MODELS OF GERIATRIC CARE, QUALITY IMPROVEMENT, AND PROGRAM DISSEMINATION

Effectiveness of a National Transitional Care Program in Reducing Acute Care Use

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This study evaluated the effectiveness of a national transitional care program for elderly adults with complex care needs and limited social support. The Aged Care Transition (ACTION) Program was designed to improve coordination and continuity of care and reduce rehospitalizations and visits to emergency departments (EDs). Dedicated care coordinators provided coaching to help individuals and families understand the individuals' conditions, effectively articulate their preferences, and enable self-management and care planning. Participants were individuals aged 65 and older hospitalized and enrolled from five public general hospitals in Singapore between February 2009 and July 2010 (N = 4,132). The coordinators worked with participants during hospitalization and followed up with telephone calls and home visits for 1 to 2 months after discharge and coordinated placements with appropriate community service providers. Unplanned rehospitalization and ED visit (up to 6 months after discharge) rates were compared with those of a comparator group of individuals who did not receive care coordination using propensity score-based weighting. Participant and caregiver surveys on quality of life and self-rated health were also administered. Recipients of the ACTION program had fewer unplanned rehospitalizations and ED visits after discharge. Propensity score–adjusted odds ratios of participants versus control for number of unplanned rehospitalization and ED visits were 0.5 (95% confidence interval (CI) = 0.5–0.6) and 0.81 (95% CI = 0.72–0.90) 30 days after discharge and 0.6 (95% CI = 0.6–0.7) and 0.90 (95% CI = 0.82–0.99) 180 days after discharge. Quality of life and self-rated health were better 4 to 6 weeks after discharge than 1 week after discharge. These findings confirm the effectiveness of the ACTION program in improving the transition of vulnerable older adults from hospital to community. Such transitional care should be considered as an integral part of care integration. **J Am Geriatr Soc 62:747–753, 2014.**

Key words: care coordination; rehospitalizations; Singapore

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Rehospitalizations are common and costly.[1] In the face of aging populations, rising healthcare costs, and limited budgets, most developed countries are actively exploring innovative approaches to improve care delivery, reduce rehospitalizations, and contain health budgets. In addition to the expense, rehospitalizations may reflect poor quality care.[2–4]

Transitional care has been defined as a set of actions designed to ensure the coordination and continuity of care as people transfer between locations or different levels of care within the same location.[5] Executing effective care transitions can be challenging.[6] Greater access to postdischarge health services per se may not reduce rehospitalizations. For example, a Veterans Affairs study found that pre- and post-discharge follow-up by a nurse and primary care physician increased rather than decreased rehospitalizations,[7] and a study of 15 randomized trials reported that 13 of the care coordination programs did not reduce rehospitalizations.[8] Transitional care interventions with substantial person contacts for carefully selected individuals from hospital to other settings may be more effective in reducing rates of subsequent hospitalizations.[8–11]

The Singapore healthcare system comprises some 35 specialty care areas. Although quality of care within each specialty is good, fragmentation of care across the health system presents a challenge. There were 251 hospital admissions per 1,000 population aged 65 and older, with a 19.0% all-cause 30-day readmission rate[12] in 2010. Currently,

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Singapore's community and long-term care systems are less well developed than its acute care system. Care integration and enabling better and more-comprehensive chronic and long-term care in the nonacute sector is a priority for the Health Ministry. Because of the good quality of care and available subsidies, there is a strong preference for medical care within the accessible public health system—public hospitals and polyclinics—where 70% to 80% of Singaporeans obtain their medical care. In recent years, Singapore's public hospitals have been experiencing high occupancy rates,[13] bringing greater urgency to the integration of hospital and community care.

