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ORIGINAL ARTICLE:SOCIAL RESEARCH, PLANNING AND PRACTICE

Evaluation of an integrated primary care-led dementia shared care program in Singapore: An effectiveness and cost-effectiveness study

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Aim: With an aging Singapore population, there is an increasing demand for dementia care. The present study aimed to evaluate the effectiveness and cost-effectiveness of the Primary Care Dementia Clinic (PCDC) in comparison with the Memory Clinic (MC; hospital-based) and other polyclinics.

Methods: A quasi-experimental design was implemented. Effectiveness of PCDC was assessed through caregiver satisfaction, quality of life (caregiver-rated) and adverse events rates. Quality-of-Life measures using the EuroQol 5 Dimension Questionnaire (EQ-5D) at baseline, 6 months and 12 months was assessed. Costs were calculated from a societal perspective. The incremental cost-effectiveness of the PCDC was compared with MC and other polyclinics.

Results: The present study showed that quality of life and the rate of adverse events at 12 months were similar between the three groups. Caregiver satisfaction at 12 months was higher in the PCDC group when compared with other polyclinics. There were no observed differences in societal cost between the three groups. At 6-month follow up, direct medical costs for PCDC were significantly lower that of other polyclinics. At 12-month follow up, PCDC patients had higher Quality Adjusted Life Years (QALYs) compared with the MC group.

Conclusion: PCDC provided effective care, similar to care at MC and better than care at other polyclinics. Caregiver satisfaction was higher for the PCDC group, and PCDC patients had lower direct medical costs at 6-month follow up. Given these findings, adopting a PCDC model in other polyclinics in Singapore can be beneficial for optimal right siting of patients. **Geriatr Gerontol Int 2017; ••: ••–••.**

Keywords: dementia, integrated care, primary care, program evaluation, Singapore.

Introduction

Singapore has one of the fastest aging populations in Asia. The number of people aged ≥65 years is expected to increase to nearly 20% by 2030.[1] With this increase, dementia prevalence is also expected to escalate from an estimated 28 000 individuals in 2012 to approximately 80 000 individuals by 2050.[2] This highlights the need for the local healthcare system to provide quick access to dementia care so that diagnosis and treatment can be sought promptly.[3] The current system of dementia care is fragmented, skewed towards tertiary care and might not be sustainable in the long term.[4]

Primary care physicians can play an important role in the diagnosis and management of dementia, as they are often the first point of contact for many individuals.[5] An early diagnosis of dementia can allow patients and their caregivers to have access to medical and psychosocial support services, which might prevent psychological stress, improve morale and quality of life (QoL), and delay nursing home admission.[6–8]

Currently, persons suspected to have dementia are referred by family physicians (FP) in the polyclinics

(i.e. primary care setting in Singapore) to the specialist Memory Clinic (MC) at the hospital for further assessment. On diagnosis, patients are treated and managed at the MC. However, with the inclusion of dementia as part of the Chronic Disease Management Program, which allowed for the use of Medisave for treatment for dementia in both primary and tertiary care in 2010, more dementia cases are now being managed at the polyclinics.

In 2012, the Ministry of Health funded several dementia shared care teams between MC and polyclinics. One such dementia shared care team is the collaboration between a tertiary hospital MC and National Healthcare Group Polyclinics. The tertiary hospital provides a multidisciplinary team (geriatricians, nurse clinicians, social workers) to co-run clinic sessions with FP, nurse clinicians and other relevant allied health professionals in the polyclinic (referred to as Primary Care Dementia Clinic [PCDC]). The specific aims of this dementia care integration program include:

1. Building capability of a multidisciplinary team for community management of dementia patients;
2. Developing integrative structure and processes for PCDC and tertiary hospital MC;
3. Allocating resources appropriately and increasing the overall capacity of dementia care, while providing seamless and prompt access to primary and tertiary dementia care.

