The de Morton Mobility Index (DEMMI) provides a valid method for measuring and monitoring the mobility of patients making the transition from hospital to the community: an observational study

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Question: Is the de Morton Mobility Index (DEMMI) valid for measuring the mobility of patients making the transition from hospital to the community? **Design**: Observational cohort study. **Participants**: 696 consecutive patients admitted to 11 Transition Care Programs for multidisciplinary care in Victoria and Tasmania during a 6-month period. The DEMMI and Modified Barthel Index were administered within 5 working days of admission and discharge from the Transition Care Program. **Outcome measures**: The DEMMI and Modified Barthel Index. **Results**: Neither the DEMMI nor the Modified Barthel Index had a floor or ceiling effect. Similar evidence of convergent, discriminant and known-groups validity were obtained for each instrument. The DEMMI was significantly more responsive to change than the Modified Barthel Index using criterion- and distribution-based methods. The minimum clinically important difference estimates represented similar proportions of the scale width for the DEMMI and Modified Barthel Index and were similar using criterion- and distribution-based estimates. Rasch analysis identified the DEMMI as essentially unidimensional in a Transition Care Program cohort and therefore can be applied to obtain interval level measurement. Rasch analysis demonstrated that the DEMMI was administered similarly by physiotherapists and allied health assistants under the direction of a physiotherapist. **Conclusion**: The DEMMI and Modified Barthel Index are both valid measures of activity limitation for Transition Care Program patients. The DEMMI has a broader scale width, provides interval level measurement, and is significantly more responsive to change than the Modified Barthel Index for measuring the mobility of Transition Care Program patients. **[de Morton NA, Brusco NK, Wood L, Lawler K, Taylor NF (2011) The de Morton Mobility Index (DEMMI) provides a valid method for measuring and monitoring the mobility of patients making the transition from hospital to the community: an observational study.** *Journal of Physiotherapy* **57: 109–116]**

Key words: Measurement, Older adults, Mobility, Physical ability, Physiotherapy

Introduction

The Transition Care Program was established in 2004-05 as a jointly funded initiative between the Commonwealth and states and territories of Australia. It is provided to older persons at the end of a hospital stay in the form of a package of services (Department of Health and Ageing 2008). Between October 2005 and February 2008 there were 12 573 discharges from the Transition Care Program nationally (Department of Health and Ageing 2008). A common component for all Transition Care Programs is the provision of allied health services to aid the assessment, treatment and discharge planning of patients.

Across Australia current practice involves a broad range of models of care relating to the provision of Transition Care Program physiotherapy services and the use of allied health assistants. Also, a diverse range of outcome measures are applied. It is a current requirement that all Transition Care Programs apply the Modified Barthel Index at admission to and discharge from the program (Department of Health and Ageing 2008). However, there is evidence that the Modified Barthel Index has a ceiling effect in older populations in hospital (de Morton et al 2007) and community settings (Hill et al 2008) and that it measures domains that are not relevant to physiotherapy interventions (de Morton et al 2008c). Systematic reviews have identified drawbacks in the use of other activity limitation measures in hospital (de

Morton et al 2008a) and community settings (Davenport et al 2008). There are currently no best practice guidelines regarding the optimal method for measuring activity limitation for patients making the transition from hospital to the community.

Physiotherapy focuses on the assessment and management of problems with movement (Jensen et al 1999). To conduct a rigorous evaluation of the efficacy of physiotherapy for patients making the transition from hospital to the community, a tool for measuring activity limitation that, in particular, measures the construct of mobility accurately is required. According to the World Health Organisation International Classification of Functioning 'mobility' is classified as one of nine domains of 'activity and participation' and is defined as 'moving by changing body position or location or by transferring from one place to another, by carrying, moving or manipulating objects, by walking, running or climbing, and by using various forms of transportation' (WHO 2001). An instrument that can be applied in a broad range of environments and that will accurately measure and monitor changes in mobility for all patients in Transition Care Programs without floor or ceiling effects would have many benefits.