This study evaluated the effectiveness of Aged Care Transition (ACTION)—a national demonstration program[14] providing hospital to community transitional care support for elderly adults with complex care needs and limited social support. The primary goals of the ACTION program are to reduce unplanned hospitalizations and emergency department (ED) visits and to improve overall health in this vulnerable population. The Agency for Integrated Care (AIC) implemented it at the five general public hospitals in Singapore with funding from the Health Ministry over 4 years starting from mid-2008. The program, delivered by dedicated care coordinators, is goal oriented and time limited to complete the care recipient's restorative process and assist them and their families to make long-term arrangements for care. Subsequent unplanned hospitalizations of a cohort of individuals who received the ACTION program were compared with those of a cohort of individuals who did not. Potential self-selection bias, the lack of a comparison group, and short follow-up periods have limited most care management program evaluations. The current study addressed these limitations by applying inverse probability of treatment weighting using the propensity score on acute usage data up to 6 months after discharge to a control group.

METHODS

Program Description

AIC employed ACTION care coordinators. A care transition team was set up at each of the five hospitals (Alexandra Hospital, Changi General Hospital, National University Hospital, Tan Tock Seng Hospital, and Singapore General Hospital, including the National Heart Centre) between June 2008 and November 2009 and were initially authorized to operate for 4 years. Each team comprised four to 16 care coordinators and a project director and a clinician leader—both of whom were hospital employees with other responsibilities. Depending on the hospital role of the project director, ACTION could be under the purview of the operations, medical social services, or nursing departments at the respective hospitals. Of the six clinician leaders, four were geriatricians, one a family medicine–hospitalist, and one a cardiologist. AIC set broad guidelines for enrollment of individuals newly admitted to the program (Table 1). In general, individuals meeting one or more of these criteria were referred to the care coordinators early during their inpatient stay for a more-comprehensive assessment and, if found suitable, for voluntary enrollment in the program. The service was provided at no cost to care recipients and their families. The main reasons for enrollment were significant functional decline, complex medical problems, home caregiver with difficulty coping, confusion or cognitive impairment, or elderly adult living alone with no caregiver.

Table 1. Agency for Integrated Care (AIC) Guidelines for Recruitment into the Aged Care Transition (ACTION) Program

Guidelines for Recruitment into the ACTION Program
Admitted into government-subsidized ward classes[a] of the respective hospitals
Aged ≥ 65
Multiple diagnoses and comorbidities
Taking >5 different types of medications
Impaired mobility or significant functional decline
Impaired self-care skills
Poor cognitive status
Catastrophic injury or illness
Chronic illness
Lives alone or has poor social support
History of multiple hospital admissions or visits to emergency departments over the last 6 months

Care coordinators further assessed individuals who met at least one criterion for possible recruitment into the program.

[a]Within the public hospitals, individuals have a choice of type of ward accommodation at admission; 80% of the public hospital beds are heavily subsidized (40–80% subsidy based on means test).

Adopting the Care Transitions Program's[15] components, the care coordinators, the majority of whom are registered nurses and medical social workers, provided coaching aimed at helping individuals and their families understand the individual's condition, effectively articulate their preferences, enable self-management and care planning, to ensure safe and effective care transitions from the hospitals to home. During hospitalization, the care coordinator worked with families and other hospital staff to develop the most appropriate care plans and followed up with telephone calls and home visits for an average of 1.5 months after hospitalization. With the average length of hospital stay being 15 days, participants were enrolled in the program for an average of 2 months. The care coordinators also helped to coordinate referrals to appropriate service providers offering services such as day care and home care within the community through AIC. Each hospital was allowed to define its own focus and processes within the specified boundaries, in particular, screening or referral process, clinical disciplines to include, and intensity and duration of postdischarge follow-up. In general, individuals on their hospital's clinical pathway management, case management, or disease management programs and nursing home residents were not enrolled.

Study Population and Data Sources

A retrospective cohort study was conducted to compare the risk of unplanned rehospitalizations of individuals in the ACTION program with the risk of a comparator group of individuals. The ACTION cohort comprised 5,023 cases enrolled in the ACTION program between February 1, 2009, and July 31, 2010. Although the program started in

