Introduction

Since the introduction of casemix-based funding to Victoria in 1993, the length of stay in acute care for patients undergoing knee joint arthroplasty has decreased markedly. Average length of stay in 1992 was 16.8 days and by 1999 was 9.2 days (Victorian Public Health Policy and Funding Guidelines 1999).

The current health care climate promotes a decreasing length of stay, with early discharge and care at home actively encouraged (Baume and Wolk 1995). Most patients undergoing elective knee arthroplasty should be discharged directly home from the acute care facility. During the study period, mean hospital length of stay across the three hospitals was 6.5 days, more than 30% less than the Victorian average for the preceding year. In that time, 56% of patients had achieved functional independence sufficient for discharge directly home, however only 36% were actually discharged home. The reasons identified for discharge to rehabilitation despite the achievement of sufficient functional independence included pressure on clinicians to decrease length of stay and the need to make decisions regarding discharge early in the post-operative recovery when the eventual patient outcome may still be unclear. Unnecessary discharges to rehabilitation increase the overall length of stay in the health care system and costs per patient. This finding suggests a method of risk screening is required to assist clinical decision making with regard to discharge. [Oldmeadow LB, McBurney H and Robertson VJ (2002): Hospital stay and discharge outcomes after knee arthroplasty: Implications for physiotherapy practice. Australian Journal of Physiotherapy 48: 117-121]

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arthroplasty, in three acute public hospitals in Melbourne, Victoria. The purpose of the study was to describe rates of discharge to home within the context of shorter hospital lengths of stay and to describe the patients’ functional mobility levels at discharge. Possible implications for physiotherapy practice are discussed.

Methods

A prospective observational study investigated 35 consecutive patients admitted for knee arthroplasty at each of three acute public hospitals in Melbourne between October 1999 and March 2000. The hospitals were chosen on the basis of availability of a staff physiotherapist willing to participate in data collection and reliability testing required for this study. Patients were included regardless of whether the surgical prosthesis was a total or hemi knee arthroplasty, the pathology osteoarthritis or rheumatoid arthritis, and the surgery a primary or revision procedure. Reasons for exclusion were knee arthroplasty for metastatic disease or trauma, transfer out of the acute orthopaedic ward for medical reasons, or discharge to a country hospital. University and hospital ethics committees approved the study and informed consent was obtained as required.

Post-operative care Post-operative medical and nursing care followed similar clinical pathway guidelines at each hospital. Physiotherapy at each consisted of standardised programs of exercise and gait retraining (Enloe et al 1996). Weekend service was provided at the discretion of the physiotherapist, as was the use of continuous passive motion machines and cryotherapy. Occupational therapy, social work interventions and post-acute care services were available to patients as needed.

Patients discharged directly home were required to be medically stable with independent functional mobility if living alone and able to manage with supervision if living with others. Functional mobility criteria included household level transfers and ambulation and the negotiation of stairs, using minimal gait aids. Each hospital encouraged restoration of maximum knee flexion motion while not prescribing a minimum range for discharge.

Data collection On admission, the treating physiotherapist recorded data from each patient including gender, age, preoperative mobility, range of knee motion and level of social support available. Preoperative mobility was graded as mobile in the community or housebound. “Housebound” was defined as being unable to independently leave the home property due to disability. The social support measure related to the availability or otherwise of an on-site carer at home.

Outcome measures Data collected at discharge included length of stay (days from admission to discharge, as all hospitals implemented surgery on the day of admission), discharge destination (home or rehabilitation), range of knee motion at discharge and the patient’s functional mobility score using the Iowa Level of Assistance Scale (Shields et al 1995; see Appendix of Jesudason and Stiller 2002, this issue.). The Iowa Scale was developed specifically for use with patients with joint arthroplasty and has been shown to be reliable, valid and responsive (Shields et al 1995). The scale rates specific tasks of transfer, ambulation and step negotiation from independent (0) through supervision (1) to assistance (2-4) and unsafe to test (5). “Ready for discharge home” was defined as Iowa scale 0 or, if living with a carer, 1. Intratherapist and intertherapist reliability for the Iowa Scale was tested on nine physiotherapists involved in the study. Their test-retest evaluation of three patient videotapes, presented in random order and 90 minutes apart, was high (weighted Kappa = 0.74 (95% CI, 0.60-0.88), p = 0.22).

