ORIGINAL ARTICLE

Group Physiotherapy Provides Similar Outcomes for Participants After Joint Replacement Surgery as 1-to-1 Physiotherapy: A Sequential Cohort Study

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ABSTRACT. Coulter CL, Weber JM, Scarvell JM. Group physiotherapy provides similar outcomes for participants after joint replacement surgery as 1-to-1 physiotherapy: a sequential cohort study. Arch Phys Med Rehabil 2009;90:1727-33.

Objectives: To compare effectiveness and time efficiency of physiotherapy rehabilitation provided within a group with an individualized program provided at home for improving participants' outcomes after total joint replacement surgery.

Design: Quasiexperimental sequential cohort trial with 12-week follow-up.

Setting: A tertiary acute care hospital.

Participants: Consecutive patients (N=51) having hip or knee replacement surgery in an 8-month period and who were able to weight-bear postoperatively.

Interventions: The first group admitted to the study entered the exercise group, and patients in the following 4 months entered the home physiotherapy group.

Main Outcome Measures: Primary outcome measures included the Western Ontario McMaster's University Osteoarthritis Index (WOMAC), Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36), Timed Up & Go (TUG) test, and knee range of motion (ROM). Secondary measures included the 6-m walk test and a patient evaluation questionnaire. Staff time costs were recorded. Outcomes were recorded preoperatively or at hospital discharge, and 5 and 12 weeks postoperatively.

Results: There was no difference between the 2 groups for either the WOMAC or SF-36 scores, 6-m walk test, TUG test, or ROM measures at 12 weeks ($P>.05$), although both groups of patients improved between hospital discharge and 12 weeks. The class group accessed more frequent physiotherapy than the home group (mean, 7.5 and 3.96 visits, respectively). The physiotherapist's time was less per patient per visit for the class group (mean, 27min direct and 10min indirect) than for the home visits (mean, 38min direct and 26min indirect).

Conclusions: This trial suggests that the class-based exercise rehabilitation was the most efficient method of delivery of the physiotherapy service, without cost to patient outcomes.

Key Words: Arthroplasty; Rehabilitation.

OSTEOARTHRITIS IS THE MOST common form of chronic arthritis. The condition affects approximately 1.4 million Australians, or approximately 7.3% of the population,[1] and with other bone and joint diseases is the most common cause of physical disability.[2,3] Based on current trends, osteoarthritis is forecast to become the fourth leading cause of disability worldwide by 2020.[3] The pain and disability associated with osteoarthritis affects approximately 10% of men and 18% of women older than 60 years. Osteoarthritis poses a substantial and increasing burden on persons with impairments not only to their physical status and independence but also to their quality of life.

Osteoarthritis is the most common reason for joint replacement surgery in Australia, accounting for 96% of primary total knee replacement procedures and 88% of primary total hip replacement procedures performed in 2001 to 2002.[4] The number of joint replacement procedures increased by 9.1% between 1999 to 2000 and 2000 to 2001, and by 13.4% between 2000 to 2001 and 2001 to 2002 according to data from the Australian Orthopaedic Association National Joint Replacement Registry. This increase is due to a growing demand for joint replacement surgery by younger people and an increase in the number of older people with joint pain and disability, as those aged 65 years and older are predicted to be 18% of the population by 2021.[1] As a consequence, the demands on provision of rehabilitation can be predicted to increase.

Rehabilitation has been defined as the provision of time-limited, goal-oriented, physical, occupational, and vocational therapy directed towards the restoration (optimization) of health.[1] Evidence has shown that rehabilitation after total hip replacement is essential to prevent decline postoperatively and to restore a high functional level.[5] In Australia, as a primary program, 71% of rehabilitation is provided as outpatient programs after total knee replacement. The most common mode of rehabilitation is one-to-one physiotherapy (63% of rehabilitation), outstripping supervised exercise classes (23% land, water, or both) and monitored home exercise programs (9% of rehabilitation).[6] One-to-one treatments have been shown to have low economic value when compared with group-based programs, and particularly if those groups are community based.[7,8] At the Canberra hospital, postoperative physiotherapy rehabilitation for the

List of Abbreviations

LOS	length of stay
MCS	Mental Component Summary
PCS	Physical Component Summary
PJR	primary joint replacement
ROM	range of motion
SF-36	Medical Outcomes Study 36-Item Short-Form Health Survey
TUG	Timed Up & Go
WOMAC	Western Ontario McMaster's University Osteoarthritis Index

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joint replacement patient before this trial took the form of one-to-one home-based therapy. This involved a single physiotherapist traveling to the patients' home and providing exercise rehabilitation and gait retraining. There is no evidence to support individual physiotherapy programs over group programs for rehabilitation after discharge home for total joint replacement patients.[9,10] With few results available, the sustainability of one-to-one services has been questioned, especially in an underresourced health sector.

