Abstract

There is an increasing demand for acute care services due in part to rising proportions of older people and increasing rates of chronic diseases. To reduce pressure and costs in the hospital system, community-based post-acute care discharge services for older people have evolved as one method of reducing length of stay in hospital and preventing readmissions. However, it is unclear whether they reduce overall episode cost or expenditure in the health system at a more general level. In this paper, we review the current evidence on the likely costs and benefits of these services and consider whether they are potentially cost-effective from a health services perspective, using the Australian Transition Care Programme as a case study.

Evaluations of community-based post-acute services have demonstrated that they reduce length of stay, prevent some rehospitalisations and defer nursing home placement. There is also evidence that they convey some additional health benefits to older people.

An economic model was developed to identify the maximum potential benefits and the likely cost-savings from reduced use of health services from earlier discharge from hospital, accelerated recovery, reduced likelihood of readmission to hospital, and delayed entry into permanent institutional care for participants of the Transition Care Programme. Assuming the best case scenario, the Transition Care Programme is still unlikely to be cost saving to a health care system. Hence for this service to be justified, additional health benefits such as quality of life improvements need to be taken into account. If it can be demonstrated that this service also conveys additional quality of life improvements, community-based programmes such as Transition Care could be considered to be cost-effective when compared to other health care programmes.

Key Words
Elderly; Community Health Care; Programme Evaluation; Cost Analysis; Post-Acute Programmes

What is known about this topic:
- Programmes managing the discharge process from hospital to the community for older people aim to improve the recovery process for the patient and alleviate hospital burden.
Cost-effectiveness, and hence efficiency, of post-acute care programmes for older people is uncertain.

**What this paper adds:**

- Assuming the best case scenario for the effectiveness of post-acute services, programmes such as Transition Care in Australia are still unlikely to be cost saving to the health care system.
- If it can be demonstrated that this service also conveys additional quality of life improvements, Transition Care could be considered to be cost-effective when compared to other community health care programmes.
Introduction

There is an increasing demand for acute care services, due in part, to rising proportions of older people and higher rates of chronic diseases. In response to increasing demand, Governments look for new ways to achieve efficiency gains with an underlying desire for overall health system sustainability. The current approach is to re-orient healthcare systems away from acute hospital to community-based services focused on the management of long-term conditions, to potentially improve efficiency and simultaneously reduce pressure on acute inpatient services.

Consequently, health care providers have developed alternatives to acute hospital inpatient care, including services that avoid hospital use completely and those which reduce hospital use by managing the interface between inpatient and community care. Such post-acute care programmes for older people are thought to provide some tangible health benefits to the recipients. In this context the need for efficient management of aged care beyond hospital discharge, with emphasis on rehabilitation and lessening hospital burden, is recognised by Governments as an increasingly high priority. However, the cost-effectiveness, and hence efficiency, of post-acute care programmes for older people is uncertain.

The Australian Transition Care Programme (TCP) is a clearly defined national programme, specifically designed to offer post-acute care in both community and in institutional settings (usually in residential aged care facilities which primarily offer permanent long term care). The Transition Care Programme targets older patients at the conclusion of a hospital episode who have been assessed as eligible for at least low level residential aged care and who would benefit from a period in a non-hospital environment to optimise their functional recovery (Department of Health and Ageing, 2005). The programme provides flexible care in the form of a package of services including home help and personal care (up to daily); slow stream rehabilitation including physiotherapy and occupational therapy; nursing care and case management (Gray et al., 2008). The guidelines for the TCP provide funding for an expected length of stay of eight weeks with a maximum period of 12 weeks post discharge from hospital (Department of Health and Ageing, 2005). The Transition Care Programme is jointly funded by the state and federal governments; however state health departments deliver the services. As of 30 June 2010, the Australian Government had allocated 3349 places to
Transition Care, of which 2698 were operational, amongst 84 services across all jurisdictions (Steering Committee for the Review of Government Service Provision, 2011). The number of Transition Care places equates to about 1.3 places per 1000 people aged 70 years or over, compared with 24.5 community care packages per 1000 people for the same age group (Steering Committee for the Review of Government Service Provision, 2011).

The Transition Care model was influenced by Intermediate Care (IC), a non-hospital based service in the UK that represents an alternative to high-cost inpatient hospital care (Kaambwa et al., 2008). IC covers a diverse range of services surrounding hospital care, including admission avoidance and supported discharge in the community or nursing homes. The Transition Care Programme is intended to enable care recipients to return home, rather than prematurely enter residential care, and to optimise their functional capacity while simultaneously freeing hospital beds for other uses and reducing access blocks (Crotty et al., 2005). This is similar to the goals of IC which focus on patient rehabilitation and independence, minimising unnecessary hospital admissions, and preventing premature admissions to permanent residential care (Glasby et al., 2008).

