Letter to the Editor

From Hospital to Home: Impact of Transitional Care on Cost, Hospitalisation and Mortality

Dear Editor,

The ageing population in Singapore poses a growing challenge and need to realign current health services and care management pathways to treat older adults with complex medical conditions.[1,2] This group of patients typically have multiple comorbidities and disabilities and are at risk of poor outcomes after they are discharged home from hospitals. Consequently, they require frequent admissions to hospitals. To address the issue of frequent readmissions of older adults with complex care needs, transitional care (TC) is offered as a care management model that can help to ameliorate this situation.[1–3]

Studies on TC have primarily targeted frail older patients and focused on health education, self-management and care coordination of social and community services that are nurse-led.[4–8] Since only care coordination is involved, frail patients with exacerbations or unresolved medical conditions had to be referred back to primary care or hospital-based physicians while patients with functional needs were referred to home- or community-based rehabilitative services.[4]

A TC model that appears to hold much promise is one that employs a multidisciplinary team comprising a medical social worker (MSW), nurse, physician and therapist to deliver comprehensive home-based care to older adults.[5,9] In the literature, the findings on the impact of TC on acute hospital utilisation, costs and mortality are mixed and inconclusive.[8,10] A local study of an integrated model of home TC had shown a reduction in readmissions to hospitals, inpatient stay and visits to the hospital emergency department (ED). However, its findings were limited by a lack of economic evaluation.[5]

Our study aimed to examine the impact of a TC programme on cost, hospitalisation and mortality in frail patients with complex functional, medical and social needs who were discharged home from a hospital located in the northern region of Singapore.

Materials and Methods

The intervention was a 3-month posthospitalisation, nurse-led home visit programme. Using an inter-disciplinary team approach, the care management team comprised a MSW, nurse, occupational therapist, physician, physiotherapist and speech therapist. The nurse was designated care manager and served as the primary point of contact for the patient, and was also responsible for the coordination of care that includes nursing procedures, monitoring chronic diseases and educating patients (and their caregivers) on chronic disease management. Additionally, the team physician was a geriatrician. Patients were selected for the programme by the geriatrician based on their clinical, functional and social profile. The workflow of the TC programme is shown in Figure 1.

For our retrospective study, we included 695 patients who were eligible for TC between April 2012 and March 2014. They were sourced from the hospital's administrative records and TC nurses' assessment forms. Data on hospital utilisation and mortality were obtained from the Ministry of Health (MOH), Singapore. Patients who were readmitted or died within 7 days postdischarge were excluded from the study. Patients were visited at a mean of 7.8 days after discharge from the hospital.

The baseline period under study was defined as 180 days prior to hospitalisation and the follow-up period was defined as 180 days after discharge from hospital. The number of hospital admissions, ED visits and duration of inpatient stay were compared between patients who had accepted (TC group, n = 533) or declined (non-TC group, n = 162) TC at follow-up 180 days later.

Other outcome measures included cost and mortality. Differences in total cost of hospitalisation between the TC and non-TC groups at 180-day follow-up were compared. Mean cost savings for the patient, government and healthcare sector were also estimated. The cost analysis included TC and inpatient charges. All cost estimates were based on normative figures published by MOH in 2012/13.[11] The costs were determined based on the requirements outlined for each care service.[11] Inpatient cost savings were derived from duration of inpatient stay (in days) multiplied by mean daily inpatient cost. The total estimated cost savings were then calculated by deducting total TC costs from inpatient cost savings.

The independent variables were intervention and time. The covariates were activities of daily living (ADLs), age, Charlson Comorbidity Index (CCI), cognitive status, ethnicity, gender, duration of inpatient stay (in days), level of care, number of admissions during the baseline

period and ward class. Data were analysed using STATA version 12.0 (College Station, TX, USA). Student's t-test and chi-square test were used for continuous and binary variables, respectively. For count or continuous outcomes, the difference-in-difference (DID) approach was used to compare outcomes between the TC and non-TC groups. For binary outcomes, we used logistic regression analysis that included independent variables and covariates. A value of P <0.05 was considered statistically significant.