The advantages of group exercise include peer support, modest program costs, and close supervision and encouragement from the exercise leader.[7,11] Disadvantages include loss of flexibility in scheduling exercise times and the effort, time, and expense required to travel to classes. Current evidence suggests equal effectiveness for individual or group programs for osteoarthritis rehabilitation of the knee.[7]

The advantages of group exercise and the proposed increase in efficiency of our physiotherapy service stimulated the idea to evaluate 2 methods of rehabilitation. This study determined whether there was a difference in outcomes between physiotherapy-directed rehabilitation after joint replacement performed individually in the patient's home, and a program in a group setting in the hospital. We also determined whether there was a difference in efficiency between physiotherapy delivered in the home and the class program.

METHODS

Design

This sequential cohort study recorded outcomes for patients who underwent elective total hip or total knee replacement at the Canberra hospital. This proposal was exempt from requiring institutional review board approval because it did not meet criteria for an interventional study.

Participants

Fifty-one patients were recruited over an 8-month period (April through November 2007). Patients admitted to the study during the first 4 months were assigned to the class group, and those admitted during the following 4 months were assigned to the home group. Patients were excluded if they were nonweight-bearing postoperatively or if they resided outside the local service region. Thirteen patients were excluded for being outside the service area; these patients had physiotherapy rehabilitation organized for them on an individual basis and were not included in this analysis of outcomes. Another 2 patients were excluded from the recruitment, one because of transfer to a rehabilitation facility and the other for refusal of all physiotherapy input. Patients were not excluded because of age, sex, joint replacement type, or unilateral or bilateral replacements.

All patients treatments after having elective joint replacement surgery at the Canberra Hospital are following the hospital's PJR program, which focuses on a multidisciplinary approach including preoperative education and a goal-oriented program for discharge day 5 postoperatively.

Some patients included in this trial were having revision replacement surgery. These patients followed the same clinical pathway as PJR as long as they were able to weight-bear postoperatively and therefore as per normal service provision stated above.

Intervention

The clinical pathway at the Canberra hospital for the PJR program includes assessment, a preoperative education program, and general or epidural anesthesia. Physiotherapy commences 1 day after surgery, and the anticipated LOS is 5 days. Patients are discharged home when independently mobile. After hospital discharge, all patients are prescribed a standard exercise program to be performed 3 times daily.

Those patients admitted during the first 4 months received physiotherapy rehabilitation consisting of a circuit-based group exercise program run by orthopedic physiotherapists. Patients commenced rehabilitation on the next available class day postdischarge and were able to attend twice weekly for 4 weeks. The class exercise program was developed by selecting elements from the original home-based program. The patients referred for physiotherapy during the second 4 months received rehabilitation consisting of a home-based service commenced within 48 to 72 hours postdischarge. Patients were seen by the physiotherapist once a week for 4 weeks, unless the physiotherapist deemed a need for twice weekly visits.

Physiotherapy in both groups included, but was not limited to, exercise rehabilitation and gait retraining. Exercises for the class and home groups were identical and included wall squats, quadriceps sets, sit to stand, exercises on stairs, lunges, gluteal sets, hip abductor sets, and pedaling on an exercise bike. Exercises were modified according to the length of time postsurgery, and some patients did not have an exercise bike at home. If after completion of the rehabilitation program (class or home) the physiotherapist identified a need for the patient to complete further physiotherapy or to have additional allied health intervention, then the patient was referred on appropriately.

Professional Time Analysis

Time efficiency for the 2 groups was evaluated by direct (patient contact) and indirect (preparation, documentation, cleanup, and follow-up) time spent per patient by staff over each 4-month period. For the class group, total staff time included time spent by the physiotherapists and physiotherapy assistant. The class time for the physiotherapist was calculated to include a 60-minute rehabilitation session and 5 minutes of documentation per patient. The time for the physiotherapy assistant was calculated to include the 60-minute rehabilitation session and 30 minutes total preparation and cleanup per class. For the physiotherapy home group, indirect time included driving.

