

Original Article

Emergency department use among patients from residential aged care facilities under a Hospital in the Nursing Home scheme in public hospitals in Queensland Australia

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BACKGROUND: Hospital emergency department (ED) use by patients from residential aged care facilities (RACFs) is not always appropriate, and this calls for interventions to avoid some unnecessary uses. This study aims to compare patterns of ED use by RACF patients with and without a Hospital in the Nursing Home (HiNH) program.

METHODS: RACF patients presenting to EDs of a hospital with and a hospital without this program during pre- and post-intervention periods were included. Data on patient demographics and ED presentation characteristics were obtained from the Emergency Department Information System database, and were analysed by descriptive and comparative statistics.

RESULTS: In both hospitals, most RACF residents presenting to EDs were aged between 75–94 years, female, triaged at scale 3 to 5, and transferred on weekdays and during working hours. Almost half of them were subsequently admitted to hospitals. In accordance with the ICD-10-AM diagnostic coding system, diagnoses that consistently ranked among the top three reasons for visiting the two hospitals before and after intervention included Chapter XIX: injury and poisoning and Chapter X: respiratory diseases. Associated with the intervention, significant decreases in the numbers of presentations per 1 000 RACF beds were identified among patients diagnosed with Chapter XI: digestive diseases [rate ratio (95%CI): 0.09 (0.04, 0.22); $P < 0.0001$] and Chapter XXI: factors influencing health status and contact with health services [rate ratio (95%CI): 0.22 (0.07, 0.66); $P = 0.007$].

CONCLUSION: The HiNH program may reduce the incidence of RACF residents visiting EDs for diagnoses of Chapter XI and Chapter XXI.

KEY WORDS: Residential aged care; Emergency department; Presenting complaint

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INTRODUCTION

Hospital emergency departments (EDs) provide a full range of emergency care for patients who require either immediate treatment for life-threatening illnesses

or some less urgent care, accessible 24 hours a day and seven days a week.^[1] The EDs play a vital role in providing acute care and access to the hospital care systems in every community; however their ability is

limited by the problem of overcrowding which is now occurring worldwide.^[2-4]

A substantial demand on the emergency department comes from patients living in residential aged care facilities (RACFs).^[5,6] Residents of RACFs represent the frailest population group in society, with chronic disease, atypical symptoms, multiple co-morbidities, cognitive and functional impairment, and social problems.^[7-10] Compared with their community-dwelling peers, RACF residents have a higher rate of ED presentations and repeat visits, and are more prone to hospital acquired infections or complications.^[11,12] ED utilization by RACF residents is affected by access to general practitioners (GPs), availability of alternate RACF care and primary care, socio-demographic factors, and transportation facilities.^[12,13] A considerable proportion of presentations from RACFs to EDs have been considered by previous researchers as inappropriate or avoidable,^[8,10] providing the potential to intervene to reduce the burden on EDs from RACF residents. The Hospital in the Nursing Home (HiNH) program in Queensland Australia is such an initiative aimed at reducing unnecessary ED presentations from RACF patients.

A good understanding of the patterns of ED utilisation by RACF residents will have obvious implications for designing better interventions to address RACF population's complex and special needs and to prevent unnecessary or inappropriate ED use by them. However to date, little is known regarding the current patterns of ED use by aged care residents in Australia and no evaluation has ever been conducted to disclose the impact of the HiNH intervention on the patterns. This study thus aims to determine how the characteristics (particularly the common diagnoses on presentation) of hospital ED visits made by RACF residents changed with the HiNH intervention in Queensland Australia. We hypothesize in this study that, after the intervention, there would be reduced numbers of ED presentations from RACFs with diagnoses that could be relatively simply coped with, while there might be no changes for presentations with other complicated diagnoses.

