Effectiveness of case management and post-acute services in older people after hospital discharge

Wen K Lim, Sue F Lambert and Len C Gray

ABSTRACT

Objective: To evaluate the benefits of coordinating community services through the Post-Acute Care (PAC) program in older patients after discharge from hospital.

Design: Prospective multicentre, randomised controlled trial with six months of follow-up with blinded outcome measurement.

Setting: Four university-affiliated metropolitan general hospitals in Victoria.

Participants: All patients aged 65 years and over who were discharged between August 1998 and October 1999 and required community services after discharge.

Interventions: Participants were randomly allocated to receive services of a Post-Acute Care (PAC) coordinator (intervention) versus usual discharge planning (control).

Main outcome measures: Comparison of quality of life and carer stress at one-month post-discharge, mortality, hospital readmissions, use of community services and community and hospital costs over the six months post-discharge.

Results: 654 patients were randomised, and 598 were included in the analysis (311 in the PAC group and 287 in the control group). There was no difference in mortality between the groups (both 6%), but significantly greater overall quality-of-life scores at one-month follow-up in the PAC group. There was no difference in unplanned readmissions, but PAC patients used significantly fewer hospital bed-days in the six months after discharge (mean, 3.0 days; 95% CI, 2.1–3.9) than control patients (5.2 days; 95% CI, 3.8–6.7). Total costs (including hospitalisation, community services and the intervention) were lower in the PAC than the control group (mean difference, $1545; 95% CI, $11–$3078).

Conclusions: The PAC program is beneficial in the transition from hospital to the community in older patients.

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VARIOUS HOSPITAL and home-based interventions have been used to improve the quality and efficiency of the discharge process. These have focused on specific diagnostic groups, such as patients with heart failure,[1] or those considered "at risk" of readmission.[2-5] They have included various types of discharge planning[1-6] and specific home-based interventions undertaken mostly by medical and nursing personnel.[1-3,7-9] Results have varied, with some studies showing improved outcomes,[1-3] others being inconclusive,[7,9-11] and one reporting adverse outcomes.[5] A review by Bours and colleagues on the effects of aftercare found that most studies did not report clear benefits.[12]

In Australia, studies have focused on post-discharge interventions administered by hospital-based staff. However, the Post-Acute Care (PAC) program in Victoria was developed as a different model, where PAC coordinators have a separate budget enabling them to purchase both therapeutic services (eg, physiotherapy) and supportive services (eg, personal care and Meals on Wheels) for patients in the immediate post-discharge period. The rationale is that patients are at most risk in this immediate period, particularly with the trend to decreasing length of hospital stay. The PAC program enables a coordinated approach to case management and provision of short-term community services. It is available for all patients aged 18 years and over who require community services.

We evaluated the benefits of the PAC program in patients aged 65 years and over through a randomised controlled trial. This age group was chosen because of its higher risk of readmission and adverse outcomes. To our knowledge, this is the first randomised controlled trial to evaluate a post-discharge service of this nature.

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METHODS

Study population

Four university-affiliated metropolitan general hospitals in Victoria participated in the evaluation. The study was performed between August 1998 and April 2000. Ethics committee approval was obtained from the local ethics committee in all four participating hospitals.

Participants were all patients aged 65 years and over who were discharged between August 1998 and October 1999 and met the eligibility criteria in Box 1.

Assessment and randomisation

Before randomisation, informed consent was obtained from patients, baseline demographic data were collected, and the Assessment of Quality of Life (AQoL) questionnaire was administered.[13] This Australian questionnaire has five dimensions (Illness, Independent Living, Social Relationships, Physical Senses and Psychological Well-being). Patient carers were interviewed using the Caregiver Strain Index.[14]

Patients were randomly allocated to the intervention (PAC) or control group

1: Eligibility criteria for the Post-Acute Care (PAC) study

Inclusion criteria were:

- Patients were in an acute ward for over 48 hours and were discharged home;
- Patients were expected to live at least one month post-discharge; and
- Patients and carers were able to give informed consent.

Exclusion criteria included:

- Patients admitted from or discharged to a nursing home or hostel;
- Patients discharged from an emergency department; and
- Obstetric or psychiatric patients.