Outcome Measures

Primary outcome. All patients were evaluated by a single physiotherapist, unblinded to groups. The primary outcome measures, the WOMAC[12] and SF-36[13] questionnaires, were completed by the patient preoperatively and at 5 and 12 weeks postoperatively. The TUG and knee ROM were recorded at hospital discharge and at 5 and 12 weeks postoperatively (table 1).

To perform the TUG, the patients started seated in a standardized chair (seat height between 44 and 47cm), walked 3m,

Table 1: Outcome Measures Completed at Various Times: Preoperatively, at Hospital Discharge, at 5 and 12 Weeks

Outcome Variables	Preoperative	Hospital Discharge	5wk	12wk
WOMAC	✓		✓	✓
SF-36	✓		✓	✓
TUG		✓	✓	✓
Knee ROM		✓	✓	✓
Patient evaluation questionnaire			✓	
6-m walk test		✓	✓	✓

turned, returned to the chair, and sat down. Patients used their normal walking aid for indoor walking and were given no physical assistance when instructed to stand. Time was recorded for the completion of the entire activity, commencing on the instruction to get up, according to the established protocol.[14]

Knee flexion ROM was measured using an active test, with the patients seated. Patients were asked to slide the heel of their operated leg backwards to a position of maximum knee flexion. Knee extension was measured using an active test with the patients supine, resting their operated leg over a rolled towel. Patients were asked to lift their foot and extend their knee to its maximum position. Both the flexion and extension angles were measured using a goniometer.

Secondary outcome. Secondary outcome measures included a 6-m walk test and a patient evaluation questionnaire. The 6-m walk test was used as a measure of gait velocity. Patients were asked to walk as quickly as possible in a straight line on a 6-m path. This information was then interpreted using existing normative data.[15]

Patient satisfaction was evaluated using a questionnaire. Questions included the level of information provided, access to services and transport, access to equipment for exercises, and satisfaction with the skills of the staff. Patients responded using a 5-point Likert scale and could add comments. It was completed at 5 weeks (when patients had completed physiotherapy).

Data Analysis

Patient demographics for each group were compared to assess whether the 2 groups were comparable before intervention by using a Student *t* test for interval data (age and WOMAC scores) and a chi-square test for categorical data (sex, hip or knee replacement). Differences in outcomes between treatment groups and between visits for the WOMAC, TUG, and 6-m walk test were analyzed using linear mixed models analysis, in order to control for sex and age and adjust for multiple tests. SF-36 data were calculated as PCS and MCS, and analyzed for differences between the preoperative and postoperative periods and for differences between the 2 treatment groups by using a linear mixed models analysis, controlling for age and sex. Bonferroni adjustment was made to confidence intervals for post hoc analysis. Interval data were reported as estimated marginal means and standard error of the mean (±SE). Where data were found to be nonparametric distributions, they were analyzed using a Mann-Whitney *U* test, and the data were reported as mode and range. This included the patient evaluation questionnaire. Significance levels were set at 95% for all tests.

To assess whether one treatment group had improved outcomes compared with the other, the minimum clinically important improvement scores for the WOMAC[16] and SF-36[17] were used to determine required sample size. For an 80% probability that the study will detect a treatment difference at a 2-sided 5% significance level, if the true difference between the treatments is 8 (knee replacement) or 9 (hip replacement) points of the WOMAC score out of 100, then 26 and 52 people, respectively, would need to enter the study (assuming an SD of 12 points). A sample group of 49 would be required to detect a clinically important difference for the PCS and MCS of 6 points, at which level patients can be expected to describe a clinical improvement (assuming an SD of 11 points).

RESULTS

Comparison of Groups Before Intervention

The exercise class group consisted of 25 patients (7 men; 28%), and the group that received home-based physiotherapy consisted of 26 patients (16 men; 62%). However, 1 male participant died during the follow-up period, and 2 could not be contacted to complete the final 12-week testing, leaving 23 for analysis. The age of the patients ranged from 38 to 86 years (mean, 68y).