METHODS

Study design

This was a pre-post controlled study of an intervention (the HiNH program). The HiNH intervention was funded by the Queensland government and operated mainly by a team of ED-based nurses. Major components of

the intervention included sending clinical staff from hospitals to RACFs to provide outreach services for RACF patients, and providing support and education for RACF staff and GPs to increase their knowledge and confidence in the acute care for their patients, such that an increased range of procedures (e.g., urinary catheter change, parenteral antibiotic administration, wound care, etc.) could be alternatively provided within patients' own facilities instead of at EDs. In this study, we examined the general patterns of ED utilization by RACF residents, and whether the patterns (the common presenting complaints, in particular) changed with the intervention.

The study was conducted at the ED of two public hospitals in Queensland Australia: the Royal Brisbane and Women's Hospital (RBWH, intervention group) and the Logan Hospital (LH, control group). RBWH introduced the HiNH program in February 2006, while LH performed the usual practice. Both hospitals are metropolitan principal referral hospitals located in South East Queensland, providing a similarly wide range of clinical services including emergency care, outpatient and admitted patient services. This study included a pre-test period (from June to August in 2005) and a post-test period (from June to August in 2011). It was likely that the intervention effect would come to a stable status after a reasonable length of implementation (e.g., in 2011), as compared with the very first beginning stage of its implementation. In addition, there were no fundamental changes (e.g., policy changes) within these two hospitals from 2005 to 2011 known to the authors, except that the intervention hospital began to carry out the HiNH program in 2006.

Data collection

Data for this study were sourced from Emergency Department Information System (EDIS), an Australian public hospital information dataset to track patients' ED episode. This database allowed the identification of people who lived in RACFs and had presentations to the EDs of RBWH (cases) and LH (controls) during the included pre-test and post-test periods. Identification of patients residing in RACFs were based on the following criteria: 1) address and phone number in EDIS matched any accredited RACF; 2) referral or discharge destination coded as RACF; and 3) free text search included any words or recognized abbreviations that indicated an RACF, e.g., nursing home, NH, aged care facility, etc.

The ED case records were then accessed, and for each de-identified patient presentation, we collected the patient's demographic data (age, gender) and ED

presentation related data, including Australasian Triage Scale (ATS) score, International Classification of Diseases (ICD) code, the day and time of ED arrival, and disposition from ED relating to whether the individual was discharged or admitted to hospital). The ATS score contained a five-tier triage scale showing the acuity of presentations (Scale 1 being the most urgent to Scale 5 being the least urgent). Generally, patients grouped to ATS 1 & 2 must be seen immediately, and those grouped to ATS 3–5 could wait and be seen in order of arrival at EDs. The ICD code was grouped into the ICD disease chapters (from chapter I to chapter XXII), according to ICD-10-AM index (10th version, Australian modification), showing patients' presenting clinical complaints for visiting the ED.

Data analysis

Subject characteristics and patterns of emergency department use were summarized by groups of patients presenting to the ED of RBWH and LH over the pre- and post-test period, in the format of numbers (percentages) for categorical variables. Pearson's chi-square test was used to identify differences in the frequency distribution of the categorical variables. With regard to the most common presenting complaints, the top ten were summarized as numbers (proportions) of presentations falling into this diagnosis chapter. The top ten diagnoses were identified and ranked, according to the number of presentations with this diagnosis from RACFs as well as the presentation rates (i.e., the numbers of presentations with this diagnosis per 1 000 RACF beds). Poisson log-linear model was adopted to compare whether significant differences exist in the presentation rate for each of the top diagnosis chapters associated with the HiNH intervention. The threshold for statistical significance was $P < 0.05$. Statistical analysis was performed with SPSS v. 21 (IBM Corp., Armonk, NY).

Ethical approval

The study was reviewed and approved by the Ethical Review Committee of the Queensland University of Technology, Brisbane Australia (Reference No.: 1000000457).