The present study aimed to evaluate the effectiveness and cost-effectiveness of the PCDC (in a specific National Healthcare Group Polyclinic) in relation to two models of care – standard primary care at other National Healthcare Group Polyclinics, and specialist care at the MC.

Methods

Study participants

Inclusion criteria

All stable dementia patients with a Clinical Dementia Rating of 0.5–3.0, on stable doses of antidepressants and/or antipsychotic agents, and having no significant behavioral issues/caregiver stress, were considered for the program. Patients' primary informal caregivers, defined as "a family member or friend who is most involved in providing care or ensuring provision of care to the patient," were also recruited. Foreign domestic workers (maids) or nurses were not considered informal caregivers, even if they were the ones most involved in caring for the patient.

Exclusion criteria

The following were excluded from the present study: patients living in a nursing home; caregivers who had no telephone contact; caregivers who were non-English

and non-Mandarin speaking; and Civil Service Club, Medifund (those on full medical assistance) and Private-class patients (excluded from program entry). It is important to note that in Singapore, healthcare is a co-payment system where the patients would still pay for out-of-pocket costs for consultations and medications.

On a weekly basis, a research assistant would identify a list of stable dementia patients who were due for their appointments at the MC. With consent from the patients, the research assistant would proceed to interview the caregiver and collect baseline data for the outcomes. If the patient did not attend the appointment at the polyclinic because he/she had decided to continue follow up at MC instead, the patient would be considered as part of the group who receives follow up at the MC.

With alpha = 0.05 and power = 0.80, the sample size required was 224 patients. After accounting for a 15% attrition rate, the total sample size required for the study was 264.

Details of the PCDC

The PCDC was set up in Ang Mo Kio Polyclinic on 23 July 2012, and was run by FP and nurses. Each patient visit was estimated to consist of a 15-min consultation with a FP, and a 15-min consultation with a nurse. Referrals to medical social workers, psychologists and physical or occupational therapists were made as necessary. A team of geriatricians and nurse clinicians from the tertiary hospital MC co-ran the clinic sessions with the FP and nurses, and led case conference discussions every 2 weeks to help the PCDC team address any concerns or challenges in dementia care.

Analysis for effectiveness of PCDC

Descriptive statistics were used to analyze the baseline characteristics. An intention-to-treat analysis was undertaken, and patients were analyzed according to the initial treatment group they were recruited to, instead of the final treatment they will receive. Ordinary Least Squares regression was used to model Quality of Life in Alzheimer's Disease (QOL-AD), EuroQol 5 Dimension Questionnaire (EQ-5D) index scores and Zarit Caregiver Burden scores, adjusting for covariates, such as age, sex, agitation/aggression, baseline Barthel score, baseline Global Clinical Dementia Rating (CDR) score and comorbidities.

Caregiver satisfaction questions (ordinal) for the five domains were recoded into a dichotomous scale – positive response (agree/strongly agree) versus the rest (neutral, disagree, strongly disagree). Odds for positive response were computed adjusting for covariates. The χ^2-test was used to assess the difference in caregiver satisfaction between the groups. Logistic regression was used to ascertain the odds for a positive response in the various caregiver satisfaction domains.

Zero-inflated Poisson regression was used to analyze adverse events, such as the number of falls, emergency department (ED) attendances and hospital admissions, as they had an excess of zero counts.

Analysis for cost-effectiveness of PCDC

The total monthly cost for each participant in the intervention and comparator groups was computed by aggregating across the different services. Cost comparisons (direct medical costs, direct non-medical costs and indirect costs) were carried out for PCDC versus MC and PCDC versus other polyclinics at 6 and 12 months. The t-test was used to compare mean costs. Multivariate cost analysis using multivariate linear regression adjusted for baseline differences was also carried out at 6 and 12 months for PCDC versus MC and PCDC versus other polyclinics. An ordinary least squares regression was carried out to estimate the mean incremental Quality Adjusted Life Years (QALY) from baseline to 6 and 12 months for PCDC versus MC and PCDC versus other polyclinics. As the cost data was collected over the 3-year recruitment timeframe, we deflated it to the base year 2012 using the consumer price index.