In 2008, the de Morton Mobility Index (DEMMI) was developed and validated in an older acute medical population (de Morton et al 2008b); it has since been

validated in subacute hospital (de Morton and Lane 2010) and community settings (Davenport and de Morton 2010, de Morton et al 2010). However, the DEMMI has not been validated for use during the transition from hospital to the community. The clinimetric properties of the DEMMI have been evaluated extensively in a range of clinical populations and it is the first mobility instrument that can accurately measure and monitor the mobility of older adults across acute, subacute, and community settings (Belvedere and de Morton 2010, Davenport et al 2008, de Morton et al 2008a). The DEMMI is a 15-item unidimensional measure of mobility and it appears to have face validity for the needs of physiotherapists and their patients within Transition Care Programs.

Therefore, the aim of this study was to validate the DEMMI in the Transition Care Program cohort and the secondary aim was to investigate whether it is valid for allied health assistants to administer the DEMMI to patients within the Transition Care Program. The specific research questions of this study were:

1. Does the DEMMI have the properties required to accurately measure and monitor the mobility of patients transitioning from the hospital setting to the community?
2. Are DEMMI scores valid when it is applied by an allied health assistant with patients transitioning from the hospital setting to the community?

Method

Design

The mobility of consecutive Transition Care Program patients was assessed by usual care physiotherapists or allied health assistants on admission to and prior to discharge from the Transition Care Program using the DEMMI (de Morton et al 2008b). All eligible patients received the Transition Care Program's usual multidisciplinary management. Mobility assessments were conducted within five business days of admission, discharge, or transfer from the Transition Care Program. As the nature of the Transition Care Program is slow stream restorative care, with patients admitted for up to 18 weeks, it was decided that it was appropriate to allow five business days to complete the assessment.

Baseline data were collected at initial assessment and included age, gender, diagnosis, gait aid use, Transition Care Program setting, admission Aged Care Assessment Service assessment (ie, assessment related to suitability for high level, low level, or other care), Charlson comorbidity score (Charlson et al 1987), and the Modified Barthel Index (Shah et al 1989).

Prior to the discharge mobility assessment, patients were asked, 'How does your mobility compare to when you arrived in the Transition Care Program?' Response choices were based on a 5-point Likert scale (much worse, a bit worse, same, a bit better, or much better). Discharge assessments followed the same procedures as initial assessments and included discharge destination.

Participants

The 14 Transition Care Programs across Victoria and Tasmania were invited to participate in this study. Patients consecutively admitted to these programs were included. Patients were excluded if mobilisation was

Table 1. Characteristics of participants.

Characteristic	n = 696
Age (yr), mean (SD)[a]	82 (9)
Gender, female:male	411:280
Charlson comorbidity score, mean (SD)	1.7 (1.8)
Hospital setting before admission to TCP, n (%)	
Acute hospital	288 (41)
Sub-acute hospital	349 (50)
Other	12 (2)
TCP setting, n (%)	
Hospital	259 (37)
Residential care	272 (39)
Community	138 (20)
ACAS at admission, n (%)	
High level care	265 (38)
Low level care	102 (15)
Other	281 (40)
Previous gait aid, n (%)	
None	137 (20)
Stick/crutches	56 (8)
Frame	441 (63)
Diagnosis, n (%)	
Inability to cope	94 (14)
Upper limb/spine/pelvis fracture	51 (7)
Lower limb fracture/joint replacement/ amputation	147 (21)
Cognitive/psychological	58 (5)
Neurological	110 (16)
Medical/pain/palliative	134 (19)
Surgical	21 (3)
Respiratory	74 (11)
Modified Barthel Index, mean (SD)[b]	60 (29)
de Morton Mobility Index, mean (SD)[c]	39 (20)
TCP length of stay (days), mean (SD)[d]	42 (30)
Physiotherapy/AHA/group exercise (sessions/participant), mean (SD)[e]	11 (12)

Missing data account for items with fewer than 696 data points.
[a] n = 649, [b] n = 670, [c] n = 678, [d] n = 637, [e] n = 595. ACAS = Aged Care Assessment Service, AHA = Allied Health Assistant, TCP = Transition Care Program

medically contraindicated or if the patient was isolated due to infection or did not consent to the DEMMI mobility assessment. Patients were also excluded if they had only one assessment and it was determined that they did not require physiotherapy intervention as part of their management.