RESULTS

A comprehensive search on the EDIS database identified that there were 449 vs. 207 presentations to the EDs from 2 127 vs. 921 RACF beds in the catchment

areas of RBWH vs. LH during the pre-intervention period (June to August, 2005). While during the post-intervention period, there were 393 vs. 265 presentations to RBWH vs. LH from 2 485 vs. 1 313 RACF beds. This equaled to 211 vs. 225 ED presentations per 1 000 RACF beds per three months to RBWH vs. LH before intervention, while 158 vs. 202 ED presentations per 1 000 RACF beds to RBWH vs. LH after intervention. From the 3-month pre-intervention to 3-month post-intervention period, the number of presentations to the ED from 1 000 RACF beds decreased by 25.1% in RBWH, while only by 10.2% in LH. In addition, our data showed ED presentations from RACFs accounted for 2.3% and 1.6% of the total presentations during this period in RBWH and LH, respectively.

Patterns of ED use by RACF residents in RBWH and LH were summarized in Table 1. Over the included study periods, the majority of patients presenting to the ED from RACFs were aged between 75 and 94 (73.9% for RBWH and 72.4% for LH) and were females (62.8% for RBWH and 64.6% for LH). Approximately 80% of RACF patients were triaged at ATS 3 to 5 on their ED arrival. They had relatively low acuity of illness and instead of requiring to be seen immediately; they could wait at the ED for clinical assessment and treatment within an acceptable length of time (generally 30 to 120 minutes of maximum waiting time). Over half of RACF transfers arrived at the ED during weekdays (75.4% for RBWH and 73.3% for LH) and normal working hours (60.7% for RBWH and 57.8% for LH). As a result of ED visits, about half of RACF patients were admitted to hospitals (53.7% for RBWH and 55.7% for LH) and the remaining was discharged (46.3% for RBWH and 44.3% for LH). From pre-intervention period to post-intervention period, a decreased percentage of RACF patients (–7.1%) were subsequently admitted in RBWH, while an increased percentage of patients (17.5%) were admitted in LH.

Table 2 presents a list of ICD diagnosis chapters and the ICD code ranges covered by each chapter, based on which we grouped the ICD codes extracted from the EDIS database into the corresponding ICD chapters, from Chapter I to Chapter XXII.

Frequencies of ED presentations falling into each disease chapter were compared, and the ten most common complaints on presentations from RACFs to EDs are shown in Table 3, which also provides a breakdown on people presenting to RBWH and to LH in the pre- and post-intervention period. Chapter XIX:

injury and poisoning remained consistently as the most common (No.1) reason for RACF patients' ED visits, accounting for over one fifth of all presentations (from 21.89% to 27.48%). Chapter X: respiratory diseases were either the second or third commonest reason for ED presentations (ranging from 9.92% to 19.81%). Chapter XVIII: symptoms, signs and abnormal clinical

and laboratory findings, not elsewhere classified was among the top three medical problems on presentations in LH over the post-test period and in RBWH before and after the intervention, but was ranked fourth in LH over the pre-test period (ranging from 10.94% to 18.32%). Besides, both Chapter IX: circulatory diseases and Chapter XXI: factors influencing health status and

Table 1. Patterns of emergency department use in RBWH and LH by RACF residents, *n* (%)