Direct medical costs, indirect medical costs and details on cost computation can be found in Tables S1–S5.

The primary economic evaluation was a cost-effectiveness analysis from the societal perspective. We used a generalized linear model multivariate regression to model both cost and health benefit data. The results will be presented as incremental cost per QALY. The utility values (QALY) for the patients attending the PCDC, other polyclinics and MC were derived from the EQ-5D questionnaire by using the UK value sets. The cost-effectiveness analysis was carried out at 6- and 12-month follow up.

Results

A total of 263 patients enrolled for the study at baseline (MC $n = 101$, PCDC $n = 99$, other polyclinics $n = 63$). At 6 months, 240 patients were available for follow up (MC $n = 95$, PCDC $n = 92$, other polyclinics $n = 53$), and at 12 months 226 patients were available for follow up (MC $n = 89$, PCDC $n = 86$, other polyclinics $n = 51$; Table 1).

Demographics at baseline

The mean age of the patients at baseline was 78.7, 80 and 80.7 years for the MC, PCDC and other polyclinics groups, respectively (Table 1). There were no differences in baseline characteristics between MC versus PCDC or PCDC versus other polyclinics for sex, ethnicity, marital status, housing type, smoking status and alcohol consumption (Table 1).

At baseline, 29.7% of the patients attending MC had clinical signs of agitation/aggression compared with 17.2% of the patients in the PCDC group (P-value 0.03). There were no significant differences between MC versus PCDC and PCDC versus other polyclinics for other behavioral problems, such as delusions, hallucinations, depression, anxiety, elation, apathy, disinhibition, aberrant motor behavior, and appetite and eating disorders (Table 2). There were also no baseline differences in Barthel scores, Lawton scores, Global CDR, mean Global CDR, sum of boxes, modified Mini-Mental State Examination (MMSE) mean score and EQ-5D visual analog scale score between the three groups (Table 2).

Effectiveness

Comparisons of QoL, caregiver burden and adverse event outcomes between MC versus PCDC and PCDC versus other polyclinics are presented in Tables 3 and 4. The Alzheimer's Disease QoL (ADQoL) score was significantly higher in the MC when compared with the PCDC (29.3 ± 6.1 vs 27.3 ± 5.7). However, the difference in differences from baseline was not significant between the groups. The EQ-5D index score was significantly lower at 12 months for the MC when compared with baseline (0.81 ± 0.23 vs 0.73 ± 0.32). There was a significant reduction in the number of ED attendances at 12 months for the PCDC group (0.23 ± 0.59 vs 0.09 ± 0.32). AD-QOL was significantly lower at 12 months for patients from both groups. ED attendances were significantly lower at 12 months for patients attending the PCDC (0.23 ± 0.59 vs 0.09 ± 0.32; Table 4; figures for comparison of the effectiveness measures can be found in Figs. S1–S3).

The multivariate ordinary least squares regression, adjusted for age, sex, agitation/aggression, Global CDR score, Barthel score and comorbidities, showed that the ADQoL score was significantly higher among patients in the MC at 12 months when compared with the PCDC (OR 4.5, 95% CI 0.6–33.8), and there was no difference in ADQoL scores at 12 months between the PCDC and other polyclinics (OR 0.6, 95% CI 0.1–6.5). There was no difference in the EQ-5D index score, Zarit Caregiver Burden score between PCDC and MC, and PCDC and other polyclinics. Similarly, multivariate analysis showed no differences in adverse events, such as the number of falls, ED attendance and hospital admission between the groups at 12 months.

