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Research

Two weeks of additional standing balance circuit classes during inpatient rehabilitation are cost saving and effective: an economic evaluation

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KEY WORDS

Balance training
Rehabilitation
Cost-effectiveness
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ABSTRACT

Question: Among people admitted for inpatient rehabilitation, is usual care plus standing balance circuit classes more cost-effective than usual care alone? **Design**: Cost-effectiveness study embedded within a randomised controlled trial with concealed allocation, assessor blinding and intention-to-treat analysis. **Participants**: 162 rehabilitation inpatients from a metropolitan hospital in Sydney, Australia. **Intervention**: The experimental group received a 1-hour standing balance circuit class, delivered three times a week for 2 weeks, in addition to usual therapy. The circuit classes were supervised by one physiotherapist and one physiotherapy assistant for up to eight patients. The control group received usual therapy alone. **Outcome measures**: Costs were estimated from routinely collected hospital use data in the 3 months after randomisation. The functional outcome measure was mobility measured at 3 months using the Short Physical Performance Battery administered by a blinded assessor. An incremental analysis was conducted and the joint probability distribution of costs and outcomes was examined using bootstrapping. **Results**: The median cost savings for the intervention group was AUD4,741 (95% CI 137 to 9,372) per participant; 94% of bootstraps showed that the intervention was both effective and cost saving. **Conclusions**: Two weeks of additional standing balance circuit classes delivered in addition to usual therapy resulted in decreased healthcare costs at 3 months in hospital inpatients admitted for rehabilitation. There is a high probability that this intervention is both cost saving and effective. **Registration**: ACTRN12611000412932. **[Treacy D, Howard K, Hayes A, Hassett L, Schurr K, Sherrington C (2018) Two weeks of additional standing balance circuit classes during inpatient rehabilitation are cost saving and effective: an economic evaluation. *Journal of Physiotherapy* XX: XX–XX]**

Introduction

With increasing costs constraining healthcare systems, it is important to determine the cost-effectiveness of existing and new interventions. In 2013–14, total expenditure on health in Australia was estimated at AUD154.6 billion, with more than a third of this expenditure on hospitals.[1,2] Decreasing patient length of stay in areas such as rehabilitation wards as well as reducing the number of preventable hospital readmissions may result in substantial system savings.[3] However, there is concern that decreasing lengths of stay and early discharge may result in decreased function and increased care needs at discharge, increased family burden, increased hospital readmissions, and premature death.[4–7] These adverse consequences would negate any initial savings from reducing length of stay. If a change in treatment delivery can result in a decreased length of stay, whilst improving patient safety outcomes and long-term outcomes, then the patient, community and healthcare system are likely to benefit.

Balance plays an essential role in all functional activities of daily living such as walking and standing. People admitted to a rehabilitation ward often present with poor mobility, impaired balance and reduced ability to carry out activities of daily living.[8] Poor balance and mobility limitation have consistently been associated with an increased risk of falling among rehabilitation inpatients and patients discharged home from rehabilitation settings.[9] Falls are a frequent occurrence among patients admitted to rehabilitation wards;[10,11] once discharged home, the likelihood of falling is significantly greater for these people than that for the general community.[12,13] Therefore, impaired balance is an important target for intervention during periods of hospitalisation.

In 2009–10, approximately 10% of Australian hospital bed days occupied by people aged $\geq$ 65 years were due to an injurious fall. Of those individuals who were hospitalised due to an injurious fall, 61% experienced at least one fracture and the majority of these were hip fractures.[14] Patients who experience a fall in an inpatient setting are likely to have increased costs and a longer length of hospital stay.[15] The number of falls and total healthcare costs associated with these falls are predicted to rise significantly in the future with Australia's ageing population.[16] In addition to the

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financial cost, falls also place significant burden on an individual's quality of life.

Specific balance exercise has been shown to improve balance and reduce falls in the general older population living in the community. Systematic reviews have found that targeted exercise interventions can improve balance[17] and decrease falls[18] in older people. Howe et al[17] found that programs that involved balance and coordination exercises were effective interventions for improving balance. Sherrington et al[19] found that exercise programs that included challenging balance activities, such as exercising without using the hands for support and narrowing the base of support, were associated with a greater fall prevention effect than other programs. However, these additional interventions, although frequently resulting in improved outcomes, often have additional costs. As there are limited resources within the health system (eg, finance, time and staffing), it is important to be able to quantify the cost-effectiveness of these interventions to enable healthcare managers to make well-informed and effective decisions on resource allocation. To date there have been few studies that have examined the cost-effectiveness of inpatient rehabilitation programs.

A randomised controlled trial was conducted, which found that 2 weeks of standing balance circuit classes delivered for 1 hour, three times a week, in addition to usual therapy improved balance in older general rehabilitation inpatients at 2 weeks and showed a trend towards an improvement in balance at 3 months.[20] It also found an improvement in mobility at both 2 weeks and 3 months, a trend towards a shorter length of hospital stay, and a non-statistically significant decrease in readmissions at 3 months.