three of the five hospitals before February 2009, only individuals enrolled after January 2009 were included so as to allow the program to stabilize. This represented approximately 5% of annual public hospital admissions for those aged 65 and older. For the comparator group, the same number of individuals hospitalized during the period was retrospectively selected from the Health Ministry Casemix and Subvention administrative database. Because limited information was available from the database, only partial ACTION eligibility criteria were imposed for comparator selection. Individuals who met at least one of the following criteria for index hospitalization were excluded from the comparator group: social overstayers (individuals who were medically ready for discharge but who extended their hospital stay for social reasons), individuals who left the hospital against medical advice, individuals who were younger than 65, and individuals who were discharged from a nonsubsidized (where individuals receive not more than 20% government subsidy of their hospitalization charges) ward class. Furthermore, only individuals who met at least one of the following criteria were included in the comparator group: three or more diagnoses, one or more of seven chronic diseases (diabetes mellitus, hypertension, hyperlipidemia, dementia, chronic obstructive pulmonary disease, stroke, and schizophrenia), and more than one hospitalization or ED visit in the 180 days before the index hospital admission. Frequency matching based on age and sex stratification was performed to ensure a similar age and sex distribution. For individuals in the comparator group with multiple hospitalizations, one hospitalization was randomly selected to be their index hospitalization. The ACTION cohort's data were also extracted from the Casemix database using a unique identifier and date of hospital admission.

Data were obtained for the ACTION and comparator groups from the Casemix database on age, sex, date of index hospital admission, primary diagnosis, length of stay, Charlson Comorbidity Index (for index hospitalization), and number and dates of hospitalizations and ED visits within 6 months before and after index hospitalization. To determine whether readmissions were unplanned, the ED admission records were merged with hospitalization records within 180 days of the index hospitalization. A rehospitalization was classified as unplanned if the date of hospitalization was the same as the date of admission to or discharge from the ED or was between the two dates. Information on mortality within the 180-day postdischarge period was obtained from the national registry of births and deaths. With approval from the Health Ministry, data were extracted in a de-identified form and analyzed in the Ministry's Microdata Access Laboratory.

As part of an overall program audit and evaluation, a summary of cost and operational data was obtained from the AIC ACTION implementation team and finance department. Between February and March 2011, a service feedback survey was administered in a consecutive sample of ACTION care recipients who gave informed consent. Those who lodged a complaint against the hospital, social overstayers, and those who were cognitively impaired and did not have a caregiver (who could take the survey as a proxy) were excluded. Fewer than 5% overall were excluded. An external research team administered surveys over the telephone or face to face 1 week and 4 to 6 weeks after discharge. The first survey comprised the EQ-5D[16] scale, and the second survey comprised the locally validated[17] Care Transition Measure (CTM-15)[18,19] as a measure of quality of transitional care, service satisfaction ratings, and a second EQ-5D.

Statistical Analyses

The nonequivalence of the comparator group was adjusted for using propensity score weighting. Propensity score represents the conditional probability that a given individual will be enrolled in the ACTION program given the individual covariates.[20] Each subject's propensity score was derived using multiple logistic regression with the covariates age, sex, length of initial hospital stay, Charlson index, number of hospital admissions in the past 180 days and ED attendance. These covariates had been reported to be predictors of unplanned rehospitalization.[21,22] Individual observations were inverse probability weighted so that the two groups had the same overall propensity to be assigned to ACTION or the comparator group, which meant that each observation for each ACTION participant was weighted by the inverse of the propensity score, and each observation for each comparator participant was weighted by the inverse of (1–propensity score).[23] Those with weights exceeding the 99th percentile were assigned the 99th percentile weight to avoid apportioning inordinate weight. Participant characteristics were compared before and after propensity adjustment using two-sample *t*-tests (for continuous variables) or chi-squared tests (for categorical variables). A propensity score–weighted logistic regression, with postdischarge mortality accounted for, was fitted for each primary outcome (unplanned rehospitalizations (15, 30, and 180 days after discharge) and ED visits (30 and 180 days after discharge)) to obtain the respective adjusted outcomes.[24,25] The adjusted unplanned rehospitalization outcomes were compared using Wald tests. Statistical analyses were performed using Stata version 10 (Stata Corp., College Station, TX).