Variables	RBWH			<i>P</i> -value (Pre vs. Post)	LH			<i>P</i> -value (Pre vs. Post)
	Pre-test (<i>n</i> =449)	Post-test (<i>n</i> =393)	Overall (<i>n</i> =842)		Pre-test (<i>n</i> =207)	Post-test (<i>n</i> =265)	Overall (<i>n</i> =472)	
Age group (years)				0.997				0.006*
<65	29 (6.5)	26 (6.6)	55 (6.5)		6 (2.9)	24 (9.1)	30 (6.4)	
65–74	58 (12.9)	49 (12.5)	107 (12.7)		20 (9.7)	43 (16.2)	63 (13.3)	
75–84	137 (30.5)	123 (31.3)	260 (30.9)		72 (34.8)	81 (30.6)	153 (32.4)	
85–94	193 (43.0)	169 (43.0)	362 (43.0)		88 (42.5)	101 (38.1)	189 (40.0)	
≥95	32 (7.1)	26 (6.6)	58 (6.9)		21 (10.1)	16 (6.0)	37 (7.8)	
Gender				0.887				0.053
Male	168 (37.4)	145 (36.9)	313 (37.2)		63 (30.4)	104 (39.2)	167 (35.4)	
Female	281 (62.6)	248 (63.1)	529 (62.8)		144 (69.6)	161 (60.8)	305 (64.6)	
Australasian Triage Scale (ATS) [†]				0.480				0.037*
ATS 1&2 (seen immediately)	80 (17.8)	78 (19.8)	158 (18.8)		27 (13.0)	54 (20.4)	81 (17.2)	
ATS 3–5 (can wait)	369 (82.2)	315 (80.2)	684 (81.2)		180 (87.0)	211 (79.6)	391 (82.8)	
Attendance day				1.000				0.402
Weekday	339 (75.5)	296 (75.3)	635 (75.4)		156 (75.4)	190 (71.7)	346 (73.3)	
Weekend	110 (24.5)	97 (24.7)	207 (24.6)		51 (24.6)	75 (28.3)	126 (26.7)	
Attendance time				0.105				0.005*
Working hours	284 (63.3)	227 (57.8)	511 (60.7)		135 (65.2)	138 (52.1)	273 (57.8)	
After hours	165 (36.7)	166 (42.2)	331 (39.3)		72 (34.8)	127 (47.9)	199 (42.2)	
Disposition from ED				0.045*				<0.0001*
Admitted [‡]	256 (57.0)	196 (49.9)	452 (53.7)		95 (45.9)	168 (63.4)	263 (55.7)	
Discharged	193 (43.0)	197 (50.1)	390 (46.3)		112 (54.1)	97 (36.6)	209 (44.3)	

*: *P*<0.05; †: ATS 1&2: patients who must be seen immediately; ATS 3–5: patients who can wait and will be seen in order of arrival. ‡: Admitted patients also included patients who were died at hospitals.

Table 2. A list of ICD disease chapters and the code ranges covered by each

ICD Chapter	Disease classification	ICD Code range
I	Certain infectious and parasitic diseases	A00–B99
II	Neoplasms	C00–D48
III	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	D50–D89
IV	Endocrine, nutritional and metabolic diseases	E00–E90
V	Mental and behavioural disorders	F00–F99
VI	Diseases of the nervous system	G00–G99
VII	Diseases of the eye and adnexa	H00–H59
VIII	Diseases of the ear and mastoid process	H60–H95
IX	Diseases of the circulatory system	I00–I99
X	Diseases of the respiratory system	J00–J99
XI	Diseases of the digestive system	K00–K93
XII	Diseases of the skin and subcutaneous tissue	L00–L99
XIII	Diseases of the musculoskeletal system and connective tissue	M00–M99
XIV	Diseases of the genitourinary system	N00–N99
XV	Pregnancy, childbirth and the puerperium	O00–O99
XVI	Certain conditions originating in the perinatal period	P00–P96
XVII	Congenital malformations, deformations and chromosomal abnormalities	Q00–Q99
XVIII	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	R00–R99
XIX	Injury, poisoning and certain other consequences of external causes	S00–T98
XX	External causes of morbidity and mortality	V01–Y98
XXI	Factors influencing health status and contact with health services	Z00–Z99
XXII	Codes for special purposes	U00–U89

contact with health services turned up among the top three reasons once. The remaining disease chapters were all ranked outside the top three but within the top ten most common reasons for ED visits by RACF residents, including Chapter XI: digestive diseases, Chapter XIV: genitourinary disease, Chapter XII: skin and subcutaneous tissue, Chapter XIII: musculoskeletal system and connective tissue, Chapter V: mental and behavioral disorders, Chapter VI: nervous diseases, and Chapter IV: endocrine, nutritional and metabolic diseases, all of which occupied less than 10.0% of all general presentations.

