 24 software.
Results

Of the 748 patients who met the inclusion criteria, 643 (86%) completed PROMs before surgery and 6 months after arthroplasty. Of the 643 arthroplasty subjects, only 44 (7%) were discharged straight to home (Home Group), with the remaining 599 attending formal inpatient rehabilitation (Rehab Group). There were 40 separate sites used for inpatient rehabilitation, with 47% receiving care at the same hospital as the index surgery.

Each group of 44 patients consisted of 24 males and 20 females and a mean age of 63 years, with 29 THR and 15 TKR performed. There was no statistically significant difference between the two groups for pre-operative demographic variables or PROMS (see Table 1). The Home Group had a significantly lower mean Body Mass Index (BMI) of 27, compared to the Rehab Group mean of 29 (p=0.047). The mean length of stay for acute care was 5 days, for both groups. The median length of stay for inpatient rehabilitation was 7 days (4-16 days) at a cost of AUD $5,600 (range $3,200 to $12,800).

At 6 months, there was no significant difference between the two groups for any of the mean HOOS/KOOS sub-scores (see Figure 2). There was no significant difference between the Home and Rehab Group for any of the mean EQ5D sub-scores at 6 months (p>0.3).

At 6 months after arthroplasty, the mean Knee Society Expectation Score was 10.1 for the Home group and 9.7 for the Rehab Group (p=0.43), out of a possible 15. The mean Knee Society Satisfaction Score was 35 for the Home Group and 34 for the Rehab Group (p=0.60), out of a possible 40. The proportion of subjects in each group that reported they were satisfied or very satisfied with the results of surgery, and would undergo the same surgery again are shown in Figure 2.
Discussion

In this study, inpatient rehabilitation after hip or knee arthroplasty did not positively affect 6-month patient reported satisfaction, expectation, pain, quality of life, ADL scores, when compared with subjects who were discharged direct to home.

It has been well established that hip and knee arthroplasty is an effective means of treatment for osteoarthritis, with excellent functional and pain outcomes being reported widely in literature. With the increasing age of the population, rising obesity levels and increasing access to healthcare, arthroplasty rates are increasing. Likewise, postoperative rehabilitation services are in high demand, with an average of 32% of THR patients and 39% of TKR patients receiving inpatient rehabilitation in Australia. It is imperative an effective and affordable treatment is found, with outpatient therapy being raised as one possible solution.

Whilst TKR has been shown to be an effective solution to OA, there is ample literature that suggests that between 11-18% of patients are unsatisfied with primary TKR. In fact, Bourne et al. reported only 72-86% pain relief satisfaction when performing activities of daily living post TKR. The authors concluded that further methods should be used to screen patients at risk of lower pain satisfaction, including discussions regarding expectations of surgery and realistic outcomes. Hamilton et al. reported on 4709 THR and TKR patients over a 4-year period, whereby satisfaction was 90% and 82% respectively, at 12 months. In line with the previously reported findings, the authors identified three further patient satisfaction determinants: meeting preoperative expectations, pain satisfaction and hospital experience. These determinants further broaden the scope with which at-risk groups can be identified preoperatively, in order to maximise satisfaction rates. Thus, a rigorous screening preoperatively, including detailed discussions of patient expectations and realistic orthopaedic advice, is necessary to dispel myths and prepare patients adequately for life after TKR or THR. In doing so, it may be possible to see improvements in TKR satisfaction scores to equal those of THR.

Despite the high proportion of Australians using inpatient rehabilitation after arthroplasty, the efficacy of this treatment has received little attention. Buhagiar et al. recently conducted a randomised controlled trial (RCT) of 165 Australian subjects comparing inpatient to a supervised 6-week home-based rehabilitation program for TKR in a public hospital setting. At 6 months after surgery there were no reported differences between the groups for 6-minute walk tests, pain, function, quality of life or complications. Similar studies outside of Australia have also reported no differences in outcome measures between inpatient and supervised home-based rehabilitation after hip or knee arthroplasty.
arthroplasty 4, 6, 7, 19. The results of our study support these findings in an Australian population of privately insured patients after arthroplasty.

