Clustered domestic residential aged care in Australia: fewer hospitalisations and better quality of life

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The known Models for providing residential care are changing around the world, with increasing emphasis on care in home-like environments. Large residential aged care facilities are still typical in Australia.

The new A clustered, domestic model of residential aged care was associated with fewer hospitalisations and emergency department presentations and higher quality of life for residents, without increasing whole of system costs.

The implications Smaller scale, clustered domestic models of care may better meet the preferences of residents and their families, and also improve health and quality of life outcomes for older people, at similar or lower costs.

Abstract

Objective: To compare the outcomes and costs of clustered domestic and standard Australian models of residential aged care.

Design: Cross-sectional retrospective analysis of linked health service data, January 2015 – February 2016.

Setting: 17 aged care facilities in four Australian states providing clustered (four) or standard Australian (13) models of residential aged care.

Participants: People with or without cognitive impairment residing in a residential aged care facility (RACF) for at least 12 months, not in palliative care, with a family member willing to participate on their behalf if required. 901 residents were eligible; 541 consented to participation (24% self-consent, 76% proxy consent).

Main outcome measures: Quality of life (measured with EQ-5D-5L); medical service use; health and residential care costs.

Results: After adjusting for patient- and facility-level factors, individuals residing in clustered models of care had better quality of life (adjusted mean EQ-5D-5L score difference, 0.107; 95% CI, 0.028–0.186; $P = 0.008$), lower hospitalisation rates (adjusted rate ratio, 0.32; 95% CI, 0.13–0.79; $P = 0.010$), and lower emergency department presentation rates (adjusted rate ratio, 0.27; 95% CI, 0.14–0.53; $P < 0.001$) than residents of standard care facilities. Unadjusted facility running costs were similar for the two models, but, after adjusting for resident- and facility-related factors, it was estimated that overall there is a saving of $12 962 (2016 values; 95% CI, $11 092–14 831) per person per year in residential care costs.

Conclusions: Clustered domestic models of residential care are associated with better quality of life and fewer hospitalisations for residents, without increasing whole of system costs.

Caring for people living in residential aged care facilities (RACFs) costs the Australian government about $11.5 billion each year.[1] It is estimated that half the residents in RACFs have dementia, and ensuring that these vulnerable residents receive high quality care is complex.[2] The aged care system in Australia is currently undergoing reform to ensure that it "offers choice and flexibility for consumers".[3]

In 2010–11, 54% of RACFs in major Australian cities had more than 60 residential places, and the average facility size is growing.[4,5] However, it is increasingly recognised that the well-being of residents and their ability to live in a self-determined manner need to be maximised.[6,7] Ideally, the RACF should feel more like a home than a health care facility. Models of care have been proposed that include smaller living units designed to look and feel like homes, with staffing models and physical design that support greater resident choice in routines, as well as flexibility of activities and outdoor access.[8,9] In these models, the staff and residents often contribute to domestic duties, simulating a home-like environment and lifestyle.[6,10] The World Health Organization has indicated that such models of care have advantages for older people, families, volunteers and care workers, and also improve the quality of care.[7]

Small, clustered domestic models of care are reported to perform well on standard quality of care indicators, such as numbers of re-hospitalisations, catheter use, and pressure ulcers.[8] These models may also provide benefits in terms of quality of life, activities of daily living, and behavioural symptoms in residents with dementia.[6] However, the available evidence is limited and further investigation, including evaluation of costs, is needed.[6]

Our cross-sectional study is the first to examine resident quality of life and resource use associated with a clustered domestic model of care in Australia. We also estimated the costs associated with a clustered domestic model of care and compared them with those for standard Australian models of residential aged care.

Methods

Participants

The Investigating Services Provided in the Residential Care Environment for Dementia (INSPIRED) study is a cross-sectional investigation of the quality of life and health service use associated with different RACF models in Australia. RACFs providing different models of care and catering to residents with a high prevalence of cognitive impairment and dementia were purposefully sampled for this study; our methods have been described in detail elsewhere.[11,12] Data were collected between January 2015 and February 2016 from residents of 17 not-for-profit RACFs in

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New South Wales (five), Queensland (two), South Australia (seven), and Western Australia (three) who agreed to participate; no for-profit providers agreed to participation. Residents were eligible for inclusion if they had been a permanent resident in the RACF for at least 12 months, were not in immediate palliative care, had no complex medical or family problems that would impede participation, and had a family member willing to participate on their behalf if required.