RESULTS

Of 5,023 individuals enrolled in the ACTION program, 4,574 were aged 65 and older, 4,177 of whom were matched to unique participant records from the Health Ministry Casemix database, 4,132 of whom had matched hospital admission information and comprised the ACTION cohort for analyses. ACTION program participants were old (mean age 79.2) and had long hospitalizations (mean stay 14.6 days). Forty-one percent had at least one unplanned hospitalization, and 97% had at least one ED visit in the prior 6 months. Demographic characteristics, length of index hospital stay, comorbidity burden, number of preindex hospitalizations, and proportion with preindex hospitalizations of ACTION and non-ACTION group participants are compared in Table 2. ACTION program participants had a higher comorbidity burden (mean Charlson index 1.7 vs 1.4), longer index hospital stay (mean 14.6 vs 7.4 days), and greater ED use (mean 1.9 vs 1.7 visits) but fewer hospitalizations (mean 0.74 vs 0.89 admissions) in the 6 months before the index

Table 2. Participant Characteristics of Aged Care Transition (ACTION) (N = 4,132) and Non-ACTION (N = 4,132) Cohorts Before Enrollment into Program

Characteristic	Unweighted			Propensity Score Weighted[a]		
	ACTION	Non-ACTION	*P*-Value[b]	ACTION	Non-ACTION	*P*-Value[c]
Age, mean ± SD	79.2 ± 7.7	79.1 ± 7.7	—	79.2 ± 7.7	79.2 ± 7.7	—
Female, %	56.2	56.2	—	56.5	56.5	—
Charlson Index	1.7 ± 1.9	1.4 ± 1.7	<.001	1.6 ± 1.8	1.5 ± 1.8	.37
Length of stay, days, mean ± SD	14.6 ± 16.2	7.4 ± 10.0	<.001	11.6 ± 13.0	11.1 ± 15.4	.25
Number of hospitalizations within 180 days before index hospitalization, mean ± SD	0.7 ± 1.3	0.9 ± 1.5	<.001	0.8 ± 1.4	0.8 ± 1.4	.51
Hospitalization within 180 days before index hospitalization, %	40.7	47.4	<.001	41.9	44.7	.01
Number of ED visits within 180 days before index hospitalization, mean ± SD	1.9 ± 2.3	1.7 ± 2.1	<.001	1.9 ± 2.0	1.9 ± 3.1	.89
ED visit within 180 days before index hospitalization, %	97.4	89.9	<.001	96.9	91.5	<.001

SD = Standard Deviation; ED = Emergency Department.
[a]Inverse probability weights: 1/propensity (ACTION); 1/(1–propensity) (non-ACTION).
[b]Two-sample *t*-test or chi-square test.
[c]Weighted or logistic regression of each covariate on discharge disposition; Wald test *p*-value of coefficient for discharge disposition.

hospitalization. After adjustment using propensity weighting, there were no differences in these variables between the two groups except for a higher rate of prior ED visits for ACTION program participants (97 vs 92%). ACTION participants enrolled in 2010 were heterogeneous in terms of diagnosis for hospitalization, with the top 10 diagnoses contributing to only 29% of all diagnosis. They also had varying care needs; 40% did not have a caregiver at home, 36% had experienced two or more falls before hospitalization, 68% were taking more than five medications, and 56% had three to six comorbidities. Twenty-two percent of ACTION participants died within 6 months after discharge, compared with 14% of the comparator group (Table 3).

Table 4 compares the propensity-adjusted unplanned rehospitalizations (15-, 30-, and 180-day) and ED visits (30- and 180-day) of the ACTION and comparator groups. ACTION program participants were less likely to be have unplanned hospitalizations or visit the ED after discharge. Adjusted odds ratios comparing unplanned hospitalizations and ED visits of program subjects with those of controls were 0.5 [95% confidence interval (CI) = 0.5–0.6] and 0.81 (95% CI = 0.72–0.90), respectively, at 30 days and 0.6 (95% CI = 0.6–0.7) and 0.90 (95% CI = 0.82–0.99), respectively, at 180 days. There was a sustained ACTION program effect beyond the average of 1.5 months of ACTION program intervention. This is despite the fact that those in the ACTION program had a slightly greater propensity-weighted ED visit rate in the 6 months before the index hospitalization. The number of unplanned rehospitalizations was also compared with the number of all rehospitalizations. In the 15 days after discharge, all rehospitalizations

Table 3. Deaths of Aged Care Transition (ACTION) and Non-ACTION Participants

Death	ACTION, n = 4,132	Non-ACTION, n = 4,132[a] n (%)	Total, N = 8,264
Within 15 days of the index hospitalization	149 (3.6)	50 (1.2)	199 (2.4)
Within 30 days of the index hospitalization	291 (7.0)	127 (3.1)	418 (5.1)
Within 180 days of the index hospitalization	889 (21.5)	570 (13.8)	1,459 (17.7)

[a]Death status was missing for two control participants.