There is now a significant body of evidence illustrating the cost-effective nature of outpatient rehabilitation over inpatient for TKR and THR 7, 8, 20. The majority of arthroplasties are performed privately in Australia, and with the trending increase in arthroplasties performed annually, a significant change in practice to outpatient rehabilitation could significantly reduce both public expense and private premium increases in the future 20, 21.

In Australia, inpatient rehabilitation, THR and TKR are three out of the top five most common procedures paid by health funds 9. In a recent report produced by the Royal Australasian College of Surgeons (RACS) examining variations between surgeons and Australian states, total costs (inclusive of procedure + inpatient stay) for THR ranged from AUD$19,439 - $42,007 (median $26,350) and for TKR from AUD$17,797 - $30,285 (median $22,639), nationally. The average inpatient rehabilitation cost alone for THR and TKR was calculated to be approximately AUD$11,015 15. Data from the United States suggests inpatient costs can be as much as 10.5 times that of outpatient care 7. Inpatient rehabilitation in Australia has been reported by Hart et al. 21 in 2014/2015 as much as $970 per day. In this series, the additional cost of using inpatient rehabilitation was an average of 7 days at a cost of AUD$5600 per patient. The significance in such costs is notable with limited resources fueling the need for efficient health care delivery 7.

The privately insured population examined in this study used inpatient rehabilitation in 93% of subjects, which is much higher than the national (40%) or state (59%) averages. The utilization of rehabilitation after arthroplasty varies considerably across Australian states. After knee arthroplasty inpatient rehabilitation is used by as few as 9% in Tasmania but as high as 64% in NSW 15. There is also considerable variation between privately insured and public populations. These variations suggest that, in many cases, need is not the driving factor for use of inpatient rehabilitation after arthroplasty. We recognize that this very high rate of use of inpatient rehabilitation in our studied population is driven largely by culture rather than need. In this institution inpatient rehabilitation has become the accepted norm, with staff and patients expecting and supporting the practice routinely, without consideration for a needs based decision. We do not advocate that the practice of inpatient rehabilitation should be abandoned, but rather used more selectively. Home based rehabilitation is likely to be inappropriate in the very elderly, those living alone, or those with very low mobility.
The ability to predict arthroplasty patients who can be successfully discharged to a home based rehabilitation program is of obvious value. Oldmeadow et al. developed and validated a score that identifies 3 levels of risk of needing extended inpatient rehabilitation after hip or knee arthroplasty, with an accuracy rate of 89% for those most at risk. The Risk Assessment and Prediction Tool (RAPT) attributes a score based on age, gender, mobility, gait aids, use of community supports and whether a caregiver resides with the subject, to give a total score out of 12. Those who score >9 have an expected discharge directly home, those who score between 6-9 have a medium risk, where additional intervention to discharge home is indicated, and those with a score <6 are expected to be discharged to extended inpatient rehabilitation. It is the current practice of the investigating orthopaedic surgeons to use the RAPT score before surgery to identify arthroplasty patients that may be successfully discharged to home. Further consideration is also given to the other major factors in a patient’s life and any depression or anxiety conditions. The use of this score facilitates patient expectations to be discussed in advance and improved confidence can be given to arthroplasty patients likely to be successfully discharged with a home rehabilitation program. This score can be used as a guide to determine whether home based rehabilitation should be considered. In this series, we matched the home and rehabilitation cohorts for gender, age and procedure. The lack of any demonstrable positive effect of inpatient rehabilitation on 6 months outcomes supports the notion that inpatient rehabilitation was overused in this population.