Therefore, the research question for this economic analysis of that randomised controlled trial was:

> Among people admitted for inpatient rehabilitation, is usual care plus standing balance circuit classes more cost-effective than usual care alone?

Methods

Design

A single-centre, randomised controlled trial with concealed allocation, assessor blinding and intention-to-treat analysis was conducted. The participants were 162 people who were admitted to the general rehabilitation ward at Bankstown-Lidcombe Hospital, Sydney, Australia. Eighty-one participants were randomly allocated to the intervention group and 81 to the control group. Participants were assessed at baseline, at the end of the 2-week intervention period, and 3 months later. The full protocol is described elsewhere.[21]

Participants

Patients were eligible if they: were admitted to the ward for rehabilitation; were able to stand for 30 seconds without physical assistance or the help of an assistive device; had no contraindications to exercise such as uncontrolled hypertension or unstable cardiac disease; were able to fully weight bear as ordered by a medical officer; and were suitable for a group exercise class with minimal supervision as determined by the treating physiotherapist. People with a known infection that would pose a significant risk to others in a group setting were excluded. Consent was sought from a 'responsible person' who was usually a family member, for those patients with a Mini Mental State Examination (MMSE) score of $\leq$17 and those whom treating staff considered to have a cognitive impairment limiting their ability to give informed consent. Written informed consent was obtained directly from all other participants.

Interventions

All participants received usual therapy consisting of assessment and treatment by the multidisciplinary ward team at Bankstown-Lidcombe Hospital. Physiotherapy intervention involved participants being treated in a group setting predominantly, with additional one-to-one sessions as required. Participants would typically spend at least 2 hours in the physiotherapy rehabilitation gym and attend once or twice a day. The intervention group received six additional 1-hour standing balance circuit classes over a 2-week period. Participants in both groups received usual multidisciplinary team care (eg, outpatient therapy) after discharge. This care was on an as-needed basis and was provided by a therapist who was unaware of group allocation.

The standing balance circuit class comprised seven stations, with each station consisting of a different exercise. The classes were supervised by two physiotherapy staff members (this included a physiotherapy assistant) with a maximum of eight participants. The staff members running the class were encouraged to increase the difficulty of the exercise depending on the ability of individual participants. Class participants spent 6 minutes at each exercise station and completed six of the seven stations during each session. All stations were designed to challenge postural adjustments while standing and stepping. This challenge was achieved by performing exercises without the use of hands for support, and narrowing the base of support as able. Participants were progressed to more challenging balance exercises as deemed appropriate by the treating physiotherapist. The amount or dosage of exercises completed at each station was recorded. These exercises are described in Appendix 1 on the eAddenda.

There was high adherence to the intervention, with participants completing 92% of classes conducted during their inpatient stays. The average number of repetitions performed per class was 427 per participant (median 412, range 149 to 748).

Table 1
Participant characteristics (n = 162).

Characteristic	Intervention (n = 81)	Control (n = 81)
Age *(years)*, mean (SD)	83 (7)	81 (8)
Gender, n female (%)	51 (62)	53 (65)
MMSE *(/30)*, mean SD	25 (3)	25 (3)
Reason for admission to rehabilitation, n (%)		
lower limb fracture after fall	23 (28)	20 (25)
pelvic fracture	5 (6)	5 (6)
upper limb fracture after fall	2 (2)	2 (2)
decreased mobility after medical illness	18 (22)	20 (25)
falls with no fracture	19 (23)	19 (23)
vertebral fracture or low back pain	8 (10)	6 (7)
neurological conditions	3 (4)	2 (2)
transfemoral amputation	1 (1)	1 (1)
other	2 (2)	6 (7)
Pre-admission accommodation, n (%)		
house/unit	76 (94)	74 (91)
hostel	5 (6)	5 (6)
nursing home	0 (0)	2 (2)
Baseline SPPB, mean (SD)	3.0 (1.7)	3.0 (1.7)
Able to walk 800 m before admission, n (%)	50 (62)	43 (53)
Mobility aid pre-admission, n (%)		
nil	35 (43)	34 (42)
walking stick(s)	24 (30)	23 (28)
frame	22 (27)	24 (30)
Able to climb 12 steps before admission, n (%)	58 (72)	49 (60)
Fell in past 12 months	67 (83)	71 (88)
Co-morbidities, n (%)		
cerebrovascular accident	12 (15)	9 (11)
congestive cardiac failure	8 (10)	10 (12)
ischaemic heart disease	7 (9)	9 (11)
type two diabetes mellitus	18 (22)	24 (30)
chronic pulmonary disease	12 (15)	11 (14)
dementia	8 (10)	7 (9)
previous neck of femur fracture	3 (4)	3 (4)

MMSE = Mini-Mental State Examination, SPPB = Short Physical Performance Battery.

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