Preintervention, the class and home physiotherapy groups demonstrated homogeneity in age (mean age ± SD: class group, 66±11y; home group, 70±11y), LOS (mean LOS ± SD: class group, 6.5±2.4d; home group, 6.5±2.5d), the SF-36 scores for physical domains (mean PCS ± SD: class group, 30.0±7.3; home group, 29.5±7.1 out of 100) and mental domains (mean MCS ± SD: class group, 48.5±11.1; home group, 47.1±12.0 out of 100), and WOMAC scores (mean score ± SD: class group, 52.5±19; home group, 56.2±20) (table 2). More men were in the home physiotherapy group (65% vs 9% in the class group, $\chi^2_{3,50}$; $P=.007$). Also comparable between groups were the side of the joint replacement (right side: class group, 12/25; home group, 11/26), the number of bilateral joint replacements (class group, 4; home group, 3), and the number of hip and knee replacements in each group (hips: class group, 7/25; home group, 10/26). At hospital discharge, the 2 groups were similar for TUG (mean time ± SD: class group, 32.6±17s; home group, 29.8±16s), 6-m walk test (mean time ± SD: class group, 16.4±10s; home group, 14.0±7s), knee flexion ROM (mean ± SD: class group, 87.4°±13°; home group, 95.2°±10°), and knee extension ROM (mean ± SD: class group, –13°±8°; home group, –8.9°±7°).

Table 2: Changes in Outcomes Over Time (analysis of variance)

	Class Group			Home Group		
Outcome Measure	Preoperative/Hospital D/C	5wk	12wk	Preoperative/Hospital D/C	5wk	12wk
WOMAC	52.5±19	29±16	20.5±20	56.2±20	24.2±16	13.6±9
SF-36:						
PCS	30.0±7.3	37.3±8.5	42.7±8.9	29.5±7.1	36.4±6.3	40.8±9.8
MCS	48.5±11.1	45.0±11.0	52.3±10.0	47.1±12.0	45.7±13.6	51.0±10.9
TUG (s)	32.6±17	10.7±4.5	8.2±3	29.8±16	11.3±4.5	8.8±5
Knee flexion (deg)	87.4±13	114.2±13	118.8±13	95.2±10	116.3±12	120±13
Knee extension (deg)	−13±8	−2.8±3	−1.2±2	−8.9±7	−1.6±4	−1.1±3
6-m walk (s)	16.4±10	5.8±2	4.51±1	14.0±7	6.4±4	5.2±2

NOTE. Data are mean ± SD.
Abbreviation: D/C, discharge; deg, degree.

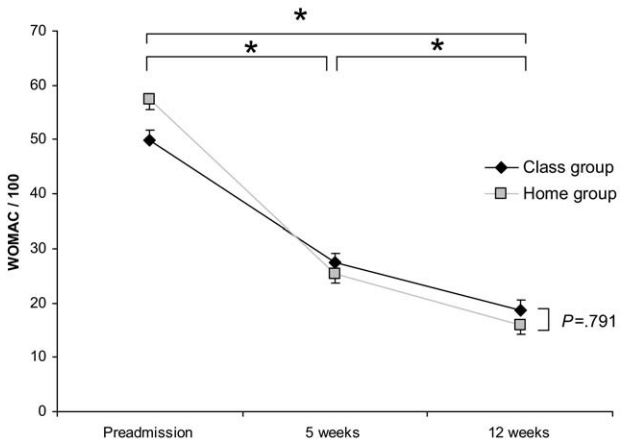

Fig 1. WOMAC scores for the class and home physiotherapy groups. As function improves, WOMAC scores decrease. The scores showed improvement at each time point (preoperative to 5 weeks, to 12 weeks recovery [*P*<.001]), but no difference between groups. Data are presented as mean ± SD. **P*<.01.

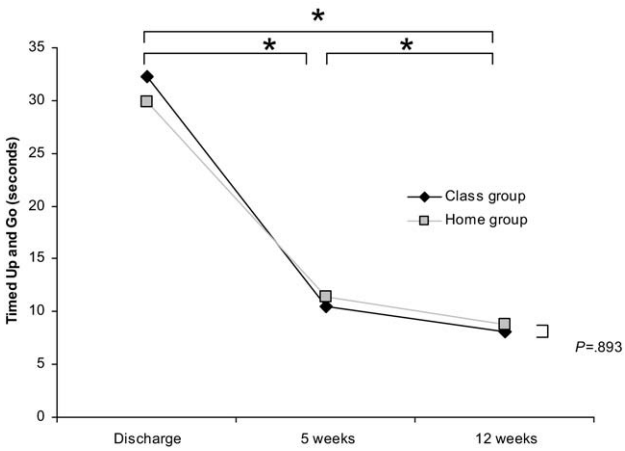

Fig 3. Values for TUG after total joint replacement showed strong improvements (*P*<.001), particularly between discharge from hospital and 5 weeks, but no difference between the 2 treatment groups (*P*=.893). Data are presented as mean ± SD. **P*<.01.