The study was approved by the Domain Specific Review Board of the National Healthcare Group, Singapore.

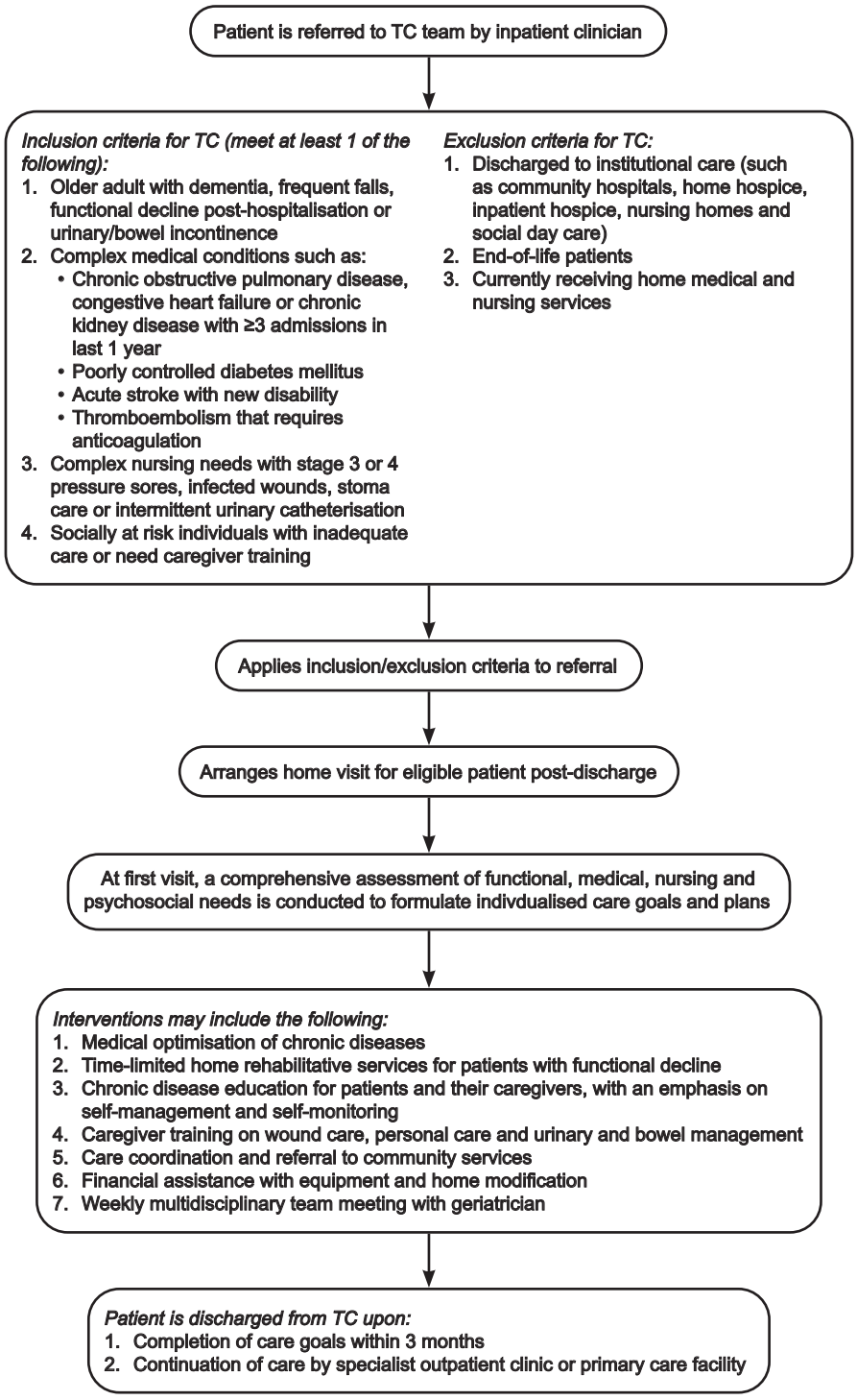

Fig. 1. Flow chart of TC programme. TC: Transitional care

Results

Patients in the TC group were older, required more assistance in their ADLs, received higher Medifund (a state endowment fund that helps needy patients to defray any outstanding healthcare charges after disbursement of subsidies and insurance payments) coverage and needed more intensive care (Table 1). At 180-day follow-up, they had 4.2 fewer days of inpatient stay (95% confidence interval [CI], −8.25– −0.14; P <0.05) than the non-TC group (Table 2). Though not statistically significant, the non-TC group had lower readmission rates (adjusted odds ratio [AOR], 0.82; 95% CI, 0.44–1.54) and mortality (AOR, 0.69; 95% CI, 0.45–1.07).

Table 1. Baseline Characteristics of Patients

Characteristic	TC Group (n = 533)	Non-TC Group (n = 162)	*P* Value
Age (mean ± SD, years)	81.9 ± 10.0	80.1 ± 12.0	0.046*
Gender (%)			0.579
Male	187 (35.1)	53 (32.7)	
Female	346 (64.9)	109 (67.3)	
Ethnicity (%)			0.882
Chinese	369 (69.2)	109 (67.3)	
Indian	43 (8.1)	16 (9.9)	
Malay	95 (17.8)	30 (18.5)	
Others	26 (4.9)	7 (4.3)	
CCI score (mean ± SD)	6.2 ± 2.2	6.0 ± 2.5	0.353
Ward class (%)‡			0.069
A	2.4	4.9	
B1	2.1	4.3	
C	53.5	58	
Non-resident	2.1	2.5	