Cost effectiveness analysis

Univariate cost analysis at 6 months showed a significantly lower mean direct medical cost for PCDC ($1600 [SD $3286]) compared with other polyclinics ($4576 [SD $12 380]), P-value = 0.03 (primarily due to differences in hospitalization costs). There were no

Table 1 Baseline demographics of the patients

Variable	MC n = 101		PCDC n = 99		Other polyclinics n = 63		P-value	
							MC vs PCDC	PCDC vs other polyclinics
Mean age (years)	79	6.2 (SD)	80	6.3 (SD)	81	5.7 (SD)	0.39	0.99
Sex								
Male	33	32.70%	31	31.30%	27	42.90%	0.83	0.13
Female	68	67.30%	68	68.70%	36	57.10%		
Ethnicity								
Chinese	94	93.10%	89	89.90%	57	90.50%	0.07	0.8
Malay	0	–	5	5.10%	4	6.30%		
Indian	7	6.90%	4	4.00%	1	1.60%		
Others	0	–	1	1.00%	1	1.60%		
Marital status								
Single	1	1.00%	0	–	1	1.60%	0.15	0.32
Married	49	48.50%	44	44.50%	23	36.50%		
Divorced/separated	0	–	4	4.00%	1	1.60%		
Widowed	51	50.50%	51	51.50%	38	60.30%		
Housing type								
1–2-room	3	3.00%	7	7.10%	1	1.60%	0.07	0.05
3-room	16	15.80%	23	23.20%	17	27.00%		
4-room	29	28.70%	34	34.30%	15	23.80%		
5-room/executive	23	22.80%	20	20.20%	25	39.70%		
Private housing	8	7.90%	7	7.10%	2	3.20%		
Landed	22	21.80%	8	8.10%	3	4.80%		
Smoking status								
Current	4	4.00%	5	5.10%	0	–	0.63	0.07
Ex-heavy	18	17.80%	13	15.50%	14	22.20%		
Non	79	78.20%	81	81.80%	49	77.80%		
Alcohol ingestion								
Current	3	3.00%	5	5.10%	0	–	0.31	0.14
Previous	13	12.90%	7	7.10%	7	11.10%		
Never	85	84.10%	87	87.90%	56	88.90%		
Mean no. comorbidities	2.3	1.3 (SD)	2	1.1 (SD)	2.9	1.2 (SD)	0.99	**<0.05**

The bold value indicates a statistically significant difference. MC, Memory Clinic; PCDC, Primary Care Dementia Clinic.

differences in societal cost between MC versus PCDC and PCDC versus other polyclinics at 6 months. Likewise, univariate cost analysis at 12 months showed no differences in societal cost between the three groups (data shown in Table S6).

Univariate analysis of QALY at 6 and 12 months also showed no significant differences between the three groups (data shown in Table S7).

Multivariate analysis of cost showed no differences in societal cost between MC versus PCDC or PCDC versus other polyclinics. However, at 12 months, the adjusted indirect cost for PCDC was 12% lower than that of MC, and this was statistically significant (Table 5). Direct medical costs were also lower for PCDC compared with other polyclinics at 6 months, and this was statistically significant.

Ordinary least squares regression to determine the mean incremental QALY showed that at 12 months QALY for the PCDC group was 0.07 higher than the MC group. The result was statistically significant (mean