The range of knee movement was measured by the treating physiotherapist using a universal goniometer. The intratherapist and intertherapist reliability of this method

Table 1. Length of stay and discharge outcomes in joint arthroplasty studies 1993-2000.

<table>
<thead>
<tr>
<th>Study</th>
<th>Number of subjects</th>
<th>Joint</th>
<th>Mean length of stay (days)</th>
<th>Discharge destination</th>
<th>Discharge function</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Bohannon et al 1993</td>
<td>186</td>
<td>knee</td>
<td>9.9</td>
<td>96% home</td>
<td>100% independent for home discharge</td>
</tr>
<tr>
<td>*Karst et al 1995</td>
<td>116</td>
<td>knee</td>
<td>5.8</td>
<td>78% home</td>
<td>83% independent for home discharge</td>
</tr>
<tr>
<td>*Fisher et al 1997</td>
<td>254</td>
<td>knee</td>
<td>4.0</td>
<td>82% home</td>
<td>not stated</td>
</tr>
<tr>
<td>*Lang 1998</td>
<td>25</td>
<td>knee</td>
<td>5.0</td>
<td>87% home</td>
<td>56% independent for home discharge</td>
</tr>
<tr>
<td>*Heck et al 1998</td>
<td>291</td>
<td>knee</td>
<td>6.9</td>
<td>80% home</td>
<td>not stated</td>
</tr>
<tr>
<td>†Dowsey et al 1999</td>
<td>92</td>
<td>hip/knee</td>
<td>7.1</td>
<td>not stated</td>
<td>not stated</td>
</tr>
<tr>
<td>*Scranton 1999</td>
<td>77</td>
<td>knee</td>
<td>3.2</td>
<td>not stated</td>
<td>not stated</td>
</tr>
<tr>
<td>†Pearson et al 2000</td>
<td>119</td>
<td>knee</td>
<td>8.0</td>
<td>not stated</td>
<td>not stated</td>
</tr>
</tbody>
</table>

* American studies † Australian studies
had previously been established (ICC\((1,1)\) = 0.99, 0.90; Watkins et al 1991).

**Data analysis** Results were analysed using SPSS for Windows (Version 10.0. Chicago: SPSS Inc. 1997). Data were compared using Chi-square, one way ANOVA with post-hoc analysis or \(t\)-tests for independent groups as appropriate. Fisher’s Exact test was used where sample sizes were small. As data for length of stay was not normally distributed, this was adjusted using a natural logarithmic transformation before analysis.

**Results**

Patient demographic data are summarised in Table 2. Patient characteristics on admission were similar between the three hospitals and each group had more women than men (ratio 2.4:1). Mean age of the total group was 71 years (range 50-88 years).

Outcome data are summarised in Table 3. The overall mean length of stay was 6.5 days (95% CI 6.0 to 7.0). This varied considerably between hospitals (\(p = 0.01\)) with the difference between Hospitals A (5.7 days) and C (7.4 days) reaching statistical significance (\(p = 0.003\)). Overall length of stay for patients discharged to rehabilitation (6.1 days, 95% CI 5.5 to 6.9) was shorter than for those discharged directly home (7.2 days, 95% CI 6.5 to 7.9). This reached statistical significance in Hospital B only (\(p = 0.03\)).

Although 64% of patients overall were discharged to rehabilitation, Hospital A had an early discharge policy which resulted in this outcome for all but one of their patients (97%). Rates for Hospitals B and C were 40% and 57% respectively, both being statistically different from Hospital A (\(p < 0.001\)) but not from each other.

All 37 patients discharged directly home (36%) had achieved independent functional mobility (Iowa Scale 0) and were medically stable, as were 22 (20%) of the 68 patients discharged to rehabilitation. Of the others, 17 (16%) were at a supervisory level of functional mobility (Iowa Scale 1) whilst the remaining 29 (28%) still required assistance.