Changes in Outcomes Measured Over Time

During the recovery period, WOMAC scores displayed improvements at all 3 time points (preoperative, 5 weeks, and 12 weeks; $F_{2,47.8}=117.8$, $P<.001$; Bonferroni post hoc comparison showed improvements at each visit, $P<.001$) (fig 1). However, there was no significant difference between the class and home groups ($F_{1,47.8}=.071$, $P=.791$), and no interaction between groups and visits, which may have suggested the intervention was influential at a particular time point ($F_{2,48.6}=2.088$, $P=.135$). For example, the estimated marginal mean difference between the class and home group at 12 weeks was 2.7 after controlling for age and sex. SF-36 PCS showed improvements at each visit ($F_{2,48.9}=59.933$, $P<.001$), but there was no difference between the groups ($F_{1,48.4}=.707$, $P=.404$) and no interaction between groups and visits ($F_{2,48.5}=.357$, $P=.701$) (fig 2). For example, at 5 weeks, the difference between the estimated marginal means for the 2 groups was 1.3±1.6, and at 12 weeks was 2.8±1.9, which is not statistically or clinically significant. SF-36 MCS showed improvements at each visit ($F_{2,48.0}=9.296$, $P<.001$), but there was no difference between the groups ($F_{1,47.5}=.084$, $P=.828$) and no interaction between groups and visits ($F_{2,48.1}=.220$, $P=.803$). For example, the difference between the estimated marginal means for the MCS of the 2 groups was 0.8±2.5 at 5 weeks and 1.2±2.1 at 12 weeks, which is not clinically or statistically significant.

Patients performed the TUG test faster at each time interval ($F_{2,46.2}=68.190$, $P<.001$). For example, considering the entire cohort, the patients had improved their times from 31.1±2.4 seconds at discharge home to 10.9±0.6 seconds at 5 weeks, and to 8.4±0.6 seconds at 12 weeks. There was no difference between the class and home groups for the TUG test ($F_{1,52.4}=.018$, $P=.893$) (fig 3), and there was no interaction between groups and visits, suggesting the interventions were influential at certain times ($F_{2,46.2}=.261$, $P=.772$) (see fig 3).

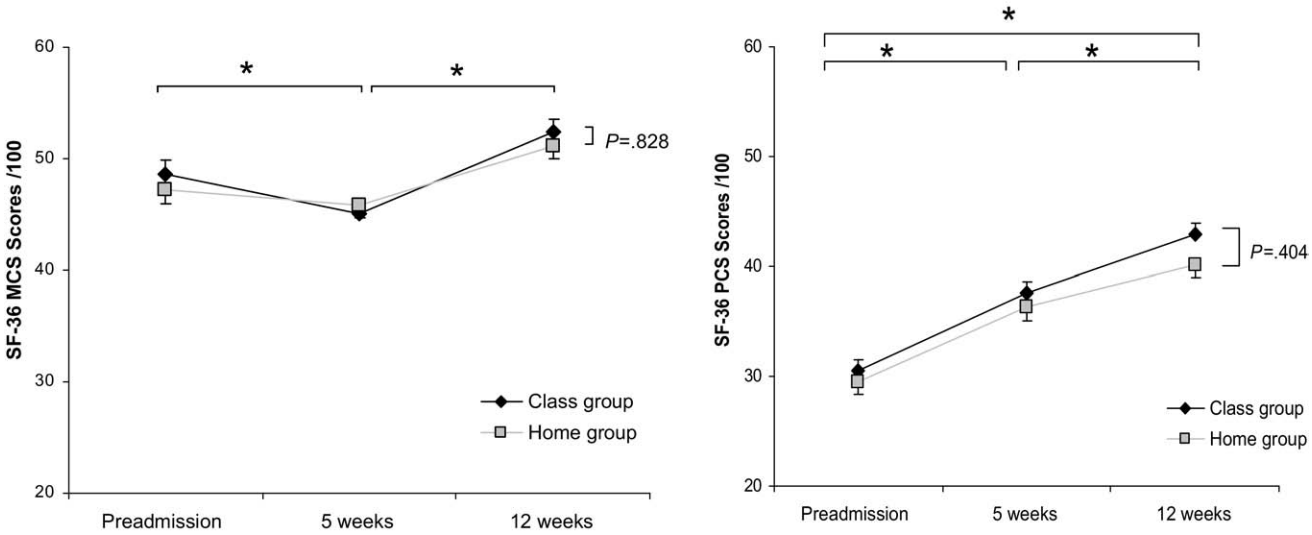

Fig 2. SF-36 PCS and MCS scores for the class and home physiotherapy groups at preadmission, 5 weeks, and 12 weeks. There was no difference between the groups. Data are presented as mean ± SD. **P*<.01.