A National Evaluation of the TCP conducted for the Australian Government (Flinders Consulting, 2008), found that the programme achieved at least some of these aims. The results showed functional gains in older people and fewer re-admissions to hospital and residential aged care facilities for TCP recipients than a comparable group of frail older people. The authors noted that these outcomes were achieved at a comparatively high cost although a comprehensive cost-effectiveness analysis was not conducted.

In summary, the TCP and other similar post discharge programmes can potentially confer benefits in cost and efficacy via four main areas: earlier discharge from hospital, accelerated recovery, reduced likelihood of readmission to hospital, and delayed entry into permanent institutional care. However, here is little evidence on the benefits or costs in these main areas. Therefore, this study aimed to measure the potential cost-effectiveness of community based post-acute programmes, using the TCP as a case study.

Methods

An economic model was developed to identify the maximum potential benefits and the likely cost-savings from reduced use of health services from earlier discharge from hospital, accelerated recovery, reduced likelihood of readmission to hospital, and delayed entry into
permanent institutional care. Additionally, the incremental quality of life improvement required for these services to be considered cost-effective was estimated. Where relevant data on TCP outcomes were unavailable, secondary resources using key articles and systematic reviews were used to develop plausible estimates of the size of any effect. The perspective of costs to the government is used throughout, as governments are the instigator and principal funder of such programmes. All costs and benefits are valued in 2010 Australian dollars.

**Costs**

Costs of the programme were taken from data published in the Australian Government’s Report on Government services (Steering Committee for the Review of Government Service Provision, 2011). From 2008 to 2010 the cost of the TCP nationally rose from $111.9 million to $192.1 million, with admissions rising from 10,081 to 14,841 over this time period and length of stay in the programme increasing from 50 to 60 days. An average cost per episode was calculated from the weighted three year average with all costs inflated to 2010 figures using purchasing power parity (Organisation for Economic Development and Co-operation). The average per episode cost was $12,411 with a three year weighted length of stay of 55 days giving an average cost per day of $224.

**Benefits**

Benefits were calculated as cost savings realised relevant to the four main areas identified in the introduction; early discharge, accelerated recovery, reduced hospital admissions and delayed entry to residential aged care. The Transition Care Programme is a relatively new initiative in Australia and hence not all relevant outcomes to fully inform a cost-effectiveness analysis have been published. Therefore, where relevant, supplementary data on the potential cost savings of similar programmes were retrieved from literature sources and used in the analysis.

**Early discharge from hospital**

In systematic reviews of early discharge programmes, recipients were reported in many cases as showing no difference in length of hospitalisation (Parker et al., 2002) or, in some instances, requiring more total days of treatment (Shepperd et al., 2009). In best case scenarios from similar U.K. programmes, older people can be discharged from hospital 8 to 9 days sooner, provided a well organised early discharge rehabilitation service is in place (Cunliffe et al., 2004, Langhorne et al., 2005). A national evaluation of the TCP (Flinders
Consulting, 2008) showed the median length of stay for the index hospitalisation varied considerably between jurisdictions, making differences between TCP and control groups difficult to interpret. Despite the lack of evidence that the TCP facilitates early hospital discharge, it is reasonable to assume that, with maturation of the program, this outcome is achievable.

The cost of a day’s stay in hospital for rehabilitation towards the end of a patient’s episode is $384 (Department of Health and Ageing, 2009). Two hospital days avoided on average may represent a reasonable compromise across the observed evidence, with a corresponding cost saving of $768.

**Accelerated recovery**

Improvement or maintenance of individual functioning is an indicator of governments’ objective for aged care services to promote the health, wellbeing and independence of frail older people (Steering Committee for the Review of Government Service Provision, 2011). The Transition Care Programme client’s level of functioning is measured by the Modified Barthel Index (MBI), which assesses activities of daily living (Shah et al., 1989). The MBI is the only clinical outcome measure collected on a national basis. In 2009-10 the average MBI score nationally on entry to the TCP was 72.1 and on exit from the TCP was 82.0 (Steering Committee for the Review of Government Service Provision, 2011). This represents an improvement of functioning from a moderately dependent level (MBI range 50 to 74) to a mild dependency level (MBI range 75-90) (Shah et al., 1989).