Outcome measures

The DEMMI is a mobility outcome measure that was recently developed in an older acute medical population (de Morton et al 2008b). It consists of 15 items and is scored on an interval level scale from 0 to 100 (de Morton et al 2008b). Eleven items are dichotomous (scored 0 or 1) and four items have three response options (scored 0, 1, or 2). A raw ordinal DEMMI score out of 19 is then converted to an interval-level DEMMI score out of 100 using a conversion table. The DEMMI was reported to take an average of 8.8
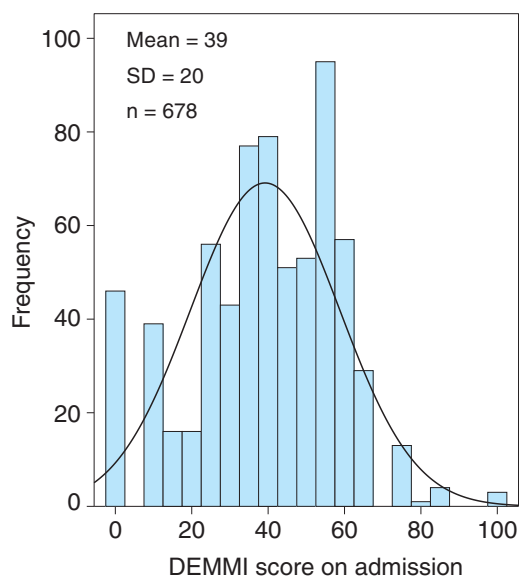
Figure 1a. de Morton Mobility Index (DEMMI) scores on admission to the Transition Care Program. 46 participants (7%) scored 0 and 3 participants (0.4%) scored 100.
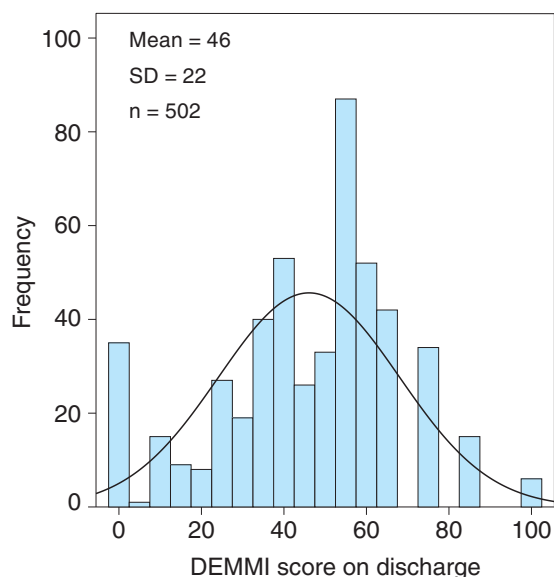

Figure 1b. de Morton Mobility Index (DEMMI) scores at discharge from the Transition Care Program. 35 participants (7%) scored 0 and 6 participants (1%) scored 100.
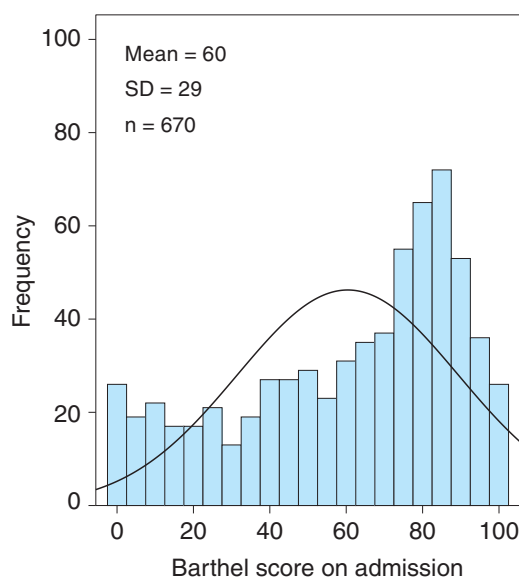

Figure 2a. Modified Barthel Index (MBI) scores on admission to the Transition Care Program. 16 participants (2%) scored 0 and 16 participants (2%) scored 100.
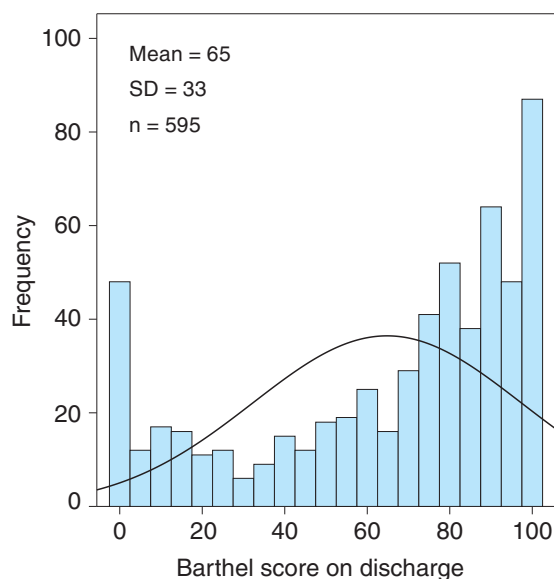