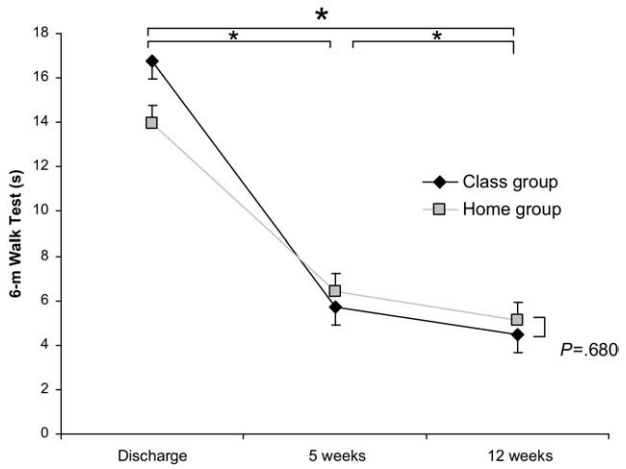

Fig 4. The 6-m walk test demonstrated improvements at each visit, but no difference between class and home physiotherapy groups. Data are presented as mean ± SD. *$P<.01$.

The 6-m walk times displayed major improvements between hospital discharge, 5 weeks, and 12 weeks ($F_{2,46.9}=36.611$, $P<.001$) (fig 4). A mean time of 4.5±0.4 seconds for the class group and 5.1±0.4 seconds for the home group was measured at 12 weeks, indicating that patients were returning to speeds to enable safety in the community environments.[15] There was no difference between the 2 treatment groups for the 6-m walk test ($F_{1,50.3}=.172$, $P=.680$). For example, at 5 weeks, the difference between the estimated marginal means for the 2 groups was 0.7±0.6 seconds, and at 12 weeks was 0.7±0.4 seconds, and there was no interaction between groups and visits ($F_{1,46.8}=.960$, $P=.390$).

Knee flexion ROM improved at each visit ($F_{2,29.5}=73.4$, $P<.001$) (fig 5). For example, from hospital discharge to the 12-week assessment, flexion increased from 87°±13° to 118°±13° in the class group, and from 95°±10° to 120°±13° in the home group. There was no difference between the 2 treatment groups for knee flexion ($F_{1,28.2}=.335$, $P=.567$). For example, at 5 weeks, the difference between the estimated marginal means for the 2 groups was 0.2°±3°, and at 12 weeks was 1°±3°, and there was no interaction between groups and visits ($F_{2,29.6}=1.071$, $P=.355$). Knee extension ROM improved at each visit ($F_{2,30.1}=36.129$, $P<.001$). For example, between hospital discharge and 12 weeks, knee extension had improved for the class group from –12.9°±2° to –1.2°±0.6°, and for the home group from –9.1°±2° to –1.1°±0.7°, where figures approaching zero indicate a straighter knee. There was no difference between the 2 treatment groups for knee extension ($F_{1,32.1}=1.307$, $P=.261$) and there was no interaction between groups and visits ($F_{1,30.1}=2.597$, $P=.091$).

Patient evaluation questionnaire. Eighteen (71%) of 25 patients in the class group, and 21 (91%) of 23 in the home group returned a completed patient evaluation questionnaire. For each group, the mode of the responses to all 4 questions was a rating of 5 out of 5 on the Likert Scale, and there was no difference between the groups ($P\geq.500$). One patient in the class group did report dissatisfaction with access to transport and with the level of information provided. However, strong positive responses from both groups indicate that both home and class groups were generally satisfied with the rehabilitation they received.

Professional Time Analysis

Program efficiency was evaluated between groups in terms of therapists' time efficiency. For home visits, a single therapist traveled to the patient's home. The mean time ± SD of the home visits consisted of 38.2±10 minutes of direct time and 25.6±10 minutes of indirect time (mostly traveling). Each home visit patient had a mean of 3.96 visits in the program, totaling 152±32 minutes per patient. Indirect time for the home group was 97±24 minutes per patient.