Assisted ADLs (mean ± SD)§	2.4 ± 1.7	1.7 ± 1.7	<0.001†
Medifund (%)‖	12.4	0.6	<0.001†
Level of care (%)¶			0.04*
1	24 (4.5)	9 (5.6)	
2	258 (48.5)	94 (58.8)	
3	250 (47)	57 (35.6)	
Hospital utilisation (mean ± SD)			
Number of admissions	2.0 ± 1.4	2.3 ± 1.7	0.127
Number of ED visits	2.0 ± 1.5	2.0 ± 1.6	0.528
Inpatient stay (days)	16.0 ± 16.0	13.9 ± 11.9	0.122
Total inpatient stay (days)	24.7 ± 21.1	23.1 ± 18.8	0.383

ADLs: Activities of daily living; CCI: Charlson Comorbidity Index; ED: Emergency department; SD: Standard deviation; TC: Transitional care

*P <0.05.

†P <0.01.

‡Singaporeans are awarded subsidies depending on the class of ward they choose when they are hospitalised. For Class A ward, there is no subsidy. For Class B1 and Class C wards, the subsidies are pegged at 20% and 65–80%, respectively.

§ADLs include eating, mobility, shower/hygiene and toileting.

‖Medifund is a state endowment fund that was set up to defray any outstanding medical charges that are still incurred by needy patients after subsidies and insurance payments have been disbursed.

¶Patients were classified into 3 tiers of care based on their care needs: Level 1 patients were medically stable; Level 2 patients faced more complex medical and nursing issues; and Level 3 patients had chronic diseases and were prone to frequent exacerbations or had high functional needs.