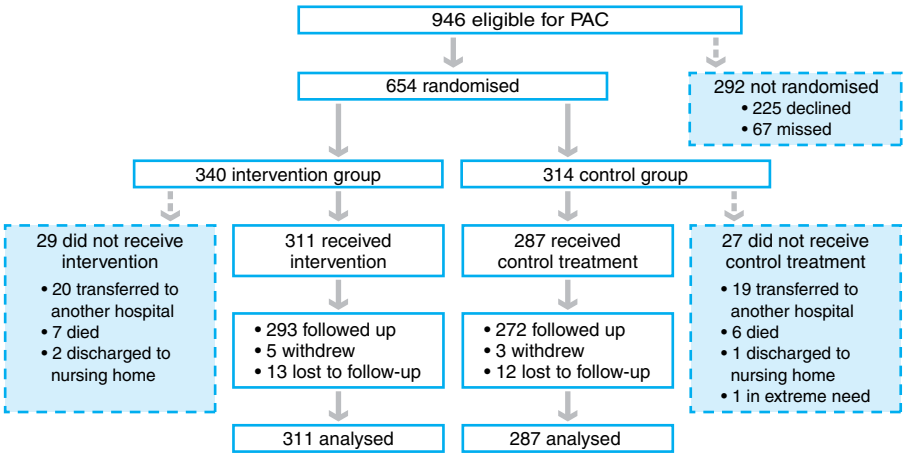
Patients were eligible for study enrolment if they met the following risk criteria:

- The patient was likely to have mobility or self-care management problems OR met two or more of the following:
  - The patient lived alone;
  - The patient had responsibilities for caring for others at home; or
  - The patient used community services before hospital admission;

AND

- The patient required community services on discharge.

2: Patient allocation for the Post-Acute Care (PAC) study



by computer-generated numbers. These were provided in sequentially numbered, sealed envelopes which were opened after baseline interviews.

Intervention

Participants in the PAC group were referred to a PAC coordinator. PAC coordinators were hospital-based staff with allied health or nursing backgrounds, who assessed patients and helped develop a discharge plan. Although this process was similar in approach to usual practice, PAC coordinators provided considerably more time and expertise than usually available. They also provided short-term case management, including:

- telephone follow-up as required;
- availability to patients in the event of a crisis;
- liaison with service providers (eg, local councils and nursing agencies);
- coordination of service provision; and
- ensuring adequate referral before discharge from the PAC program (eg, to councils or community health centres).

A budget was available to PAC coordinators to purchase community services directly for patients in the post-discharge period, enabling them to deliver a substantial patient-centred service plan unavailable to control patients.

Control patients received usual hospital discharge planning, provided by ward nursing staff and the social work department. Services were typically limited to several nursing visits per week, as well as community services, such as delivered meals and housekeeping support.

Outcomes and follow-up

Research staff who administered questionnaires and assessed outcomes were blinded to patient allocation. The primary outcome measure was hospital readmissions in the six months after trial recruitment. Secondary outcomes were quality of life and carer stress one month after discharge, mortality, hospital and community service utilisation, and health-related service costs in the six months after discharge.

Primary diagnosis and clinical outcomes, including unplanned readmissions, were obtained from review of hospital case notes. Information was available for unplanned readmissions only to the same hospital. Secondary databases included the Victorian Admitted Episodes Database (VAED) (for hospital utilisation) and the Victorian Office of Births, Deaths and Marriages (for survival). Data were also obtained directly from the main community service providers.

Statistical analysis

Statistical analysis was performed using SPSS.[15] Analysis was by modified intention to treat. The study aimed to recruit 720 patients aged 65 years or over. Allowing for an attrition rate of 20%, this would give about 600 patients available for analysis ($\alpha=0.05$ and $\beta=0.2$), which would allow the study to detect a 15% difference in readmission rates.

Continuous variables were compared between groups using *t* tests. Although health services data were skewed, it was felt that, because of the nature and size of the study, parametric tests were sufficiently robust to allow comparison between groups. For categorical variables, Fisher's exact test or Pearson's χ^2 test was used. To examine interaction between variables, stepwise multiple linear regression was used where the dependent variable was continuous. Log rank analysis was then used to compare differences between the intervention and control groups.

Economic analysis

The outcome assessed was total costs after the intervention over the six months of follow-up. To generate the average cost for each bed-day, we calculated the costs for each admission for all patients in the 12 months before recruitment and the six months after recruitment and averaged this across all hospital days. Costs of community services were obtained from the providers. Cost of coordinating care was calcu-

3: Demographic and baseline medical characteristics of 598 patients

	PAC group (*n*=311)	Control group (*n*=287)
Mean age (years) (95% CI)	76.5 (75.7–77.2)	76.8 (76.0–77.5)
Male sex	124 (40%)	123 (43%)
Born overseas	174 (56%)	126 (44%)
Private insurance	50 (16%)	46 (16%)
Main income from government pension	215 (69%)	189 (66%)
Highest education		
Diploma/certificate	218 (70%)	192 (67%)
University	72 (23%)	75 (26%)
Index admission		
Unplanned	208 (67%)	198 (69%)
Mean days of stay (95% CI)	10.0 (8.8–11.1)	10.4 (9.5–11.4)
Diagnostic group		
Medical	155 (50%)	154 (54%)
Surgical	156 (50%)	133 (46%)
Complications	99 (32%)	95 (33%)
Mean number of comorbidities (95% CI)	2.3 (2.1–2.4)	2.3 (2.1–2.5)
Mean number of medications (95% CI)		
On admission	4.8 (4.5–5.2)	4.7 (4.3–5.1)
At discharge	6.2 (5.8–6.6)	6.3 (5.9–6.7)

PAC = Post-acute care.

lated as the budgets of the PAC projects, excluding the total amount spent on community services, divided by the number of clients seen. All costs were adjusted for 1998–1999 values.