During the class, rehabilitation staff numbers varied. If there was a single patient, a single physiotherapist attended; if there was more than 1 patient, an assistant also attended, and for a group of greater than 6 patients, 3 staff attended (2 physiotherapists, 1 assistant). There were 5 occasions when the therapist worked the class alone, 16 occasions when the therapist and assistant worked the class, and 13 occasions with 3 staff

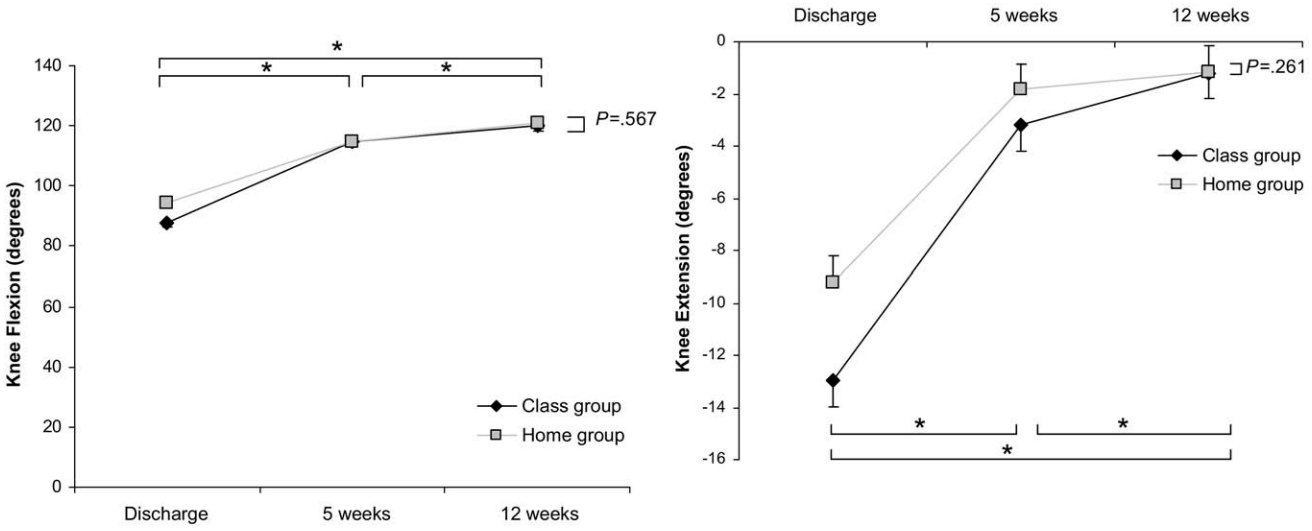

Fig 5. Knee flexion and extension ROM showed improvements at each visit, but no difference between the class and home physiotherapy groups. Data are presented as mean ± SD. *$P<.01$.

present. Classes were 60 minutes, and each patient attended a mean of 7.5 classes.

Direct staff time per patient visit, given variations in staffing, was a mean ± SD of 26.5±11 minutes, and indirect time was a mean of 10 minutes per patient visit (5min of therapist indirect time and 5min of assistant indirect time). During the course of the program for class patients, direct staff time was a mean of 198 minutes per patient, and indirect staff time was a mean of 75.2 minutes, including the occasions when 3 staff members were working. Consequently, classes resulted in less physiotherapist's time per visit (direct and indirect; $P=.122$), but total staff time was greater for the class program, because patients attended more classes, and frequently increased numbers of staff were needed to work the class. The maximum number of patients seen per class was 12, twice a week, and for home visits was 3 or 4 in one afternoon.

DISCUSSION

The normative data interpreted from Brock et al[15] predict a necessary speed of approximately 5 seconds to walk 6m to enable crossing a Melbourne intersection. Our data for both groups at 12 weeks demonstrates the ability of both groups, irrespective of the form of rehabilitation they received, to return to an appropriate and safe level of ambulation in society.[15] Results obtained by both groups for TUG also compare well with community-dwelling older adults.[18,19]

Class programs are perceived by staff and health service providers to be a preferred option because of efficiency and social benefits.[7] The change in mode of rehabilitation to the class method for the trial incurred no additional cost because the infrastructure was already available and no consumables were required. The satisfaction level of patients participating in the class was equivalent to that of patients receiving home-based therapy in this study, so perhaps staff managing the class achieved a balance between individual attention and individual exercise prescription and class motivational effects. The class method of rehabilitation did require the increased use of community transport for those patients who did not have family or social networks available to them. We do take into consideration that if this service is not available, the implementation of the class may not be an ideal option, although support to offer these classes within the community could then make them more widely available and decrease the concern associated with patient transport. Our class concept, since the study completion, has now been used as a reference for the establishment of a rehabilitation service for the same patient group in the community after discharge from other acute care facilities in the city.