Data collection

Data on demographic characteristics, health, physical and cognitive function, behaviour, and quality of life were collected from facility records and questionnaires filled by participants, their proxies (family or friends), or carers. The EuroQol EQ-5D-5L scale,[13] a tool for measuring health-related quality of life, was completed by each participant (when possible) or by their representative. Self-completion was encouraged for participants with a Psychogeriatric Assessment Scales – Cognitive Impairment Scale (PAS-Cog) score of 11 or less. Quality of life was also assessed with a dementia-specific tool, the DEMQOL (for those who could complete it themselves) and DEMQOL-Proxy. The tools and the DEMQOL results are discussed in detail in online Appendix 1.

RACF revenues and expenditures for the financial years 2013–14 and 2014–15, as well as operative costs, were collected using a survey based on the StewartBrown Aged Care Financial Performance Survey.[14] Health care use data for the 12 months prior to data collection were obtained from federal and state data custodians and linked to individual data.

Models of residential aged care

Facilities providing a clustered domestic model of care met at least five of the following criteria: small living units (15 or fewer residents), independently accessible outdoor areas, allocation of care staff to specific living units, meals cooked in the units, self-service of meals by residents, and residents' participation in meal preparation. While several other factors also characterise clustered domestic models of care, classification according to these six criteria was based on earlier research[9,15-17] and consultations with an advisory group of consumer representatives, clinicians, researchers, and care providers. Facilities that did not meet at least five criteria were defined as providing a standard Australian model of care; no standard care facilities satisfied more than two of the criteria.

Costs estimation

Health care and RACF costs were estimated from a broad perspective according to Pharmaceutical Benefits Advisory Committee guidelines.[18] All health care costs (except for pharmaceuticals) were calculated according to health care use data from federal and state data custodians. Detailed health care costing methodology has been described elsewhere,[11,12] and is summarised in online Appendix 2.

RACF resource use and costs were collected at the facility level and converted to the cost per resident per year with the formula:

$$\frac{\text{Annual facility cost}}{\text{Total number of beds} \times \text{Average occupancy rate}}$$

The annual total health care and residential care costs comprised the sum of the individual health care unit costs for each participant and the residential care costs. Private health insurance and capital establishment costs were not captured.

The cost to government included only costs paid directly by state or federal governments or their agencies (eg, Department of Veterans' Affairs). Additional details are provided in online Appendix 2.

Statistical analysis

In the economic analysis, we evaluated the differences in costs and resource use (including health service use) between the two models of care in multilevel random effect linear models, with adjustment for confounding by individual-level characteristics — age, sex, marital status, cognitive status (PAS-Cog), activities of daily living (Barthel Index), comorbidities (Cohen–Mansfield Index), and social interactions (with family and friends) — and facility-level characteristics — geographic location, size of facility (number of beds), investment in staff training, and number of direct care hours (online Appendix 3).

In the main health care use analysis, we assumed that all datasets from state and federal data custodians were complete. However, proxy consent was not always accepted as valid consent by the data custodians of Medicare Benefits Schedule (MBS) and Pharmaceutical Benefits Scheme (PBS) data; 16% of these data were consequently missing (37% for clustered care, 10% for standard models of care). As PBS data were used to estimate pharmaceutical use for only 6% of participants, pharmaceutical data were missing for 1.5% of participants (online Appendix 2). MBS data were used to estimate general practitioner consultation numbers and health care costs. A complete data analysis of these outcomes was consistent with the main analysis. Numbers of hospital separations, emergency department presentations, GP consultations, and medications were modelled by random effect Poisson regressions.

A sample size of 500 participants was required to detect a difference between the two groups in quality of life, with an effect size of 0.3 (Cohen's *d*) and 80% power. Adjusted means with confidence intervals and model-generated *P* values are reported.