Table 2 Dementia-related baseline demographics and quality of life measures

Variable	MC n = 101		PCDC n = 99		Other polyclinics n = 63		P-value MC vs PCDC	P-value PCDC vs other polyclinics
Behavioral problems								
Delusions	9	8.90%	14	14.10%	8	12.70%	0.24	0.79
Hallucinations	8	7.90%	4	4.00%	4	6.30%	0.24	0.5
Agitation/aggression	30	29.70%	17	17.20%	19	30.20%	**0.03**	0.05
Depression/dysphoria	18	17.80%	14	14.10%	15	23.80%	0.47	0.11
Anxiety	10	9.90%	8	8.10%	11	17.50%	0.65	0.07
Elation/euphoria	2	2.00%	0	–	0	–	0.15	–
Apathy/indifference	16	15.80%	13	13.10%	13	20.60%	0.58	0.2
Disinhibition	4	4.00%	3	3.00%	3	4.80%	0.72	0.56
Irritability/liability	14	13.90%	11	11.10%	15	23.80%	0.55	**0.03**
Aberrant motor behavior	2	2.00%	1	1.00%	1	1.60%	0.57	0.74
Sleep & night-time disorders	15	14.90%	0	–	3	4.80%	**<0.001**	**0.02**
Appetite & eating disorders	1	1.00%	0	–	2	3.20%	0.32	0.07
Barthel score (BADL)	95	85–100 (IQR)	95	80–100 (IQR)	95	85–100 (IQR)	0.27	0.72
Lawton score (IADL)	9	4.7 (SD)	9.8	4.9 (SD)	9.4	5.2	0.86	0.99
Global CDR								
Very mild (CDR 0.5)	0	–	4	4.10%	5	8.10%	0.11	0.53
Mild (CDR 1)	52	53.60%	44	45.40%	31	50.00%		
Moderate (CDR 2)	43	44.30%	44	45.40%	22	35.50%		
Severe (CDR 3)	2	2.10%	5	5.20%	4	6.50%		
Global CDR mean	1.5	0.5 (SD)	1.5	0.6 (SD)	1.4	0.6 (SD)	0.55	0.37
Sum of boxes	7.8	3.1 (SD)	8	3.6 (SD)	7.5	3.8 (SD)	0.65	0.34
Modified MMSE mean	16	4.7 (SD)	15	4.7 (SD)	14	4.5(SD)	0.11	0.63
EQ-5D VAS (0–100)	68	15.8 (SD)	69	16.2 (SD)	67	16.6 (SD)	0.81	0.57

The bold value indicates a statistically significant difference. BADL, basic activities of daily living; CDR, Clinical Dementia Rating; EQ-5D, EuroQol 5 Dimension Questionnaire; IADL, instrumental activities of daily living; IQR, interquartile range; MC, Memory Clinic; MMSE, Mini-Mental State Examination; PCDC, Primary Care Dementia Clinic; VAS, visual analog score.

Table 3 Univariate analysis of quality of life, caregiver burden and adverse events for Memory Clinic versus Primary Care Dementia Clinic

	Mean ± SD				
	MC (n = 101)		PCDC (n = 99)		
	Baseline	12 months (n = 89)	Baseline	12 months (n = 86)	P-value
Quality of life					
ADQoL	30.5 ± 5.0	29.3 ± 6.1[‡]	29.6 ± 5.1[§]	27.3 ± 5.7[‡§]	S[‡§]
EQ-5D index score	0.81 ± 0.23[§]	0.73 ± 0.32[§]	0.82 ± 0.21	0.78 ± 0.26	S[§]
Caregiver burden					
Zarit Caregiver Burden score	24.6 ± 14.9	23.3 ± 16.3	22.0 ± 13.1	20.6 ± 15.9	NS
Adverse events					
No. falls	0.32 ± 0.84	0.27 ± 0.56	0.39 ± 1.1	0.26 ± 0.63	NS
No. hospital admissions	0.15 ± 0.38	0.14 ± 0.49	0.16 ± 0.42	0.19 ± 0.57	NS
No. ED attendances	0.14 ± 0.45	0.15 ± 0.52	0.23 ± 0.59[§]	0.09 ± 0.32[§]	S[§]

[‡]Between groups at 12-month follow up. [§]Pairwise comparison. ADQoL, Alzheimer's Disease Quality of Life scale; ED, emergency department; EQ-5D, EuroQol 5 Dimension Questionnaire; MC, Memory Clinic; NS, not significant; PCDC, Primary Care Dementia Clinic; S, significant.