Results of the change in presentation rates associated with implementation of the intervention for each of the identified top diagnoses on ED presentation are illustrated in Table 4. Due to the HiNH intervention, significant decreases were found in the presentation rates with the following presenting diagnoses by RACF

residents, including Chapter XI: digestive diseases [ratio (95%CI): 0.09 (0.04, 0.22), $P<0.0001$] and Chapter XXI: factors influencing health status and contact with health services [ratio (95%CI): 0.22 (0.07, 0.66), $P=0.007$]. After intervention, there were more RACF patients presenting to the ED with diagnoses of Chapter XIX: injury and poisoning, Chapter XVIII: symptoms, signs and abnormal clinical and laboratory findings, Chapter IX: circulatory diseases, and Chapter VI: nervous diseases; and there were fewer patients with diagnoses falling into Chapter X: respiratory diseases, Chapter XIV: genitourinary disease, Chapter XII: skin and subcutaneous tissue [0.39 (0.20, 0.75), $P=0.005$], Chapter XIII: musculoskeletal system and connective tissue [0.38 (0.15, 0.96), $P=0.040$], and Chapter V: mental and behavioral disorders, and Chapter IV: endocrine, nutritional and metabolic diseases. However all of the above did not reach statistical significance.

Table 3. The ten most common reasons for ED presentations by RACF residents in RBWH and LH before and after the HiNH intervention

ICD Chapter	Pre-test period (RBWH): June-August 2005, n=449			Pre-test period (LH) June-August 2005, n=207			Post-test period (RBWH): June-August 2011, n=393			Post-test period (LH): June-August 2011, n=265		
	Presentations [†] , n (%)	Presentation rates [‡]	Rank	Presentations [†] , n (%)	Presentation rates [‡]	Rank	Presentations [†] , n (%)	Presentation rates [‡]	Rank	Presentations [†] , n (%)	Presentation rates [‡]	Rank
XIX	104 (23.16)	49	1	50 (24.15)	54	1	108 (27.48)	43	1	58 (21.89)	44	1
XVIII	71 (15.81)	33	2	28 (13.53)	30	4	72 (18.32)	29	2	29 (10.94)	22	3
X	51 (11.36)	24	3	41 (19.81)	45	3	39 (9.92)	16	3	47 (17.74)	36	2
IX	42 (9.35)	20	4	42 (20.29)	46	2	31 (7.89)	12	5	27 (10.19)	21	4
XI	40 (8.91)	19	5	5 (2.42)	5	7	14 (3.56)	6	7	23 (8.68)	18	5
XXI	31 (6.90)	15	6	NA			39 (9.92)	16	3	21 (7.92)	16	6
XIV	22 (4.90)	10	7	10 (4.83)	11	5	29 (7.38)	12	6	18 (6.79)	14	7
XII	19 (4.23)	9	8	NA			12 (3.05)	5	8	6 (2.26)	5	9
XIII	19 (4.23)	9	8	4 (1.93)	4	9	NA			NA		
V	17 (3.79)	8	10	4 (1.93)	4	9	12 (3.05)	5	8	5 (1.89)	4	10
VI	NA [‡]			7 (3.38)	8	6	NA			5 (1.89)	4	10
IV	NA			5 (2.42)	5	7	11 (2.80)	4	10	7 (2.64)	5	8

[†]: presentations: number (%) of presentations with this diagnosis from RACFs; [‡]: presentation rates: number of presentations with this diagnosis per 1 000 RACF beds; [§]: NA: not applicable (This indicates the fact that in this category group, e.g., RBWH pre-test group, this diagnosis chapter, e.g., Chapter VI, did not rank among the top ten ED presenting complaints).