RESULTS

Characteristics of participants

A total of 654 patients were recruited, and 598 were included in the analysis. Patient allocation is shown in Box 2. There were no significant differences between the groups in demographic characteristics, diagnostic categories, comorbidities, number of medications used, other baseline admission characteristics and length of hospital stay during the index admission (Box 3).

There was also no difference between the patient groups in mortality, both in terms of proportion of patients who died during the six months of follow-up (6% in both groups; χ^2, P=0.92) and time to death (log rank analysis, P=0.84).

Quality of life and caregiver strain

All patients completed the AQoL at baseline, and 540 completed it at one-month follow-up. At baseline, there was no difference in quality-of-life scores between the two groups, except in independent living, where the PAC group had a lower mean baseline score than the control group (0.4 v 0.45 on a scale of 0–1, with a higher score representing better quality of life; P=0.02). However, the groups differed significantly in changes in scores between baseline and one-month follow-up (Box 4). The PAC group had significantly greater improvements in independent living (P=0.002) and overall quality-of-life scores (P=0.02).

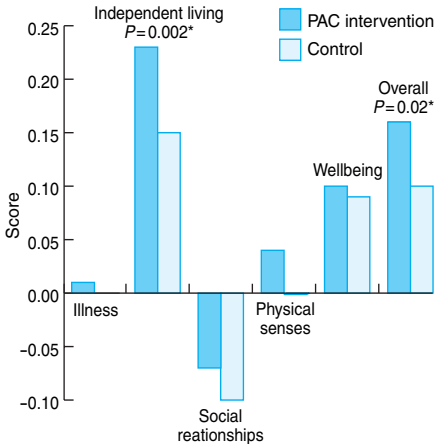
Caregiver burden was assessed at baseline and one-month follow-up for 263 patients (140 PAC and 123 control). There was no significant difference in scores for the Caregiver Strain Index between PAC and control patients (mean score, 3 for both groups, on a scale of 0–10).

Use of hospital and community services

In the six-month follow-up period, there were no significant differences between the PAC and control groups in unplanned readmissions to the index hospital or emergency department presentations (Box 5). However, hospital bed-day use was significantly lower in the PAC group than in the control group (mean, 3.0 days v 5.2 days; P=0.01; mean difference, 2.2 days; 95% CI, 0.5–3.9).

Using multiple linear regression analysis, with hospital bed-day use as the dependent variable, the strongest predictor of this use was unplanned admissions in the 12 months before recruitment, followed by length of stay during the index admission. The PAC intervention was significantly negatively correlated with hospital use in the six-month follow-up period (P=0.009).

4: Change in scores on the Assessment of Quality of Life questionnaire* between baseline and one-month follow-up



*Range of scores for each dimension and for overall score was 0–1, with higher scores representing better quality of life.

Nursing and personal care services made up a significantly greater proportion of the community services used in the six months post-discharge by PAC participants than by control participants. In contrast, Meals on Wheels services made up a greater proportion of services used by control participants (Box 5).

Costs

There were no significant differences between groups in costs of community services used in the 12 months before the index admission and the six months after discharge (Box 6). However, hospital utilisation costs in the six months after discharge were significantly lower in the PAC group than in the control group (mean difference, $1770; 95% CI, $237–$3304). Total costs, including costs of the intervention ($292.40 per PAC client), hospitalisation and use of community services over the six months of follow-up, were also significantly lower in the PAC group (mean difference, $1545; 95% CI, $11–$3078).