In our study, we suggest that the group method is the optimal choice of rehabilitation in this patient set. The direct total time for classes was shown to be higher as a result of using 3 staff members at times, but time per patient, direct and indirect, was still less per visit, and total indirect time was 22 minutes less per patient in classes. This is now time the therapist can use for more clinical tasks, teaching, and quality improvement activities rather than driving, which comprised a major time burden for home visits.

The class program did allow for a greater capacity for patient services. For example, the classes offered 8 possible physiotherapy sessions compared with 4 for the home visit recipients, as well as the utilization of group dynamics. A greater change might therefore be expected in the group that received more physiotherapy intervention, but that was not demonstrated by our data. This leads us to question whether offering the class once weekly (halving the number of sessions) could further increase the efficiency of our class program. This program was in its infancy during the trial, and we are now aiming to improve our staff-to-patient efficiency as the class becomes a more established program. We are improving the effectiveness of the class option from a professional time analysis perspective by not requiring the use of a third physiotherapist. Furthermore, the class setting allows participation by junior staff members in the management of joint replacement rehabilitation. This opportunity cannot always be afforded to them if rehabilitation is provided offsite.

To our knowledge, this study is the first to evaluate the outcomes of group rehabilitation versus home rehabilitation, including the efficiencies of both. Our study aimed to evaluate the current physiotherapists' practice and compare its effectiveness with that of a group method of service delivery supported through literature to improve efficiency and outcomes for patients.[11,20,21] Physiotherapists are determined to achieve evidence-based practice, so we hope this study will stimulate a reflection on current practices and contribute to best practice. Benchmarking between similar providers had shown us that the class type of service is already being delivered with good results anecdotally. Our physiotherapy team supports the view of Naylor et al,[6] that with little good evidence for one-to-one physiotherapy rehabilitation, more economical group programs deserve more consideration. Especially in the public hospital system, we agree that there is a need to identify the most cost-effective mode of physiotherapy intervention for this patient population.

We acknowledge that after joint replacement surgery there are patients with special needs for whom one-to-one rehabilitation may be more advantageous than the class. An example would be patients with multiple comorbidities. Age alone, however, should not be a limitation, because our oldest patient in the trial was 86 and did well. Medical comorbidities, poor home environment, and lack of social support may also be issues requiring special consideration. However, comorbidities did not affect participation in the class rehabilitation in our study.

This article has described the clinical effectiveness of 2 methods of providing physiotherapy rehabilitation for patients after joint replacement surgery. The findings of this trial have important implications to clinical practice, as both programs led to a similar improvement in patients' physical and quality-of-life status. The class-based exercise rehabilitation was demonstrated to be the most efficient method of delivery of the physiotherapy service.

Study Limitations

Findings of this study must be considered in the light of limitations of the study design. It is a cohort study with no control group. Consequently, it is not possible to attribute all improvements in function to the treatment, because improvements could have been the effect of time since surgery. Patients were not randomly assigned to treatment groups, and assessors were not blinded. It was not possible to randomize groups because of resource constraints, as the 2 treatments were delivered in sequence. The sample size was small and barely reached adequate power; however, the mean differences between the 2 intervention groups did not approach statistical or clinical significance. The follow-up period was short, at 12 weeks, and follow-up at 6 months may have been more sensitive to sustained differences between the groups. Finally, the cost analysis of the study would be strengthened by including costs of infrastructure, which in this case were already available, and costs to patients for transport and time. However, this is the first study to attempt to measure the costs of 2 programs for postarthroplasty rehabilitation, and demonstrates that health

institution costs are not borne out by improved outcomes in the more expensive home visit model of care.

CONCLUSIONS

This study found no clinical or statistical difference in outcomes between physiotherapy rehabilitation conducted in the patient's home and exercise group rehabilitation in the hospital. Some efficiency was delivered by the group program, with more direct time spent with patients, although patients in the class setting did attend more sessions and consequently had more time with the therapist. All patients recorded statistically and clinically important improvements in function and impairment, and these improvements continued at 12 weeks.

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