Table 4. Comparison of presentation rates by each of the top diagnosis chapters

ICD Chapter	Presentation rates [†] , n				Estimated difference associated with the intervention	
	Pretest-RBWH	Pretest-LH	Posttest-RBWH	Posttest-LH	Rate ratio (95%CI)	P-value
XIX	49	54	43	44	1.09 (0.79, 1.51)	0.593
XVIII	33	30	29	22	1.20 (0.63, 2.27)	0.586
X	24	45	16	36	0.81 (0.37, 1.79)	0.608
IX	20	46	12	21	1.40 (0.70, 2.82)	0.344
XI	19	5	6	18	0.09 (0.04, 0.22)*	<0.0001
XXI	15	3	16	16	0.22 (0.07, 0.66)*	0.007
XIV	10	11	12	14	0.89 (0.32, 2.53)	0.832
XII	9	3	5	5	0.39 (0.10, 1.55)	0.179
XIII	9	4	2	3	0.39 (0.08, 1.98)	0.253
V	8	4	5	4	0.69 (0.14, 3.33)	0.643
VI	3	8	2	4	1.42 (0.31, 6.45)	0.647
IV	5	5	4	5	0.96 (0.25, 3.71)	0.951

*: $P<0.05$, CI: confidence interval; [†]: presentation rates: number of presentations with this diagnosis per 1 000 RACF beds.

DISCUSSION

Our study has evaluated the demographics and clinical characteristics of RACF patients presenting to the two hospital EDs in Queensland Australia (one with the HiNH intervention and the other without), in order to improve the understanding of pattern of ED use by RACF residents and the possible influence of the HiNH intervention.

In the present study, RACF residents constituted 2.3% and 1.6% of the total presentations in the two hospitals. Although the percentages are not considerable, these presentations take up a disproportionately large share of acute care resources.^[14,15] ED presentations per RACF resident bed per year in the two hospitals ranged from 0.6 to 0.9 over the studied periods. This is consistent with previous studies which found 0.1–1.5 ED transfers per RACF resident/bed per year.^[7] Our data showed a substantial decrease (–25.1%) in the ED presentation rate in RBWH when implementing the HiNH intervention from pre- to post-intervention period, decreased by twice as much as that in LH without the intervention. This indicates that the HiNH intervention is likely to reduce unnecessary or avoidable ED presentations from RACFs. Previous studies have similar findings, supporting that 7%–48% of transfers from RACF to ED are considered inappropriate or avoidable if the availability of GPs and access to alternative primary and community care are improved.^[16–18]

Our analysis indicates that most RACF residents visiting the ED are aged between 75–94 years, female, and triaged at scale 3 to 5 (relatively low acuity). The majority of them arrived at the ED on weekdays and during normal business hours. There is no peak at weekends. Although EDs operate 24 hours a day, there may be reduced access to senior ED staff and radiology or specialist consultations outside of normal working hours.^[6] Almost half of RACF residents presenting to the ED are admitted to the hospital, a consistent finding as one prior study.^[15] From three-month pre- to post-intervention period, the likelihood of admissions via the ED decreased by 7.1% in RBWH while increased by 17.5% in LH. This finding may be associated with the HiNH implementation aimed at discharging patients back to their usual residency for alternative acute care to be provided and continued at RACFs. Though the acute hospital services in Australia are of high quality, they are not always in the best interest of RACF residents.^[16] Discharging them back to the RACF enables more suitable nursing care to meet their special needs and reduces their

susceptibility to hospital-acquired adverse events such as medication errors, falls, infections, delirium, iatrogenic complications, or unnecessary invasive treatment.^[5,6]