Figure 2b. Modified Barthel Index (MBI) scores at discharge from the Transition Care Program. 43 participants (7%) scored 0 and 50 participants (8%) scored 100.

minutes (SD 3.9) to complete in an older acute medical population (de Morton et al 2008b).

The modified Barthel Index is an ordinal scale that provides a total score between 0 and 100, where higher scores indicate greater independence in the domains of mobility and continence (Shah et al 1989). The Barthel Index has been shown to have acceptable levels of inter-observer and test-retest reliability (Collin et al 1988, Hachisuka and Ogata 1997). The validity of the Barthel Index has been widely tested and well established for rehabilitation patients (Dewing 1992, Hachisuka and Ogata 1997).

Data analysis

Validity: Convergent and discriminant validity for use of the DEMMI with this population were investigated by calculating the correlation between DEMMI and Modified Barthel Index scores using Spearman's rho and associated 95% confidence bands. A significant, moderate to high correlation between measures would provide evidence of convergent validity. A low correlation of the DEMMI with a measure of a different construct (Charlson Comorbidity Index) would provide evidence of discriminant validity. Known-groups validity (groups who would be expected to differ in their mobility) was investigated using an

Table 2. Convergent and discriminant validity of the de Morton Mobility Index and the Modified Barthel Index.

Property	Tool	n	Estimate (95% CI)
Convergent validity	DEMMI with MBI	655	0.75 (0.71 to 0.78)
Discriminant validity	DEMMI with Charlson Index	678	−0.11 (−0.18 to −0.04)
	MBI with Charlson Index	670	0.08 (0.01 to 0.16)

DEMMI = de Morton Mobility Index, MBI = Modified Barthel Index

Table 3. Known-groups validity of the de Morton Mobility Index and the Modified Barthel Index. Mean (SD) scores for high and low residential care groups, and mean (95% CI) difference between groups.

Tool	Groups		Difference between groups
	High level residential care	Low level residential care	High minus low
DEMMI	33 (19)	59 (13)	−25 (−30 to −20)
	(n = 185)	(n = 65)	
MBI	85 (13)	47 (28)	38 (33 to 43)
	(n = 228)	(n = 71)	

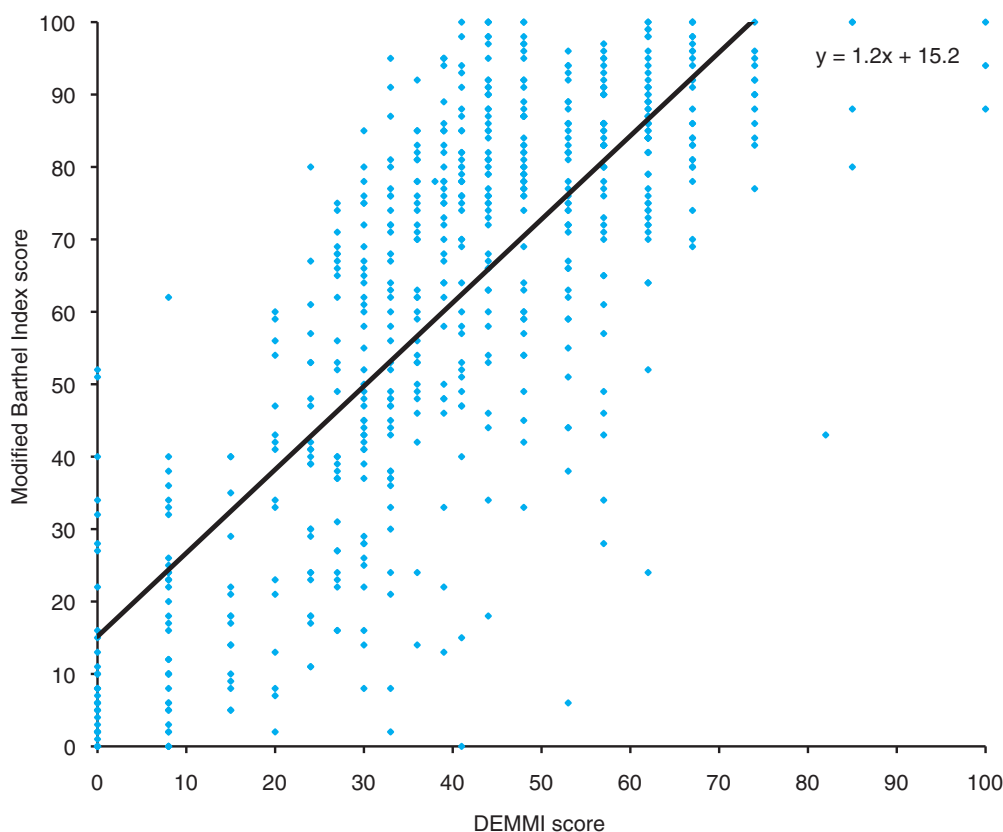DEMMI = de Morton Mobility Index, MBI = Modified Barthel Index