Table 4. Usage Outcomes: Unplanned Rehospitalizations and Emergency Department (ED) Visits After Enrollment into Program of Aged Care Transition (ACTION) and Non-ACTION Participants

Usage Outcome	ACTION	Non-ACTION	*P*-Value[a]	Propensity Adjusted Odds Ratio (95% Confidence Interval)	*P*-Value[a]
Unplanned rehospitalizations					
Within 15 days					
n	411	879	<.001	0.5 (0.4–0.5)	<.001
%	10.0	21.3	<.001		
Within 30 days					
n	646	1,148	<.001	0.5 (0.5–0.6)	<.001
%	15.6	27.8	<.001		
Within 180 days					
n	1,564	2,130	<.001	0.6 (0.6–0.7)	<.001
%	37.9	51.6	<.001		
ED visits					
Within 30 days					
n	992	1,240	.002	0.81 (0.72–0.90)	<.001
%	19.3	32.0	<.001		
Within 180 days					
n	3,801	4,545	.05	0.90 (0.82–0.99)	.03
%	46.3	57.9	<.03		

[a]Weighted or logistic regression of each covariate on discharge disposition; Wald test *p*-value of coefficient for discharge disposition.

in both groups were unplanned. At 30 days, 70% of hospitalizations of the ACTION group were unplanned, compared with 90% in the comparator group. At 180 days, approximately half of all rehospitalizations in either group were unplanned.

According to AIC records, the additional cost for the ACTION program over 6 months from April to September 2010 was S$1.94 million, which the care coordinators' salaries almost entirely accounted for (>95%). In 2010, the program follow-up period after hospital discharge averaged 1.5 months (16%, <1 month; 46%, 1–2 months; 38%, >2 months).

Of 536 people recruited for a satisfaction survey, 451 completed both surveys 1 week and 4–6 weeks after discharge and constituted the analyses cohort. Because of participant preference, proxy caregivers completed approximately 70% of the surveys. The overall mean CTM-15 score was 63.8 (n = 451), with mean score for each domain (critical understanding, participant preferences, self-management preparation, and care plan)[19] ranging from 2.81 to 2.98 (1, strongly disagree; 2, disagree; 3, agree; 4, strongly agree), reflecting mainly positive responses on all domains. On a 5-point scale (very poor, poor, satisfactory, good, excellent), the majority rated knowledge of the care coordinators (63%) and care and concern shown by care coordinators (68%) as good or excellent. Of the 451 completed surveys, 296 of the pre- and postsurvey pairs were completed by the same individual, which were analyzed for any change in EQ-5D. A greater proportion reported having no problem 4 to 6 weeks after discharge than 1 week after discharge for the five domains of the EQ-5D (Figure 1). Furthermore, mean scores on the EQ visual analogue scale for self-rated health also improved between 1 week (mean score 60.4) and 4 to 6 weeks (mean score 64.1) after discharge (P = .03).

DISCUSSION

This study showed that the goal-oriented, time-limited Singapore ACTION program reduced unplanned rehospitalizations and ED visits for older adults hospitalized with complex care needs and limited social support. Although a range of approaches have shown promise in improving care and reducing avoidable hospitalizations in a controlled trial setting, there has been little evidence that such interventions have been successfully implemented in practice on a regional or national scale.[26–28] As far as the authors are aware, this is among the first evaluations of a large-scale program based on the Care Transitions Intervention.[15] Many demonstration care coordination or transition programs did not reduce rehospitalizations and healthcare expenditures for people with chronic illness.[8,29] This demonstration had a large sample size and achieved good precision in the usage outcomes, as evidenced by the narrow CIs. Furthermore, the program achieved these outcomes using flexible models implemented in different hospitals in diverse groups managed under different clinical disciplines.