DISCUSSION

This study provides evidence that coordinating the provision of short-term community services and providing fol-

5: Use of hospital and community services

Service	12 months before admission: PAC group (*n*=311)	12 months before admission: Control group (*n*=287)	*P*	6 months after discharge: PAC group (*n*=311)	6 months after discharge: Control group (*n*=287)	*P*
Hospital						
Unplanned admissions (mean, 95% CI)	0.5 (0.3–0.6)	0.4 (0.3–0.5)	0.61	0.4 (0.3–0.5)	0.5 (0.4–0.6)	0.19
Emergency visits (mean, 95% CI)	0.1 (0.0–0.1)	0.1 (0.0–0.1)	0.11	0.1 (0.0–0.1)	0.1 (0.0–0.1)	0.95
Patients with unplanned admissions	80 (26%)	74 (26%)	0.39	75 (25%)	79 (28%)	0.25
Patients with emergency visits	19 (6%)	11 (4%)	0.18	20 (6%)	18 (6%)	0.99
Hospital days used (mean, 95% CI)	NA	NA	NA	3.0 (2.1–3.9)	5.2 (3.8–6.7)	0.01*
Community services (number of episodes, % of all service episodes)						
Meals on Wheels	1626 (37%)	2038 (43%)	< 0.001*	1030 (18%)	1831 (33%)	< 0.001*
Nursing	1277 (29%)	1511 (32%)	0.001*	3300 (58%)	2882 (52%)	< 0.001*
Home care	794 (18%)	538 (11%)	< 0.001*	623 (11%)	605 (12%)	0.73
Personal care	505 (11%)	546 (11%)	0.84	540 (10%)	136 (3%)	< 0.001*
Other	219 (5%)	95 (2%)		172 (3%)	55 (1%)	

PAC = Post-acute care. *Difference is significant ($P<0.05$) by comparison of means (continuous variables) or χ^2 test with proportions.

low-up through the PAC program can be a beneficial component of discharge planning. The PAC program led to greater improvement in overall quality of life at one month after discharge and a reduction in hospital bed-day utilisation in the six months after discharge, with an apparent reduction in health-care costs.

The model of care was important in generating these outcomes. PAC coordinators are trained to identify and target community services to meet patient needs, have a good working knowledge of local community services and can obtain services at short notice. The capacity to purchase services with a dedicated budget adds flexibility. The ability of the PAC intervention to reduce hospital stay among readmitted patients may relate to the fact that community service structures are already in place among these patients, allowing faster discharge planning. The failure of PAC to reduce mortality or readmissions is not surprising given the generic nature of the intervention and the absence of any medical intervention.

Although patients were aware of their study status, the research staff who administered questionnaires and assessed outcomes were blinded to it. This study design is therefore not significantly different from that of other health service studies on older patients.[1-3]

A further study limitation relates to the cost analysis, which used averages for costs of community services and hospital bed-day utilisation. Although a more accurate estimate of costs would have been to follow up each individual and cost each component of their admission and community service utilisation, the logistical and budgetary requirements of doing so would have been beyond the scope of this study. The social work intervention in the control group was also not costed, thus underestimating the cost benefit of the PAC intervention. Taking into account this limitation, the PAC intervention apparently reduced costs by reducing hospital bed-days, despite increasing nursing and personal care services. We conclude that coordination and purchase of community services by trained staff confers additional benefits on older patients in the transition from hospital to home.

6: Costs of hospital and community services

	Total cost ($): PAC (*n*=311)	Total cost ($): Control (*n*=287)	Average cost per patient ($): PAC (*n*=311)	Average cost per patient ($): Control (*n*=287)	Mean difference (95% CI)	*P**
Community service use						
Previous 12 months	216 456	341 314	697	1 189	(−148 to 1133)	0.13
6 months post-discharge	142 749	150 962	459	526	(−135 to 269)	0.52
Hospital utilisation (in the 6 months post-discharge)	2 609 290	2 916 207	8 390	10 161	1770 (237 to 3304)	0.02
Total (in the 6 months post-discharge)	2 843 162	3 067 169	9 142	10 687	1545 (11 to 3078)	0.048

PAC = Post-acute care. **P* for difference in average cost between PAC and control group.

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COMPETING INTERESTS

None identified.

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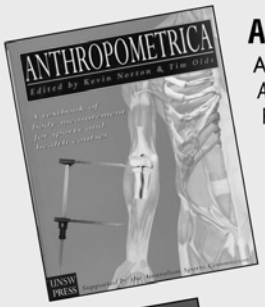

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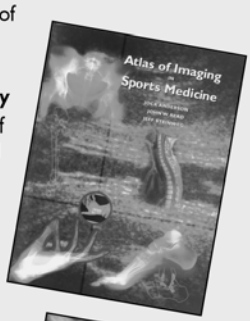

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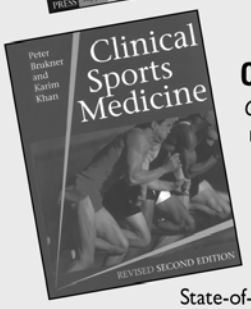

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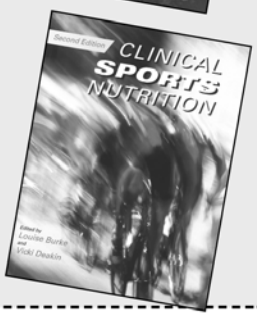

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