Ethics approval

This investigation was approved by the Flinders University Social and Behavioural Research Ethics Committee (references, 6594, 6732, 6753) and by federal and state custodians of health care use data: the federal Department of Human Services External Request Evaluation Committee (references, M12830, MI3723, MI3520, MI3522, MI4646), the Department of Veterans' Affairs Human Research Ethics Committee (reference, E015/014), the SA Department for Health and Ageing Human Research Ethics Committee (reference, SSA/16/SAH/29), the Department of Health WA Human Research Ethics Committee (reference, 2015/59), the Queensland Department of Health (reference, RD006096), and the NSW Population and Health Services Research Ethics Committee (reference, HREC/15/CIHS/35). Self-consent by patients to participation was obtained when possible; for participants with more severe cognitive impairment, proxy consent for participation was provided (usually by a close family member).

Results

Participant and facility characteristics

Of 1323 potential participants assessed for eligibility, 901 were eligible and 541 (60%) provided consent (self-consent, 130 [24%]; proxy consent, 411 [76%]). Four of the 17 facilities provided a clustered domestic model of care, all of which were designated dementia-specific facilities and provided housing in units for 15 or

1 Residential aged care facility characteristics, by model of care

Facility characteristic	Model of care: Standard care	Model of care: Clustered domestic	P*
Total number of residents	421	120	
Location			0.003
Major cities	339 (80%)	81 (68%)	
Regional	82 (20%)	39 (32%)	
Facility size			< 0.001
Small (< 80 beds)	133 (32%)	29 (24%)	
Medium (80–100 beds)	126 (30%)	91 (76%)	
Large (≥ 100 beds)	162 (38%)	0	
Staff training costs			< 0.001
Low (≤ $1000/resident/year)	266 (72%)	0	
High (> $1000/resident/year)	104 (28%)	120 (100%)	
Direct care hours			< 0.001
Low (≤ 2.5 hours/resident/day)	232 (55%)	28 (23%)	
High (> 2.5 hours/resident/day)	189 (45%)	92 (77%)	

* Student *t* or χ^2 tests. ◆

fewer residents; all were operated by a single provider. Thirteen RACFs provided a standard model of care (Box 1).

There were statistically significant differences between the models of care with respect to age distribution of residents, frequency of social interactions, number of comorbidities, proportions with dementia diagnosis, and PAS-Cog scores (Box 2). All residents in a clustered domestic model of care had a dementia diagnosis or a PAS-Cog of 5 or more (indicative of cognitive impairment).

Outcomes

After adjusting for differences in individual and facility characteristics, residing in a clustered domestic model of care was associated with a significantly higher quality of life compared with residing in a standard model of care (adjusted mean EQ-5D-5L difference, 0.107; 95% confidence interval [CI], 0.028–0.186; $P = 0.008$). Further, the clustered model of care was associated with significantly lower numbers of hospitalisations (adjusted rate ratio, 0.32; 95% CI, 0.13–0.79; $P = 0.010$) and of emergency department presentations that did not lead to admission (adjusted rate ratio, 0.27; 95% CI, 0.14–0.53; $P < 0.001$) than standard care (Box 3).

Costs

Unadjusted crude costs of providing residential aged care were similar for the two models of care. After adjusting for differences in

2 Characteristics of the participating residents, by model of care

Resident characteristic	Model of care: Standard care	Model of care: Clustered domestic	P*
Number of eligible residents	697	201	
Number of participating residents (consent rate)	421 (60%)	120 (60%)	
Age (years)			0.010
< 65	9 (2%)	5 (4%)	
65–74	27 (6%)	16 (13%)	
75–84	110 (26%)	37 (31%)	
85–94	230 (55%)	57 (48%)	
≥ 95	45 (11%)	5 (4%)	
Sex			0.88
Women	313 (74%)	90 (75%)	
Men	108 (26%)	30 (25%)	
Diagnosis of dementia in medical records	231 (55%)	117 (98%)	< 0.001
PAS-Cog score			< 0.001
0–4 (no cognitive impairment)	90 (21%)	3 (2%)	
5–9 (mild cognitive impairment)	88 (21%)	12 (10%)	
10–15 (moderate cognitive impairment)	64 (15%)	18 (15%)	
16–21 (severe cognitive impairment)	179 (42%)	87 (72%)	
Dementia diagnosis or PAS-Cog score ≥ 5	333 (79%)	120 (100%)	< 0.001
Modified Barthel Index, mean (SD)	41.3 (33.3)	37.1 (31.1)	0.23
Social interactions with friends and family			< 0.001
At least once a week	312 (75%)	66 (56%)	
Occasionally (at least once a month)	82 (20%)	33 (28%)	
Rarely or never	21 (5%)	18 (15%)	
Comorbidity Index (number of comorbid diagnostic groups), mean (SD)	3.8 (1.4)	3.2 (1.4)	< 0.001