This study has some limitations. For both the Home Group and the Rehab Group there was no data reported on type of rehabilitation therapy nor the frequency of patient attendance following discharge. Subjects were not randomised to the groups, introducing the potential for bias. Over 90% subjects in this study attended inpatient rehabilitation. This is significantly higher than the Australian average of 40% and indeed abroad. This may reflect the higher socioeconomic district the hospital is situated in, resulting in higher rates of people being able to afford inpatient, private care. Additionally, we recognize that a culture of expected inpatient rehabilitation exists in our hospital that biases the likelihood that patients will elect to discharge to home. All subjects were from a single centre, so may not be representative of national practices. Regardless of the high proportion attending inpatient rehabilitation the lack of demonstrable positive effect is enhanced by our cohort matching based on demographics such as age and procedure. There were no significant differences in the baseline patient reported outcomes between the 2 matched groups. However, the rehabilitation group did have a significantly higher BMI before surgery (p=0.05), which may reflect a lower activity level biasing them to a longer inpatient stay. Additionally, although the preoperative ASA grades were
not significantly different between the groups, it is possible that they were not equal with respect to medical comorbidities. Regardless we were unable to detect a difference between the groups at 6 months.

Conclusion

Our study has shown that inpatient rehabilitation after hip or knee arthroplasty did not positively affect 6-month patient reported satisfaction, expectation, pain, quality of life, or ADL scores, when compared with subjects who were discharged direct to home. A significant average saving of $5,600 per patient with the use of home discharge is a promising avenue for health cost reduction, and health resource distribution.

Conflicts of Interest Nil
FIGURE LEGENDS:

Figure 1: Mean Patient Reported Outcome Measures for KOOS or HOOS scores 6 months after arthroplasty in the Home and Rehab Groups. There was no significant difference between the Home and Rehab groups for any subscore.

Figure 2: Satisfaction after Arthroplasty in the Home and Rehab Groups. There was no significant difference between the Home and Rehab group.

TABLES:

Table 1: Baseline Patient Reported Outcome Scores for the Home and Rehab Groups

<table>
<thead>
<tr>
<th></th>
<th>HOME GROUP (N=44)</th>
<th>REHAB GROUP (N=44)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean BMI</td>
<td>27</td>
<td>29</td>
<td>0.047</td>
</tr>
<tr>
<td>Mean preoperative ASA* Score</td>
<td>1.5</td>
<td>1.6</td>
<td>0.628</td>
</tr>
<tr>
<td>Mean age at surgery (years)</td>
<td>62.9</td>
<td>62.6</td>
<td>0.917</td>
</tr>
<tr>
<td>No of Males</td>
<td>24</td>
<td>24</td>
<td>0.999</td>
</tr>
</tbody>
</table>

**PREOPERATIVE PATIENT REPORTED SCORES**

<table>
<thead>
<tr>
<th>Mean HOOS/KOOS SYMPTOMS</th>
<th>42.4</th>
<th>42.0</th>
<th>0.834</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAIN</td>
<td>42.4</td>
<td>42.0</td>
<td>0.913</td>
</tr>
<tr>
<td>FUNCTION</td>
<td>52.9</td>
<td>51.1</td>
<td>0.682</td>
</tr>
<tr>
<td>QOL</td>
<td>31.7</td>
<td>30.8</td>
<td>0.834</td>
</tr>
<tr>
<td>Mean EQ5D MOBILITY/5</td>
<td>2.6</td>
<td>2.9</td>
<td>0.213</td>
</tr>
<tr>
<td>SELF CARE /5</td>
<td>1.6</td>
<td>1.8</td>
<td>0.216</td>
</tr>
<tr>
<td>USUAL ACTIVITIES /5</td>
<td>2.9</td>
<td>2.6</td>
<td>0.285</td>
</tr>
<tr>
<td>PAIN /5</td>
<td>3.1</td>
<td>3.2</td>
<td>0.594</td>
</tr>
<tr>
<td>ANXIETY/DEPRESSION /5</td>
<td>1.5</td>
<td>1.4</td>
<td>0.660</td>
</tr>
<tr>
<td>GENERAL HEALTH /10</td>
<td>6.7</td>
<td>6.9</td>
<td>0.601</td>
</tr>
</tbody>
</table>

*American Society of Anaesthesiologists Physical Status Classification System
References