Consistently in both hospitals before and after the intervention period, the number one reason for ED presentations by RACF residents is Chapter XIX: injury and poisoning, contributing to over one fifth of all visits. This finding is consistent with those reported elsewhere.^[11,12,14,17,19] We assume the high rate of injury and poisoning leading to ED attendances may be because such illnesses themselves have high incidence rate and they are potentially more treatable than others or would result in more clinical deteriorations, which thus decreases the threshold for ED utilization. Presentations to the ED also tend to occur in patients with diagnosis of Chapter X: respiratory diseases, which consistently serve as the top three reasons in all groups. However, diagnoses in Chapter X: respiratory diseases, such as pneumonia, are considered as potentially preventable in previous studies.^[14,20] These results provide vital messages for designing interventions to improve access to medical care for these most common diagnoses leading to ED presentations from RACFs (such as injury and poisoning, and respiratory diseases), hence reducing the unnecessary ED utilization for these conditions. Besides, Chapter XVIII: symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified also ranked high as the top three reasons in three of the four comparison groups. This is not surprising, owing to the reality that priority of ED care is often to stabilize patient illness and this may sometimes compromise the work on accurate diagnosis.^[19]

After implementing the HiNH intervention, there were significant decreases in the numbers of ED visits with the following two of the top presenting complaints, i.e., Chapter XI: digestive diseases and Chapter XXI: factors influencing health status and contact with health services. This may indicate the current HiNH scheme has certain effect on reducing ED visits from RACFs out of the above presenting diagnoses. The HiNH intervention aims at increasing RACF staff's capacity and confidence in providing with a wider range of acute interventions, such as wound management, parenteral antibiotics or common end of life procedures such as syringe driver management, avoiding emergency presentation and hospital admission. Prior studies also support that some hospital-type care could be alternatively undertaken in the RACFs.^[6] However this study also found no significant changes in ED visits under the HiNH scheme with all

other top presenting diagnoses, e.g., Chapter XIX: injury and poisoning, Chapter X: respiratory diseases, and Chapter IX: circulatory diseases. This is consistent with findings from one prior study demonstrating that a number of ED presentations from RACFs are still considered appropriate and necessary.^[16] This might be owing to the important roles that the ED takes in caring for certain acute illness conditions. For instance, EDs have capacity in providing suitable observations and in performing complex procedures, and are much better equipped with medical facilities such as X-ray facility, all of which are not yet available at RACFs under current circumstances. Enhanced access to care for such conditions might be possible at RACFs, however, requires further careful consideration and planning.

There are limitations to this study. First, this study relied on data from the electronic administrative database of the Australian public hospitals, where the complete clinical records were not yet available. Other important information, such as GP consultation, resource utilization at the ED (e.g., lab and radiological investigations) and co-morbidities of patients, were not evaluated in this study. Second, we included all eligible ED presentations in two hospitals for a three-month period before and after the intervention. However the distribution and pattern of ED visits might vary over the course of the year. It is still unclear how the time of a year would affect the findings.

In conclusion, knowledge regarding patterns of ED presentations by RACF residents is crucial for optimizing the way that the scarce and costly healthcare resources are used as well as ensuring that patients receive the right care in the most appropriate settings. The current study adds to our knowledge in this area. Presentations to the EDs from RACFs tend to occur in patients with diagnosis of Chapter XIX: injury and poisoning and Chapter X: respiratory diseases, which remain consistently among the three most common reasons for ED visits. Emphasis on preventing RACF residents from visiting the ED for injury and poisoning-related and respiratory illnesses could be considered to further improve design of the HiNH program. Organising and delivering ED care to RACF residents represents a complex area for health policy, but alternative care models such as the Hospital in the Nursing Home may assist with reducing acute resource use by this frail population in certain aspects, for instance, decreasing the number of RACF residents visiting EDs for diagnoses of Chapter XI: digestive diseases and Chapter XXI: factors influencing health status and contact with health services.

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Conflicts of interest: None declared.

Contributors: XH, BL, RP and ST initiated the study conception and designed the study. LF, JZ, JS and KD assisted with study design and data analysis. LF drafted the manuscript. All authors contributed to the revision and final approval of the manuscript.

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