PAS-Cog = Psychogeriatric Assessment Scales – Cognitive Impairment scale; SD = standard deviation. * Student *t* or χ^2 tests. ◆

3 Outcomes for clustered domestic and standard Australian models of care, adjusted for potential confounding factors

Outcome	Adjusted means* (95% CI)		Difference (clustered – standard) (95% CI)		P
	Clustered domestic	Standard care	Unadjusted	Adjusted*	
EQ-5D-5L score (quality of life)†	0.615 (0.539–0.691)	0.508 (0.456–0.560)	0.009 (–0.133 to 0.151)	0.107 (0.028–0.186)	0.008

	Adjusted means* (95% CI)		Rate ratio (clustered *v* standard) (95% CI)		P
	Clustered domestic	Standard care	Unadjusted	Adjusted*	
Hospital admissions	0.147 (0.055–0.393)	0.463 (0.233–0.921)	0.58 (0.26–1.3)	0.32 (0.13–0.79)	0.010
Emergency department presentations	0.114 (0.053–0.244)	0.417 (0.285–0.610)	0.61 (0.28–1.3)	0.27 (0.14–0.53)	< 0.001
Hospitalisation for ambulatory care-sensitive conditions	0.031 (0.006–0.154)	0.058 (0.020–0.168)	0.90 (0.24–3.3)	0.54 (0.05–5.5)	0.60
General practitioner consultations	14.9 (8.84–25.18)	11.4 (8.75–14.87)	0.86 (0.54–1.4)	1.3 (0.75–2.3)	0.34
Number of medications	14.4 (12.4–16.7)	12.0 (10.9–13.2)	0.96 (0.81–1.1)	1.2 (1.0–1.4)	0.05

CI = confidence interval. * Adjusted for age, sex, PAS-Cog score, modified Barthel Index, frequency of social interactions, number of comorbidities, facility location and size, staff training, and direct care hours. † Proxy responses: 95% in clustered model, 66% in standard model of care. ◆

participant- and facility-level characteristics, the costs of residential care in a clustered domestic model were significantly lower (predicted cost saving, $12 962; 95% CI, $11 092–14 831). The mean adjusted total annual cost for providing health and residential aged care in a clustered domestic model was $14 270 lower than for the standard model (16% saving; $P = 0.11$). The difference in the total costs attributed to government funding was similar, but represented a significant 21% saving ($P = 0.030$) (Box 4).

4 Annual costs per resident of clustered domestic and standard Australian models of care (2016 dollars)

	Unadjusted mean costs (SD)		Unadjusted mean savings (95% CI)	Adjusted mean savings* (95% CI)	P
	Clustered	Standard care			
Overall costs					
Total health care costs	5146 (8818)	7091 (11 232)	1945 (–240 to 4129)	1804 (–3805 to 7412)	0.53
In-hospital (admissions and emergency department)	2613 (8654)	3654 (10 317)	1041 (–986 to 3068)	1902 (–2584 to 6388)	0.41
Out-of-hospital	2533 (1493)	3437 (2495)	904 (434 to 1374)	–85 (–1626 to 1455)	0.91
Total residential care costs	79 613 (11 841)	80 548 (10 343)	935 (–1239 to 3108)	12 962 (11 092 to 14 831)	< 0.001
Total costs	84 759 (14 100)	87 639 (15 044)	2880 (–137 to 5896)	14 270 (–3195 to 31 734)	0.11
Cost to government					
Total health care costs	4335 (8998)	6340 (11 475)	2005 (48 to 2963)	1869 (–3373 to 7111)	0.48
In-hospital (admissions and emergency department)	2607 (8651)	3637 (10 285)	1030 (–814 to 2873)	1910 (–2541 to 6361)	0.40
Out-of-hospital	1727 (1786)	2703 (3741)	976 (495 to 1457)	–21 (–1565 to 1522)	0.98
Total residential care costs†	58 442 (8694)	59 307 (9417)	865 (–1018 to 2748)	12 683 (10 649 to 14 718)	< 0.001
Total costs	62 777 (11 909)	65 647 (14 698)	2870 (306 to 5436)	13 978 (1010 to 26 946)	0.030