Of the total group, 74% had achieved at least 70 degrees of knee motion within seven days. For Hospitals B and C, there was no significant difference in discharge range of motion for those discharged home or to rehabilitation (\(p = 0.21\)). For all except two patients, postoperative range of motion was not a determinant of discharge destination.

Demographic differences were found between patients discharged to rehabilitation and home, with increased age (\(p = 0.014\)), being female (\(p = 0.07\)) and housebound before admission (Fisher’s Exact test, \(p < 0.003\)) and the absence of a carer (\(p = 0.002\)) all associated more frequently with discharge to rehabilitation.

**Discussion**

Our study found that the lengths of stay for patients undergoing knee arthroplasty in the three public hospitals in Melbourne studied between October 1999 and February 2000 were less than the Victorian average for the preceding year. This achievement was, however, associated with relatively high rates of discharge to rehabilitation facilities (64%). For patients undergoing elective hip and knee arthroplasty, pre-operative medical and social conditions are unchanged by the surgical experience and discharge directly home, with post-acute care as needed, is the preferred destination. Hence, discharge home depends primarily on restoring sufficient functional mobility. In our study, 56% of patients had achieved functional independence in transfers and ambulation adequate for discharge home, but only 36% of patients actually were discharged home. Possible reasons for these findings are explored below.

Of the 68 patients discharged to rehabilitation facilities, approximately one third in each hospital (a total of 22) had already achieved a level of independent functional mobility sufficient for discharge directly home. For eight of these patients, this discharge destination was determined by hospital policy (Hospital A). For the other 14, no medical or social concerns were identified in their histories and the most common reason for discharge to rehabilitation appeared to be the availability of a bed, requested early in the post-operative period. Less common reasons documented were the need for progression from a walking...
frame to crutches (three) having a range of knee motion of less than 55 degrees (two) and needing ongoing wound care (one), all of which may have been managed using post-acute community services.

Physiotherapists report enormous pressure to increase throughput and to discharge early (Ferguson 1998). The current pressure to reduce length of stay affects clinicians in both acute care and rehabilitation facilities. A possible consequence is that those responsible for discharging patients from the acute care are reluctant to refuse a rehabilitation bed that provides an opportunity for immediate discharge, regardless of a patient’s functional progress at the time. The clinical pathway requires confirmation of discharge destination by the second postoperative day and slow progress at that time may mislead the clinicians who make discharge decisions. The challenge to clinicians is to determine the appropriate discharge destination while taking account of potential for variance in postoperative progress noted in previous studies (Wang et al 1997, Zavadak et al 1995). Physiotherapists may lack confidence in predicting successful discharge to home in a day or two when the alternative of immediate discharge to another facility is available.

The present study found that more than half the patients achieved optimal physiotherapy-related outcomes in approximately seven days and up to 72% may have done so with a day or two more in acute care. In an era of an increasing demand for resource justification, physiotherapists need to demonstrate they can achieve effective physiotherapy-related patient outcomes while also meeting the requirements of the hospital and the overall health care system.

**Conclusions**

For the three hospitals studied, acute care lengths of stay during the study period were shorter than for the previous year. This result was, however, associated with high rates of discharge to rehabilitation facilities, some of which appear unnecessary. Further research is needed to develop objective guidelines regarding discharge decision making, to enable appropriate and timely discharge for all patients following knee arthroplasty.

Risk assessment is essential to identify patients for whom additional interventions may change or modify the outcome. Validated risk assessment tools are required to support clinician decision making regarding discharge. The present study found, based on functional status attained in approximately seven days, that knee arthroplasty patients form three broad sub-groups: the independently functionally mobile (56%); those requiring supervision (16%); and those requiring continued assistance (28%). If membership of a functional attainment sub-group could be accurately predicted, those at risk of not achieving the optimal outcomes in the required length of stay could be targeted for customised interventions. We are currently undertaking research to develop such a tool and explore the implications of using it in acute hospitals following total knee arthroplasty.

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