Table 4 Univariate analysis of quality of life, caregiver burden and adverse events for Primary Care Demintia Clinic versus other polyclinics

	Mean ± SD				
	PCDC (*n* = 99)		Other polyclinics (*n* = 63)		
	Baseline	12-month (*n* = 86)	Baseline	12-month (*n* = 51)	*P*-value
Quality of life					
ADQoL	29.6 ± 5.1§	27.3 ± 5.7§	29.2 ± 5.5§	26.7 ± 5.6§	S†§
EQ-5D index score	0.82 ± 0.21	0.78 ± 0.26	0.79 ± 0.23	0.76 ± 0.34	NS
Caregiver burden					
Zarit Caregiver Burden score	22.0 ± 13.1	20.6 ± 15.9	24.3 ± 15.7	20.8 ± 15.2	NS
Adverse events					
No. falls	0.39 ± 1.1	0.26 ± 0.63	0.46 ± 0.95	0.56 ± 1.82	NS
No. hospital admissions	0.16 ± 0.42	0.19 ± 0.57	0.14 ± 0.39	0.29 ± 0.68	NS
No. ED attendances	0.23 ± 0.59§	0.09 ± 0.32§	0.14 ± 0.39	0.14 ± 0.44	S§

†Difference in difference between baseline and 12-month follow up. §Pairwise comparison. ADQoL, Alzheimer's Disease Quality of Life scale; ED, emergency department; EQ-5D, EuroQol 5 Dimension Questionnaire; MC, Memory Clinic; NS, not significant; PCDC, Primary Care Dementia Clinic; S, significant.

incremental QALY was −0.07, 95% CI −0.12 to −0.018). There were no other differences in QALY for any other comparison after adjusting for baseline variables.

Incremental cost effectiveness ratio was computed only for PCDC versus MC at 12 months, as there was a significant difference in QALY at 12 months between these groups. The cost per QALY gained (incremental cost effectiveness ratio) for the PCDC group when compared with the MC group was $S29 042. This is considered cost-effective based on the World Health Organization criteria that the cost per QALY gained should fall within one- to threefold the gross domestic product per capita of the country. At the time of analysis, the gross domestic product per capita of Singapore was $S78 690.

Discussion

Integrated care for dementia patients is essential and urgently needed in a rapidly aging society.[9] The reality is that most dementia syndromes are associated with medical and functional challenges, and also affect their caregivers, thus placing demands on healthcare

Table 5 Multivariate analysis of cost at 6-month and 12-month follow up

		Multivariate analysis of cost: PCDC *vs* Memory Clinic		
Comparison	Time	Rate ratio (CI)	Mean adjusted PCDC cost	Mean adjusted MC cost
Direct medical cost	6 months	1.08 (0.89–1.31)	$1926 ($1688–2164)	$1652 ($1452–1853)
	12 months	1.16 (0.87–1.54)	$4897 ($4249–5545)	$4512 ($3820–5204)
Indirect cost	6 months	0.92 (0.82–1.06)	$4321 ($4030–4613)	$4738 ($4428–5048)
	12 months	0.88 (0.78–0.99)*	$7437 ($6822–8052)	$8938 ($8222–9654)
Societal cost	6 months	0.97 (0.85–1.10)	$6467 ($6138–6795)	$6885 ($6532–7237)
	12 month	0.98 (0.85–1.13)	$13 446 ($12 617–$14 275)	$14 284 ($13 298–15 270)

		Multivariate analysis of cost: PCDC *vs* other polyclinics		
Comparison	Time	Rate ratio (CI)	Mean adjusted PCDC cost	Mean adjusted other polyclinic cost
Direct medical cost	6 months	0.68 (0.34–0.98)*	$1916 ($1550–2282)	$3805 ($2947–4662)
	12 months	0.98 (0.47–2.05)	$4639 ($4063–5215)	$6174 ($5302–7046)
Indirect cost	6 months	1.08 (0.78–1.48)	$4279 ($3941–4618)	$3727 ($3320–4135)
	12 months	1.03 (0.76–1.39)	$7325 ($6716–7935)	$6707 ($5955–7459)
Societal cost	6 months	0.89 (0.62–1.28)	$6426 ($5921–7132)	$7716 ($7066–8365)
	12 months	0.99 (0.77–1.51)	$13 536 ($12 541–14 531)	$13 537 ($12 385–14 689)