CI = confidence interval; ED = emergency department; SD = standard deviation. * Adjusted for age, sex, PAS-Cog score, modified Barthel Index, frequency of social interactions, number of comorbidities, facility location and size, staff training, and direct care hours. The total cost does not represent the sum of the individual components because of random effects and residuals in the regression models. † Calculated by multiplying proportion of overall facility revenue received from government by total residential care costs for each facility. ◆

Discussion

This is the first study to examine the costs, resident quality of life, and numbers of hospitalisations associated with a clustered domestic model of care in Australia.[19,20] We found that a clustered domestic model of care is associated with better quality of life for residents, as well as fewer hospitalisations and emergency department presentations. These benefits were achieved without an increase in facility running costs. After adjusting for differences in the populations and facilities, the proportion of the overall costs of the clustered domestic model of care attributed to government was lower than for the standard model, particularly for residential care.

We found that the difference in mean quality of life scores, after adjusting for potential confounding factors, significantly favoured residents in the clustered domestic model. Quality of life ratings by proxies are often lower than self-ratings,[21] and in our study the proportion of proxy responses was higher in the clustered model (95% *v* 66%); we may therefore have underestimated the difference between the two models. Higher proxy-rated quality of life scores on some dimensions have been reported for small scale group homes in Japan, Belgium, and the Netherlands.[22-24] A longitudinal study of the American Green House model found better outcomes on some dimensions of quality of life, and for quality of care, resident satisfaction, emotional wellbeing, and change in functional status.[25] Other investigators have also reported better quality of care outcomes on standard reporting measures for these alternative models of care.[6,8] However, no clear advantage in terms of proxy-rated quality of life was found by smaller longitudinal German and Dutch studies of small scale models of care.[15,26]

Our findings of similar or lower health care costs and of fewer hospitalisations and emergency department presentations for residents in the clustered domestic model are consistent with the lower hospital re-admission rates and lower Medicare spending per resident associated with the American Green House model.[15,27] The lower hospitalisation rates for residents of clustered facilities might be explained by differences in advanced care planning or out-of-hospital health care services in these facilities. Hospitalisations are associated with poor outcomes for residents and higher costs to government.[28] Increasing access to clustered domestic residential care could therefore both benefit residents and reduce government spending.

The observational nature of the INSPIRED study had both strengths and limitations. Our study included a relatively large sample of long term permanent residents of aged care facilities with a high degree of cognitive impairment; the geographical spread of facilities was broad (four Australian states, including rural locations) and the primary data collection was comprehensive (individual-, proxy- and facility-level characteristics; health care resource use). Importantly, this study included a population with a high prevalence of dementia, a population often excluded from investigations. The costs approach we applied was based on resource use by individual participants, using linked data from federal and state health departments, and therefore provided a conservative estimate of the relevant costs.[11]

However, the cross-sectional nature of the study means that conclusions about the causality of the associations reported cannot be drawn. A randomised controlled trial investigating differences between the two models of care at the facility level would not be feasible. Further, the characteristics of the residents in the two models of care were different; we therefore collected broad data on baseline characteristics and used multilevel modelling to adjust for potential confounding. As this study enrolled participants who had resided in the care facilities for at least 12 months, our findings reflect the costs and outcomes for survivors living in care long term. Whether the advantages of residing in a clustered domestic model apply to residents in care for less than 12 months or receiving palliative care was not investigated. While the differences between the residents included in our study and those who did not consent to participation were not assessed, the sample was broadly representative of individuals living permanently in RACFs in Australia.[11]

The clustered domestic facilities in this study were owned by a single provider; whether the observed differences were attributable to the infrastructure or staffing models of the provider rather than the model of care cannot be determined. Our study did not capture the capital establishment costs of the different facility types. The American Green House model is reported to have higher capital costs than standard residential aged care models, primarily because more space per resident is needed.[29] The establishment costs for different RACF models in Australia remain to be explored, but this cost is not borne by government.

This is the first study to examine the potential positive impact on quality of life, resource use, and the costs of providing residential aged care in small domestic clusters with a home-like environment. Our preliminary findings should be further explored in longitudinal, prospective cohort studies, and the association of individual features of clustered facilities with resource use and quality of life for residents examined. Alternative financing models for supporting clustered domestic models of residential aged care should also be assessed.

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