Table 2. Hospital Admissions, ED Visits and Inpatient Stay at 180-Day Follow-Up

Variable	TC Group (n = 533)	Non-TC Group (n = 162)	Difference-in-Difference (95% Confidence Interval)		
			Unadjusted	Adjusted*	Sensitivity Analysis†
Number of hospital admissions (mean ± SD)	1.0 ± 1.4	1.2 ± 1.5	0.04 (−0.3 – 0.4)	0.03 (−0.3 – 0.4)	−0.01 (−0.34 – 0.33)
Number of ED visits (mean ± SD)	1.0 ± 1.3	1.0 ± 1.4	0.1 (−0.3 – 0.5)	0.1 (−0.2 – 0.5)	0.14 (−0.20 – 0.48)
Total inpatient stay (mean ± SD, days)	8.5 ± 14.9	11.0 ± 16.6	−4.1 (−8.6 – 0.5)	−4.2 (−8.3 – 0.1)‡	−3.41 (−6.40 – −0.42)‡

ED: Emergency department; SD: Standard deviation; TC: Transitional care

*Adjusted coefficients in the difference-in-difference analysis were used to account for intervention in TC patients. Generalised linear models with ordinary least squares regression analysis were used to adjust for age, Charlson Comorbidity Index, dementia, ethnicity, functional status, gender, inpatient stay at baseline, level of care and ward class.

†Sensitivity analysis was performed to exclude patients whose inpatient stay exceeded 60 days.

‡P <0.05.

At 180-day follow-up, the adjusted DID inpatient stay of 4.2 days translated into mean cost savings of S$2765 for every patient. The mean number of TC home visits was 4.5 for each patient, which included 1.8 (S$183/visit), 1.7 (S$344/visit) and 1 (S$252/visit) visit by the nurse, physician and therapist, respectively. However, the mean cost savings were offset by an increase in the take-up rate of the services offered by the TC programme which resulted in a mean cost of S$1166 for each patient. Nevertheless, it still resulted in mean cost savings of S$1599 for every participant.

Discussion

Our study has shown that a TC programme could reduce inpatient stay by 4.2 days at 180-day follow-up. Although most TC programmes were nurse-led, they adopted a collaborative model that involved a primary care physician.[8] In this programme, direct access by phone to the TC nurse for medical exacerbations and the presence of a geriatrician in the team had facilitated direct management of medical issues in the patients' own homes. The TC nurse also coordinated the delivery and provision of community services to participants for better continuity of care at home.[12] As such, the reduction in the number of hospital readmissions could be attributed to better access to these services and continuity of care. They also increase the likelihood of keeping older adults at home for longer periods.[13]

Although our study had demonstrated the efficacy of TC in reducing inpatient stay, it is possible that other factors may have contributed to this outcome such as earlier identification and management of the functional, medical and social problems faced by patients in their own homes and in the community. We also did not find a significant difference in the number of hospitalisations and readmissions despite a reduction in inpatient stay. Intermittent hospitalisations cannot be avoided in patients in the TC group since they had high morbidity with a CCI score of 6.2 and were at high risk for disease and symptom progression.

Various features were incorporated into the TC programme to meet the complex needs of older adults with multiple comorbidities. They included chronic disease counselling, medication management, caregiver training, nursing care and medical consultation with disease management.

Since the TC programme adopted a multidisciplinary approach, its delivery required the deployment of different resources and we therefore examined its impact on cost. Studies have shown that variability in the level and service of home medical and nursing care provided can have implications on the economic evaluation of the effectiveness of these resources.[14] Although the findings of most studies on the impact of TC on healthcare cost were inconclusive,[8,10] our study had estimated annual cost savings of S$1,119,300 (S$637,700 for patients and S$481,600 for the state) for 700 patients that accrued from a shorter inpatient stay.

Our study has a few limitations. The participants were not randomly assigned to either the TC or non-TC groups. Both groups also differed in their financial and functional status which could introduce bias. Nevertheless, the results were adjusted to account for the differences in their baseline characteristics and to exclude confounding factors. In our cost analysis, we were not able to include the costs of ED, specialist care, primary care and community support services as well as other indirect costs.