Figure 3. Scatterplot of the de Morton Mobility Index (DEMMI) scores and the Modified Barthel Index scores at admission.

independent t-test to compare scores obtained for those who were discharged to low level care (eg, hostel) compared to high level care (eg, nursing home).

Floor and ceiling effects were reported for each measure if 15% or more of the participant population scored the lowest or highest scale score, respectively.

Responsiveness to change: Responsiveness to change was evaluated using a criterion-based method (Guyatt responsiveness index, Guyatt et al 1987) and a distribution-based method (the Effect Size Index, Kazis et al 1989). Effect size indices of 0.2, 0.5, and 0.8 have been reported to represent small, moderate and large responsiveness to change, respectively (Husted et al 2000).

Table 4. Responsiveness to change of the de Morton Mobility Index and the Modified Barthel Index.

Responsiveness index	Tool	n	Estimate (95% CI)
Guyatt Responsiveness to Change	DEMMI	265	1.58 (1.39 to 1.77)
	MBI	269	0.72 (0.61 to 0.82)
Effect Size Index	DEMMI	501	0.34 (0.25 to 0.42)
	MBI	586	0.14 (0.06 to 0.22)

DEMMI = de Morton Mobility Index, MBI = Modified Barthel Index

Table 5. Estimates of the minimum clinically important difference of the de Morton Mobility Index and the Modified Barthel Index.

Method	Tool	n	Estimate (95% CI)
Criterion based	DEMMI	265	12 (10 to 13)
	MBI	269	13 (11 to 15)
Distribution based	DEMMI	678	10
	MBI	670	15

DEMMI = de Morton Mobility Index, MBI = Modified Barthel Index

Minimum clinically important difference: The minimum clinically important difference was calculated using criterion- and distribution-based methods. The criterion-based method was calculated where clinically important change was considered to have occurred for patients who rated their mobility as 'much better' at discharge assessment. The distribution-based method estimated the minimum clinically important difference by calculating half the baseline standard deviation of raw scores (Norman et al 2003).

Rasch analysis: Rasch analysis was conducted to investigate the unidimensionality of the DEMMI in a population of patients on the Transition Care Program. The Rasch model is a probabilistic model that confers confidence that scores obtained using the instrument are a valid measure of a subject's ability. The DEMMI was developed based on the Rasch model in an older acute medical population (de Morton et al 2008b) and if the data fit the Rasch model in this study, this also provides confidence that the DEMMI is indeed measuring one construct (ie, that it is a unidimensional measure of mobility) in a population of patients on the Transition Care Program and can be applied to obtain interval level measurement.

Fit to the model is indicated by an overall item-trait interaction chi-squared value of greater than 0.05, indicating no significant deviation of the data from the Rasch model, and a finding of 5% or less using the t-test procedure is recommended (Tennant and Pallant 2006). Item misfit is considered to have occurred if fit residuals of greater than ±2.5 or a significant Bonferroni adjusted *p* value are identified. Differential item functioning occurs when an item performs differently based on another variable (eg, age or gender). In this study differential item functioning for the DEMMI items was investigated for age (< 80 years, 80–84 years and 85+ years), gender, Charlson comorbidity score (0, 1, or ≥ 2), and whether a physiotherapist or allied health assistant administered the DEMMI. DEMMI data were Rasch analysed at admission to and discharge from the Transition Care Program.