*Significant difference at *P* = 0.05. All models adjusted for baseline age, sex, marital status, comorbidities, agitation/aggression, Barthel score and Clinical Dementia Rating Global rating. MC, Memory Clinic; PCDC, Primary Care Dementia Clinic.

utilization and community resources.[10,11] The present study showed that QoL measured by EQ-5D at 12-month follow up was similar between the PCDC, MC and other polyclinics. QoL, as measured by ADQoL, at 12-month follow up was higher for MC when compared with PCDC, whereas no difference between PCDC and other polyclinics was noted. Caregiver burden was similar between the groups at 12-month follow up. Adverse events, such as the number of falls, hospital admissions and ED attendances, were similar between the groups at 12-month follow up. Caregiver satisfaction at 12-month follow up was similar between PCDC and MC, but was higher in the PCDC group when compared with other polyclinics.

There were no observed differences in societal cost between the three groups at 6- and 12-month follow up. However, at 6-month follow up, direct medical costs for PCDC were statistically significantly lower than the direct medical costs for other polyclinics. At 12-month follow up, the PCDC patients had higher QALY compared with the MC group (statistically significant).

The evaluation of an innovative dementia shared care model between a tertiary hospital MC and a polyclinic is the first to be carried out in Singapore. In recent years, several studies across the world have examined the increasing role of primary care in diagnosis and care for dementia.[12,13] A Dutch study previously evaluated the effectiveness of memory clinics for dementia care, and concluded that the usual care provided within Dutch general practice for people with dementia is at least as effective as that provided by secondary care memory clinic.[14] The present findings are similar to those observed by Meeuwsen *et al.* Taking specialist skills that are usually tied to hospitals and applying them to the primary care setting (Gnosall model) provides patients and caregivers the satisfaction of good quality care at an affordable price. A study carried out in the UK, which showed similar results to the present study in Singapore, noted that dementia patients managed in primary care, through a three-tier model, had high uptake rates, high patient satisfaction and low costs.[15] Thus, Jolley *et al.* concluded that it was essential to have a shared care model for dementia, especially for the not-so-severe cases. Importantly, we have shown this to be an effective model of dementia shared care, fit for rapid translation nationwide to help build capacity to manage persons with dementia.

The present study did have limitations. First, there were certain baseline differences in demographics between patients in the intervention and control groups. However, these differences were adjusted for in the multivariate regression models. Second, over the course of 1 year, we saw a 14% dropout rate either due to death or due to patients not wanting to receive care, or them seeking care elsewhere. This dropout rate was still acceptable given that the number of patients in each arm was sufficient, based on the sample size calculation carried out before the start of the study. Third, certain patients in the MC group and other polyclinic group also received episodic care at the PCDC. However, these patients were still considered as controls, as we used an intention-to-treat approach to analyze the data. It is unlikely that a small number of visits to the PCDC would have influenced their final outcomes as controls, as a majority of their visits were at the MC and other polyclinics, respectively.

PCDC provided effective care, similar to that at MC and better than the other polyclinics. Caregiver satisfaction was higher for the PCDC group compared with the MC or other polyclinics. Patients attending the PCDC had lower direct medical costs compared with other polyclinic patients at 6 months. At 12-month follow up, the PCDC group showed an improvement in QALY compared with the MC group. Given these findings, setting up dementia shared care programs nationwide with the involvement of primary care could facilitate in providing good quality and cost-effective integrated care, thereby reducing the burden on dementia care specialists at the hospitals.

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Disclosure statement

The authors declare no conflict of interest.

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Supporting information

Additional supporting information may be found in the online version of this article at the publisher's website: .

Table S1 Data sources
Table S2 Unit cost estimates
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Table S4 Primary Care Dementia Clinic variable cost estimates.
Table S5 Cost computation.
Table S6 Univariate analysis of cost at 12 months.
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Figure S3 Zarit Burden score.