However, without comparison groups, it is difficult to determine if the TCP results in functional capacity gains over that of the normal recovery trajectory and whether any such gains are sustained beyond the short term (Gray et al., 2008). Other Australian models of post-acute care have shown that gains in functional capacity were more rapid than for the TCP group, though this may be attributed to higher staff to patient ratios, case-mix, or different points of measurement on the trajectory of recovery (Flinders Consulting, 2008). Internationally, multi-factorial interventions have been shown to improve or maintain physical function in community-based older people (Beswick et al., 2008) and in geriatric rehabilitation inpatients (Bachmann et al., 2010), but there is little evidence that low intensity programs such as the TCP facilitate accelerated recovery.
Nevertheless, the TCP may reduce healthcare expenditure of recipients compared with those who do not receive the TCP. For example, the number of visits to the patients’ general practitioner may be reduced with the TCP, given the patient has contact with health professionals who may reduce the likelihood of exacerbations of a condition. The maximum potential cost-offset is estimated at $10 on average per day of recovery and, if the average patient requires 10 weeks to recover, the consequent cost-offsets would be $700.

Reduced hospital readmissions
In the national evaluation of the TCP (Flinders Consulting, 2008), six month outcomes were compared with other frail groups (i.e. a pseudo-control group) discharged from hospital over the same period, and showed that the control groups had a 17 to 35% increased risk of hospital readmission relative to those who received the TCP in a community setting. A review of similar transitional home care programmes drawn mainly from the U.S. has shown a reduction in rehospitalisation of 30 to 50% over six months (Boling, 2009). Similarly, a review of nurse-assisted case management interventions (Chiu & Newcomer, 2007), showed reduced hospital readmission rates and/or fewer hospital days, with up to a third fewer readmissions in the intervention groups after 6 months of follow-up.

A readmission to hospital, for example due to a fall, costs around $10,000 (Heinrich et al., 2009). At best there may be a 35% chance of obtaining this potential off-set. Therefore, the overall expected cost-offsets from preventing readmissions may approach a maximum potential of $3,500.

Delay of entry to permanent Residential Aged Care (RAC)
In the TCP evaluation (Flinders Consulting, 2008), the hazard of admission to RAC in the six months post entry approval was 3.5 to 7 times higher in the pseudo-control groups than among the recipients in community settings. However, the risk of RAC admission was similarly higher for those who received the TCP in a residential setting. An audit conducted early in the programme’s implementation (Cameron & Davies, 2007) confirmed that residential-based TCP services were providing packages to older people with more severe disability who generally remained in RAC.

A subgroup analysis of international trials assessing community-based care post discharge (Beswick et al., 2008) showed the risk of nursing home admission at follow-up of 6 months was 0.77 (95% CI: 0.64-0.91) favouring the intervention groups. Results of a review of ‘early
discharge hospital at home’ also showed that significantly fewer from the intervention group were in RAC at one year (RR 0.69 (95% CI: 0.48-0.99)) (Shepperd et al., 2009). Similarly a systematic review of geriatric inpatient rehabilitation found a reduced risk for nursing home admission (RR 0.84 (95% CI: 0.72-0.99)) at 3 to 12 months post discharge (Bachmann et al., 2010).

Any cost off-sets from delaying entry to RAC are contingent on the amount of government subsidy to facilities and the average length of delay. Patients eligible for the community-based TCP may fall into the “medium dependency” category of government subsidy in Australia. Accounting for pension and rental allowances, it costs an additional $50 per day for the average patient in RAC compared with living in the community. We expect that one in every four patients may have entry into RAC delayed by an average of three months. These assumptions lead to an estimated mean cost-offset to the health sector of approximately $1,150 from the TCP.

Results

Table 1 summarises the costs and cost offsets of the TCP. The maximum cost-offsets from the TCP are estimated by assuming the most optimistic scenario for a recipient; that is, they will be engaged in an early discharge programme which reduces readmissions to hospital and health service use in the community, and delays entry into residential aged care. The maximum total cost-savings from this optimistic scenario is $6118. Subtracting this maximum cost-savings from the cost of providing the programme yields an estimated net cost of $6,323 per patient.

<INSERT TABLE ONE ABOUT HERE>

The largest assumed cost-saving comes from the avoidance of hospital readmissions and the underlying assumptions that generate these savings have the greatest effect on the net cost of the TCP. The maximum cost-offsets are not sufficient to make the TCP cost-saving or even cost-neutral. Therefore, to render the TCP cost-effective, it should generate health gains that are equivalent or better than other health interventions competing for Government funding.

<INSERT FIGURE ONE ABOUT HERE>

Figure 1 represents the Quality-Adjusted Life Year (QALY) gain required for the TCP to be considered cost-effective at different levels of willingness to pay for a QALY. At a
willingness to pay of around $50,000, the QALY gain required of 0.13 is similar to the gain seen from the use of high-dose statins in patients with stable coronary artery disease (Chan et al., 2007), or running special nurse-led clinics for prevention of coronary heart disease in primary care (Raftery et al., 2005).