Results

Of the 14 health services invited to participate, 11 health services participated in this study. Three health services declined due to understaffing. Of the included health services, the mean number of Transition Care Program beds was 40 (SD 24), ranging from 10 (in a rural setting) to 94 (in a metropolitan setting). A total of 696 participants were included in this study. Table 1 shows the baseline demographics of included participants.

Modified Barthel Index and DEMMI assessments were conducted at admission and discharge to the Transition Care Program; the scores are presented in Figures 1 and 2. Allied Health Assistants conducted assessments on 1% and 17% of occasions at admission and discharge, respectively. At admission, 678 participants (97%) were assessed with the DEMMI and 669 participants (96%) were assessed with the Modified Barthel Index. At discharge, 502 participants (72%) were assessed with the DEMMI and 594 participants (85%) were assessed with the Modified Barthel Index. Neither instrument had a floor or ceiling effect.

Validity: Similar evidence of validity was obtained for the DEMMI and Modified Barthel Index (Table 2). A significant moderate correlation was identified between DEMMI and Modified Barthel Index scores and provides evidence of convergent validity for both instruments (Table 2, Figure 3). Both instruments had low correlations with the Charlson Comorbidity Index, providing evidence of discriminant validity. Significantly higher scores were obtained for low level care residents compared to high level care residents at discharge using the DEMMI and Modified Barthel Index, which provided evidence of known-groups validity for both tools (Table 3).

Responsiveness to change: The DEMMI was significantly more responsive to change than the Modified Barthel Index when assessed using the criterion-based index, Guyatt's responsiveness to change, and distribution-based index, effect size (Table 4). The effect size for the DEMMI was in the small to moderate range, while the effect size for the Modified Barthel Index was in the small range.

Minimum clinically important difference: Similar estimates of the minimum clinically important difference were obtained using criterion- and distribution-based methods for the DEMMI and Modified Barthel Index (Table 5).

Rasch analysis: At admission, no item had high positive fit residuals to indicate multidimensionality but the *sit to stand* item had a high negative fit residual, suggesting possible redundancy. Six items (*roll, sit to stand, stand, walking independence, picking up pen, and walking backwards*) showed mild deviation from the Rasch model based on significant Bonferroni adjusted *p* values across class intervals and/or for individuals. There were no disordered thresholds or differential item functioning by age, gender, Charlson score, or whether an allied health assistant or physiotherapist administered the DEMMI. Item difficulty and person ability were well matched. However, overall fit to the Rasch model was not achieved, evidenced by a significant *p* value for χ^2 testing for item trait interaction ($p < 0.01$). However, 10 random samples of 100 fitted the model on each occasion and suggest that sample size influenced fit to the model in this population. The t-test procedure on admission data indicated unidimensionality with a result of 2.17%.

Rasch findings were similar for hospital discharge data. No items had high positive or negative fit residuals. Four items showed some mild deviation from the Rasch model (*bridge, roll, stand, stand feet together*). There was no differential item functioning for age, gender, or Charlson comorbidity score but there was significant systematic differential item functioning depending on whether an allied health assistant or physiotherapist administered the DEMMI for the bridge item. However, there were no patients in the first class interval among those assessed by an allied health assistant and this is likely to explain this finding. There were no disordered thresholds. Again, overall fit to the model was not achieved with a significant item trait interaction χ^2 value of $p < 0.01$ but random samples of 100 fitted the model on 9 out of 10 occasions. The t-test procedure on discharge data indicated unidimensionality with a result of 3.04%. The hierarchy of item difficulty was almost identical in admission and discharge samples.

Discussion

This study supports the validity of the DEMMI for measuring the mobility of patients making the transition from hospital to the community. Currently it is required that the Modified Barthel Index is administered in this patient cohort. However, the DEMMI has been identified in this study as more responsive to change than the Modified Barthel Index and is a unidimensional measure of mobility – a construct of particular interest to physiotherapists.