Since our TC programme had targeted a heterogeneous group of patients with complex medical issues and they were selected based on their clinical, functional and social profile by a geriatrician, this limits the generalisability of the findings in this study to other patient cohorts. It is possible that a simple tool could be developed to identify a homogeneous group of patients in terms of their care needs.[15] Future studies of the TC programme could be directed at a systematic segmentation of the study population to have a better understanding of their characteristics and needs, allocation of resources and delivery of services that can help to improve patient outcomes.

Conclusion

Our study showed that a multidisciplinary, nurse-led TC programme which targets patients with complex care needs could reduce inpatient stay and lead to cost savings. It also evaluated the real-world effectiveness of a TC programme in a heterogeneous group of patients who were stratified based on their care needs. However, more detailed studies that include better stratification of patient needs are needed to examine the impact of TC on cost, acute hospital utilisation and patient outcomes.

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REFERENCES

1. Forster AJ, Murff HJ, Peterson JF, Gandhi TK, Bates DW. The incidence and severity of adverse events affecting patients after discharge from the hospital. Ann Intern Med 2003;138:161–7.
2. Wong WC, Sahadevan S, Ding YY, Tan HN, Chan SP. Resource consumption in hospitalised, frail older patients. Ann Acad Med Singapore 2010;39:830–6.
3. Cua YM, Kripalani S. Medication use in the transition from hospital to home. Ann Acad Med Singapore 2008;37:136–41.
4. Wee SL, Loke CK, Liang C, Ganesan G, Wong LM, Cheah J. Effectiveness of a national transitional care program in reducing acute care use. J Am Geriatr Soc 2014;62:747–53.
5. Low LL, Vasanwala FF, Ng LB, Chen C, Lee KH, Tan SY. Effectiveness of a transitional home care program in reducing acute hospital utilization: a quasi-experimental study. BMC Health Serv Res 2015;15:100.
6. Naylor MD, Brooten DA, Campbell RL, Maislin G, McCauley KM, Schwartz JS. Transitional care of older adults hospitalized with heart failure: a randomized, controlled trial. J Am Geriatr Soc 2004;52:675–84.
7. Coleman EA, Boult C; American Geriatrics Society Health Care Systems Committee. Improving the quality of transitional care for persons with complex care needs. J Am Geriatr Soc 2003;51:556–7.
8. Bryant-Lukosius D, Carter N, Reid K, Donald F, Martin-Misener R, Kilpatrick K, et al. The clinical effectiveness and cost-effectiveness of clinical nurse specialist-led hospital to home transitional care: a systematic review. J Eval Clin Pract 2015;21:763–81.
9. Low LL, Tay WY, Tan SY, Chia EHS, Towle RM, Lee KH. Transitional Home Care Program Utilizing the Integrated Practice Unit Concept (THC-IPU): effectiveness in improving acute hospital utilization. Int J Integr Care 2017;17:5.
10. Le Berre M, Maimon G, Sourial N, Guériton M, Vedel I. Impact of transitional care services for chronically ill older patients: a systematic evidence review. J Am Geriatr Soc 2017;65:1597–608.
11. Ministry of Health, Singapore. Calculation of norm costs for long-term care expenditure. Available at: https://www.moh.gov.sg/news-highlights/details/calculation-of-norm-costs-for-long-term-care-expenditure. Accessed on 6 September 2019.
12. Lim SC, Doshi V, Castasus B, Lim JK, Mamun K. Factors causing delay in discharge of elderly patients in an acute care hospital. Ann Acad Med Singapore 2006;35:27–32.
13. Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. N Engl J Med 2009;360:1418–28.
14. Ramos ML, Ferraz MB, Sesso R. Critical appraisal of published economic evaluations of home care for the elderly. Arch Gerontol Geriatr 2004;39:255–67.
15. Chong JL, Matchar DB. Benefits of population segmentation analysis for developing health policy to promote patient-centred care. Ann Acad Med Singapore 2017;46:287–9.

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