Preliminary data suggests that the TCP has the greatest impact on preventing hospital readmissions and delaying entry into an aged care facility. In an Australian study examining older people leaving hospital to move into RAC, the median health related quality of life score was 0.05 just prior to entry, and more than one third of participants subsequently rated themselves in a state worse than death on entry to a nursing home (Giles et al., 2009). A secondary analysis of a randomised controlled trial assessing patients in hospital waiting to enter RAC found small gains from baseline in utility in patients surviving until follow-up (Giles et al., 2009). Significantly greater overall quality of life was found for recipients of a post-acute care co-ordination of services in Australia as compared with usual care discharge planning (Lim et al., 2003). It might be appropriate, therefore, to assume that there is a substantial quality of life decrement for older people entering RAC, and thus the health gains from providing post-acute programmes that delay or prevent admission to RAC for older people could be close to, or even exceed, the 0.1 QALYs required to show that the additional costs for this health gain are acceptable.

**Discussion**

This article reviews the relevant evidence for efficacy and potential cost-effectiveness of post-acute discharge programmes. An optimistic scenario is developed addressing the potential for a programme such as Transition Care to be cost-effective. The result is that, in the best case, the TCP is not cost saving to the health care sector but could be considered cost-effective relative to other possible health interventions. The limited evidence available makes this conclusion tentative.

The major contributor to the lack of cost savings is the high cost of the programme ($12,441 per participant). An Australian cost-effectiveness analysis of an RCT comparing a post-discharge programme for older people of a nurse assessment and physiotherapy delivered exercise programme to usual care has shown that the programme could save up to $7,907 over six months primarily due to reduction in use of health care services and decreased readmissions to hospital (Graves et al., 2009). The programme itself cost an average of only
$547. The analysis used a bottom up approach to calculating the cost of the programme (measuring only staff time directly attributable to the participant) whereas this study has used a top-down approach which includes the entire cost of running a service (administration, building costs, holidays and trainings etc). Nevertheless, the disparity in costs between these two post discharge programmes indicates that there may be substantial efficiencies that could be realised within the delivery of the TCP. A contributor to inefficiency may be due to the recent development of the programme. A report on Australian Government service provision (Steering Committee for the Review of Government Service Provision, 2011) indicates that although funded, approximately one fifth of the places allocated had not been filled.

The program’s length of stay may be heavily influenced by the TCP funding policy, which stipulates that a person may remain in the program for a maximum of 12 weeks, although the average duration of care is expected to be 8 weeks. This framework may drive both the selection of participants (in favour of those needing prolonged treatment) and inefficiency (in so far as reducing length of stay will tend to increase costs without any associated adjustment to income).

In an environment where a government has a priority to improve the conditions of the frail elderly, there are limited options available. Moreover, the evidence on effectiveness of these options is scarce. The expense may be justified if the intervention can be shown to achieve certain goals such as lessening the bed blocker effect and reducing the demand for residential aged care facilities even if health gains are not consistently realised. Additionally, alternative approaches to achieve these ends such as building more hospital beds and hiring additional staff may represent a greater cost than Transition Care.

Future research is required to estimate the cost-effectiveness of post-acute programmes such as Transition Care. Studies need to focus on capturing differences between a control and an intervention group in quality of life and the value of services received.

**Competing Interests**

The authors declare that they have no competing interests.

**Authors’ Contributions**

CH and TC undertook the quantitative analysis and contributed to drafting the manuscript. LG and PS developed the design of the study and contributed to the writing. NP undertook
the literature searches and contributed to drafting the manuscript. All authors read and approved the final manuscript.

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References


Tables

Table 1 – Costs and Cost Offsets of the Transition Care Programme

<table>
<thead>
<tr>
<th>Best Case Scenario</th>
<th>Incidence</th>
<th>Cost</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of TCP per recipient</td>
<td>55 days</td>
<td>$224.72/day</td>
<td>$12,441</td>
</tr>
<tr>
<td>Cost Offsets per Recipient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early Hospital Discharge</td>
<td>2 days</td>
<td>$384/day</td>
<td>-$768</td>
</tr>
<tr>
<td>Reduced Community Health Spending</td>
<td>10 weeks = 70 days</td>
<td>$10/day</td>
<td>-$700</td>
</tr>
<tr>
<td>Reduced Hospital Readmissions</td>
<td>35%</td>
<td>$10,000/event</td>
<td>-$3,500</td>
</tr>
<tr>
<td>Delay of Entry to RAC</td>
<td>25% for 3 months = 91.25 days</td>
<td>$50/day</td>
<td>-$1,150</td>
</tr>
<tr>
<td>Net Cost per Recipient</td>
<td></td>
<td></td>
<td>$6,323</td>
</tr>
</tbody>
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Figures

Figure 1: QALY gain required for the TCP to be considered cost-effective