The Modified Barthel Index and the DEMMI serve different purposes and this is reflected in the moderate correlation between instrument scores in this study. The Modified Barthel Index is a measure of independence in activities of daily living and the DEMMI is a unidimensional measure of mobility. Consequently, for physiotherapists, the Modified Barthel Index could be a relatively 'blunt' measure of effectiveness as changes in other domains such as continence can confound changes in the targeted area of interest – mobility. This may be why the DEMMI was identified as more responsive to change than the Modified Barthel Index in this study.

Neither the DEMMI nor the Modified Barthel Index had floor or ceiling effects. This is often a limitation of instruments that are applied in heterogeneous populations who range from bed-bound to high levels of independent mobility. Both the DEMMI and Modified Barthel Index have the scale width required to measure and monitor changes, both improvement and deterioration, for patients in the Transition Care Program. A greater proportion of patients scored the highest possible score of 100 at discharge on the Modified Barthel Index than with the DEMMI. This finding may indicate that the DEMMI has a broader scale width than the Modified Barthel Index and demonstrate its potential to measure improvement after discharge from the Transition Care Program and return to independence in activities of daily living.

Rasch analysis identified that the DEMMI items performed consistently regardless of whether a physiotherapist or an allied health assistant administered the assessment. This finding has important workforce implications as allied health staff recruitment and retention is a challenge for Transition Care Programs. Three of the programs across Victoria were unable to participate in this research due to staff shortages. In response to these findings, the physiotherapy profession could review the boundaries of the scope of practice of allied health assistants and physiotherapists. Our findings increase the potential for physiotherapists to work more as a consultant for all appropriate patients, with the allied health assistant able to administer the prescribed assessments and therapy as directed by the physiotherapist. Such a shift in the allied health assistant/physiotherapist scope of practice would potentially allow for aspects of workforce shortages in physiotherapists to be explored.

In this study patients were referred for allied health assistant assessment when the physiotherapist deemed the patient appropriate and subsequently a larger proportion of the allied health assistant assessments were conducted at discharge (17%) than at admission (1%). An inter-rater reliability study needs to be conducted between physiotherapists and allied health assistants using the DEMMI to investigate further whether allied health assistants can complete assessments for physiotherapists in this cohort.

The participants in this study had a wide variety of admission diagnoses. This is typical of the heterogeneity that is commonly observed in other clinical settings with older populations such as a general community population in primary care, rehabilitation centre, or acute medical hospital wards. The results of this study support the findings of DEMMI clinimetric validation studies in other clinical settings (Davenport and de Morton 2010, de Morton et al 2008b, de Morton and Lane 2010, de Morton et al 2010).

The strength of this study is that it included a large sample

from two Australian states that was inclusive of both metropolitan and regional areas, which suggests that our study was based on a representative sample of patients referred for physiotherapy in Transition Care Programs. Limitations of this study are that the analysis comparing assessments between allied health assessments and physiotherapists was preliminary and may have been biased as the assistants completed a relatively larger proportion of discharge compared to admission assessments. The methods selected for estimating the minimum clinically important difference in this study (both criterion- and distribution-based) have limitations. These methods do not incorporate how the patient feels with regards to the magnitude of the effect, taking into account factors such as the cost, inconvenience, and harms (Barrett et al 2005a, Barrett et al 2005b, Ferreira and Herbert 2008). Patients were excluded from this study if they were not discharged within the study period and this systematic bias is a limitation of this study. The most missing data in this study were for discharge DEMMI assessments (n = 194), but still included 502 participants. The influence of missing data on study results is unknown and reflects the busy caseload of Transition Care Program physiotherapists and limited staffing.

The DEMMI and Barthel are both valid measures of activity limitation for Transition Care Program patients. This study has validated the DEMMI as an instrument for accurately measuring and monitoring the mobility of Transition Care Program patients. It has a broad scale width that captures the diverse range of mobility levels that are commonly observed in Transition Care Program cohorts. The DEMMI is more responsive to change than the Modified Barthel Index and offers physiotherapists an advanced method for accurately measuring and monitoring changes in mobility for Transition Care Program patients. ∎

References

Barrett B, Brown D, Mundt M, Brown R (2005a) Sufficiently important difference: expanding the framework of clinical significance. Medical Decision Making 25: 250–261.