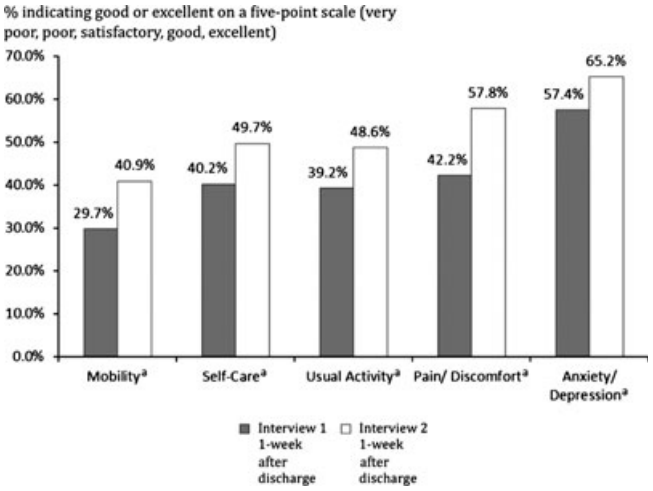

Figure 1. Change in EQ-5D quality-of-life domains of 296 repeat survey respondents who participated in the Singapore Aged Care Transitions Program ([a]P<.05).

Aged Care Transition program care coordinators did not simply educate or assist participants by telephone but supplemented telephone calls with in-person meetings.[30] Placing the care coordinators at the hospitals made it possible for them to recruit and assess participants and to collaborate closely with participants' physicians so as to have a reasonable prospect of influencing care. In some, but not all[7,31] cases, programs with substantial in-person contact that target suitable individuals have been found to be effective in reducing rehospitalizations.[8,23] When the number of unplanned rehospitalizations was compared with all rehospitalizations, all rehospitalizations within 15 days of discharge were unplanned, and 50% of the rehospitalizations within 180 days of discharge were unplanned in the ACTION or comparator groups, but within 30 days of discharge, only 70% of rehospitalizations of the ACTION group were unplanned, compared with 90% in the comparator group. Because the ACTION intervention lasted an average of 1.5 months after discharge, this suggests that the intervention had its greatest effect in reducing unplanned rehospitalizations during the intervention period. The analyses adjusted for prior hospitalizations and ED visits and other known factors that could account for differences in readmission rates. The Veterans Affairs study that reported more rather than fewer rehospitalizations provided greater pre- and post-discharge access to a primary care physician in addition to a nurse.[7] It was possible that having an additional channel to voice complaints can lead to more readmissions of chronically ill individuals. The present study did not compare contacts with primary physicians. Nevertheless, the findings confirmed that, for individuals and families who would otherwise be left on their own during transitions, the care coordinators, who enabled self-management and helped ensure continuity of clinical care and obtain support services for home care and rehabilitation, improved outcomes. The survey of a separate sample of program care recipients showed generally positive responses regarding the quality of transitional care as measured using the CTM-15, general satisfaction with the service, and improvement in EQ-5D quality of life measures during the period of the program. This finding supports the effectiveness of the program in maintaining the quality of life of the care recipients.

Australia's National Transition Care Program, introduced in 2007, was considered insufficiently cost effective

in comparison with other interface programs such as acute and inpatient subacute services.[29] The current evaluation showed that the ACTION program reduced the number of rehospitalizations by 27% and ED attendance by 16% during the 6 months after initial hospital discharge. Although actual expenditures were not obtained in this evaluation, the cost savings from the public health system's perspective could be estimated from the difference in hospital days and incremental program costs. The ACTION program cost was S$1.94 million over 6 months in 2010. The average bed cost per patient day was S$842 in 2009. There were 566 fewer rehospitalizations in 6 months in the ACTION than the comparator group. Assuming the same propensity-adjusted average length of stay during the index admission for the non-ACTION group of 11.1 days (Table 2), the associated bed days saved would be 6,283, with associated cost savings of S $5.3 million. The additional ACTION program cost to keep a care recipient out of the hospital was S$1.94 million over 6 months. Therefore, the overall cost savings from reductions in hospitalizations attributed to this care transition intervention on 4,000 individuals was estimated to be S$3.4 million over 6 months. This crude estimation assumes no net additional healthcare cost by ACTION care recipients. The assumption is reasonable given that savings from reduced ED visits for ACTION care recipients were not considered and that ACTION care recipients did not receive any residential care, were not on any other hospital programs, and were not likely to incur primary care and community care costs other than those that a control group under similar conditions would incur. The only likely additional cost to ACTION care recipients and their families would possibly be mobility or care equipment and home modifications. Notwithstanding a careful cost effectiveness analyses, this demonstration program appeared to deliver good value for the money.