Barrett B, Brown R, Mundt M, Dye L, Alt J, Safdar N, et al (2005b) Using benefit harm tradeoffs to estimate sufficiently important difference: the case of the common cold. Medical Decision Making 25: 47–55.

Belvedere S, de Morton N (2010) The application of Rasch analysis in healthcare is increasing and is applied for variable reasons in mobility instruments. Journal of Clinical Epidemiology 63: 1287–1297.

Charlson ME, Pompei P, Ales KL, MacKenzie CR (1987) A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. Journal of Chronic Disease 40: 373–383.

Collin C, Wade DT, Davies S, Horne V (1988) The Barthel ADL Index: a reliability study. International Disability Studies 10: 61–63.

Davenport S, de Morton N (2010) The reliability and validity of the de Morton Mobility Index (DEMMI) in healthy community dwelling older adults. Archives of Physical Medicine and Rehabilitation 92: 51–58.

Davenport S, Paynter S, de Morton N (2008) What instruments have been used to assess the mobility of community dwelling older adults? Physical Therapy Reviews 13: 345–354.

de Morton N, Berlowitz D, Keating J (2008a) A systematic review of mobility instruments and their measurement properties for older acute medical patients. BMC Health and Quality of Life Outcomes 6(44)

de Morton N, Davidson M, Keating J (2008b) The de Morton Mobility Index (DEMMI): an essential index for an ageing world. BMC Health and Quality of Life Outcomes 6(63)

de Morton N, Keating J, Davidson M (2008c) Rasch analysis of the Barthel Index in the assessment of hospitalised older patients following admission for an acute medical condition. Archives of Physical Medicine & Rehabilitation 89: 641–647.

de Morton N, Lane K (2010) Validity and reliability of the de Morton Mobility Index (DEMMI) in the subacute hospital setting in a geriatric evaluation and management (GEM) population. Journal of Rehabilitation Medicine 42: 956–961.

de Morton N, Meyer C, Moore K, Dow B, Jones CJ, Hill K (In press) Validation of the de Morton Mobility Index (DEMMI) with older community care recipients. Australasian Journal of Ageing.

de Morton NA, Keating JL, Berlowitz DJ, Jackson B, Lim WK (2007) Additional exercise does not change hospital or patient outcomes in older medical patients: a controlled clinical trial. Australian Journal of Physiotherapy 53: 105–111.

Department of Health and Ageing (2008) National Evaluation of the Transition Care Program: Final Evaluation Report. Accessed at http://www.health.gov.au on 15th September 2010.

Dewing J (1992) A critique of the Barthel Index. British Journal of Nursing 1: 325–329.

Ferreira M, Herbert R (2008) What does 'clinically important' really mean? Australian Journal of Physiotherapy 54: 229–230.

Guyatt GH, Walter S, Norman G (1987) Measuring change over time: assessing the usefulness of evaluative instruments. Journal of Chronic Disease 40: 171–178.

Hachisuka K, Ogata H (1997) Test-retest and inter-method reliability of the self-rating Barthel Index. Clinical Rehabilitation 11: 28–35.

Hill K, Moore K, Dorevitch M, Day L (2008) Effectiveness of falls clinics: an evaluation of outcomes and client adherence

to recommended interventions. Journal of the American Geriatrics Society 56: 600–608.

Husted J, Cook R, Farewell V, Gladman D (2000) Methods for assessing responsiveness: a critical review and recommendations. Journal of Clinical Epidemiology 53: 459–468.

Jensen G, Gwyer J, Hack L, Shepard K (1999) Expertise in physical therapy practice. Cochrane Database of Systematic Reviews (4): CD003010,

Kazis LE, Anderson JJ, Meenan RF (1989) Effect sizes for interpreting changes in health status. Medical Care 27: S178–189.

Norman GR, Sloan JA, Wyrwich KW (2003) Interpretation of changes on health related quality of life. The remarkable universality of half a standard deviation. Medical Care 41: 582–592.

Shah S, Vanclay F, Cooper B (1989) Improving the sensitivity of the Barthel Index for stroke rehabilitation. Journal of Clinical Epidemiology 42: 703–709.

Tennant A, Pallant J (2006) Unidimensionality matters! (A tale of two Smiths?). Rasch measurement transactions 20: 1048–1051.

World Health Organisation (2001) International Classification of Functioning, Disability and Health. Geneva: World Health Organisation.

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