The longer length of hospital stay, higher Charlson score (Table 1), and greater mortality (Table 2) of the ACTION group suggests that they were sicker than those in the comparator group. Nevertheless, other than the intervention from the care coordinators, both groups had equal access to services during and after their hospital stay. These differences were accounted for in the comparison of rehospitalization outcomes through the use of propensity score adjustment and discounting the death cases. Public hospitals in Singapore offer good, heavily subsidized care. Coupled with long waits for community care placement, there is a tendency toward high occupancy rates[32] and longer stays, especially in vulnerable older people, as evidenced by the group enrolled in the ACTION program. Other than being sicker, the longer hospital stay of the ACTION group is not a reflection of poor hospital care per se but rather the need to better integrate hospital and community care. This has been the current urgent focus of Singapore's public health and social care system.

There were absolute challenges and lessons learned from implementation and differences between the hospitals. This will be described in another report. The current study addressed some methodological challenges in the evaluation of programs like this. Combining large cohort data sets with propensity adjustment, program effectiveness was evaluated at the population level. Some limitations are worth noting in interpreting the findings. As with program evaluation, unlike the original Care Transition Intervention report,[10,11] this was a retrospective study and not a controlled trial. The lack of information to compare the use of community healthcare services between the two groups, which could also influence outcomes, limited the evaluation. The ACTION care teams at the different hospitals can define and refine their own care focus and process. For this reason, there was no standard rate or dosage of intervention for the ACTION group. Furthermore, the effectiveness of the program may be limited to the subgroup of participants who chose hospital beds with high government subsidies. Although this is not a reflection of socioeconomic status per se, ACTION participants are generally from the lower socioeconomic strata and have limited resources. Individuals who could afford to supplement the deficiencies in the healthcare system may be at lower risk of avoidable hospitalization.[31] The higher mortality of the intervention group remains to be explained. It could have at least three etiologies, not mutually exclusive: a sicker intervention group; more-appropriate palliative care being provided, or problems with the management of the transitions. Last, the participant–caregiver survey was conducted on a group of program enrollees from a different period. Although the results may not be specific to the initial cohort of enrollees, it is nevertheless an indication of improvement in well-being of participants who were enrolled in the program.

The ACTION hospital-based transitional care program significantly reduced acute care usage for up to 6 months after discharge. The findings confirmed the effectiveness of the Care Transition Intervention in Singapore's public health system. These findings are relevant to recent policy interest in managing demand for acute care beds and in establishing integrated regional health systems in Singapore. Good transitional care services can effectively complement sub- and postacute services. To further assist community-dwelling individuals with complex conditions beyond the 1- to 2-month transitional care period, a pilot case management program was subsequently implemented in 2012 to follow selected individuals who benefitted from the ACTION program. Transitional care services could be established within the context of regional plans for eldercare, incorporating acute care, subacute care and long-term care community and residential care for more-effective transition across settings. Some of the hospitals in Singapore are already using their own funds to support the expansion of the transitional care program.

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Author Contributions: Shiou-Liang Wee produced the original study design, supervised survey data collection and analyses, interpreted the data, wrote and revised the manuscript. Chok-Kang Loke and Chun Liang performed the data management and analyses. Ganga Ganesan supervised the Casemix data analyses, contributed to data interpretation, and revised the manuscript. Loong-Mun Wong and Jason Cheah contributed to data interpretation and offered comments for drafting the manuscript.

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