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Review Article

Unplanned Transfer to Emergency Departments for Frail Elderly Residents of Aged Care Facilities: A Review of Patient and Organizational Factors

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A B S T R A C T

Background: With an aging population, a growing number of older adults experience physical or cognitive decline that necessitates admission to residential aged care facilities (RACF). Each year a considerable proportion of these residents has at least 1 emergency transfer to hospital, which may result in a number of adverse outcomes. Rates of transfer from RACF to hospital can vary considerably between different RACFs suggesting the presence of potentially modifiable risk factors for emergency department (ED) transfer.

Methods: A systematic and comprehensive search of the peer-reviewed literature using 4 electronic databases was conducted. Included papers were those reporting on determinants of unplanned transfer to hospital for elderly people (aged 65 years and above) living in RACFs. Studies were assessed for quality and key concepts and themes extracted.

Results: There are both individual patient factors and health system factors, which influence rates of transfer to hospital for elderly RACF residents. For individuals, increased risk of ED transfer has been associated with presence of particular comorbidities such as chronic airways disease, congestive cardiac failure, and diabetes; presence of indwelling devices; absence of an advance care plan; and reduced functional ability. For organizations, "for profit" facilities and those with poorer staff to patient ratios also have higher rates of transfer to hospital, compared with those owned by not-for-profit organizations and those with improved registered nurse and medical practitioner staffing.

Conclusions: This review has identified a number of potentially modifiable patient and organizational factors that should reduce the need for burdensome transfer to the ED and improve the quality of both acute care and end-of-life care for this population of frail, elderly individuals. A number of these determinants, including facility staffing, the role of specialist geriatricians, and advance directives, should be further examined, ideally through interventional trials to evaluate their impact on the pre-hospital and emergency management of these patients.

Increasing numbers of frail, elderly people require care in residential aged care facilities (RACFs). These residents frequently have cognitive or functional impairment in addition to considerable medical comorbidity and are, therefore, vulnerable to episodes of acute deterioration in health.

Each year, up to 75% of residents experience an unplanned transfer to hospital emergency departments (ED) for care.[1–4] The outcomes of these transfers include a number of adverse sequelae.[5] In hospital, elderly residents have a high rate of potentially invasive interventions and may experience delirium, pressure ulcers, and hospital-acquired infections.[6–8] Many experience further functional decline post admission[9]; and short-term mortality rates post-transfer are high, even after specialist inpatient treatment.[4,10–12] For a proportion of residents these transfers may disrupt and inhibit appropriate palliative and end-of-life care. Gozalo et al[13] identified that 19% of RACF residents with advanced cognitive impairment were transferred within the last 90 days of life, 12% had a transition within the last 3

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days of life, and 8.1% had multiple hospitalizations in the last 90 days of life. In this study, the rate of these burdensome transfers at the end of life increased from 17% to 20% of RACF residents between 2000 and 2007.

Unplanned transfers to hospital may occur for a variety of reasons such as deterioration in physical health, falls, complications relating to indwelling devices or medications, and difficulty in managing complex behaviors. They frequently include transfers for ambulatory care sensitive (ACS) conditions and end-of-life care.[5] These transfers usually result in a patient being assessed or managed in the ED with a high likelihood of admission to hospital. They do not include planned admissions for elective procedures or operations. Given the considerable potential for negative outcomes, it is important to understand the individual patient and health system factors that place a resident at increased risk of emergency hospital transfer. This would enable those modifiable risk factors to be addressed and inform development of appropriately targeted interventions to reduce the frequency of burdensome transfers. Therefore, the aim of this review was to synthesize current evidence regarding clinical and organizational determinants of unplanned emergency transfer to hospital for acute illness or injury among frail, elderly people living in RACFs.

Methods

Search Strategy

This review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[14] Four electronic databases Medline, Embase, CINAHL, and Informit were searched systematically in August 2014. The search strategy for Medline (OVID) is outlined in Figure 1. Strategies for other databases were adjusted for database-specific indexed terms. Reference lists of selected articles were hand-searched for additional peer-reviewed papers, however, gray literature was not included. The search was not restricted by year of publication. The search results are outlined in Figure 2.

Inclusion Criteria

Studies of participants aged at least 65 years, living in RACF, that reported determinants of unplanned transfer to ED and hospital admission, and published in English were included. All included studies were from peer-reviewed sources and included quantitative analysis of primary data. Studies had to include specific analysis of the population of RACF residents aged 65 years and older. Unplanned transfers included those for acute deteriorations in health, ACS conditions, and end-of-life care. Qualitative studies and systematic reviews were not included. Studies referring to elective hospital admissions, such as for preplanned procedures were not included. A RACF was defined as a nursing home, care-home, or long-term care, skilled nursing, or residential care facility. These criteria were broad to ensure a comprehensive review. Studies that did not refer to ED or hospital transitions were excluded. Reasons for exclusion of studies after review of full-test articles are presented in Figure 2.

Assessment of Validity and Synthesis of Findings

Study quality was assessed using the Newcastle-Ottawa Scale (NOS).[15] The NOS is a checklist scale developed for observational studies which assesses 3 domains of study methodology: selection and representativeness of participants, comparability of different participant groups, and assessment of outcome or exposure.[15] There are a set number of points awarded to each domain with the maximum achievable score being 9 points for cohort and case-control studies and 10 points for cross-sectional studies.[15] Previously, the total NOS score has been used to rate quality of studies as follows:

1. exp Nursing homes/ OR nursing hom*.mp. OR exp Residential Facilities/ OR residential facilit*.mp. OR exp Long-Term Care/ OR long-term care .mp. OR exp Skilled Nursing Facilities/ OR skilled nursing facilit*.mp.
2. exp Geriatrics/ OR geriatri*.mp. OR exp Aged/ OR aged .mp. OR elderly .mp. OR exp Frail Elderly OR frail elderly .mp. OR exp “Aged, 80 and over”/ OR “Aged, 80 and over” .mp. OR gerontolo .mp.
3. 1 AND 2
4. exp Housing for the Elderly/ OR housing for the elderly .mp. OR exp Homes for the Aged/ OR homes for the ages .mp. OR residential aged care .mp. OR exp Geriatric Nursing/ OR geriatric nurs*.mp.
5. 3 OR 4
6. exp Emergency Medical Services/ OR emergency medical servic* .mp. OR exp Emergencies/ OR emergenc*.mp. OR exp Emergency Treatment/ OR emergency treatmen*.mp. OR exp Emergency Service, Hospital/ OR emergency servic* .mp. OR exp Trauma Centers/ OR trauma servic* .mp. OR trauma cent* .mp. OR exp Emergency Nursing/ OR emergency nurs*.mp. OR exp Emergency Medicine/ OR emergency medicine.mp. OR “accident and emergency”.mp. OR emergency department.mp. OR exp Ambulances/ OR ambulanc*.mp. OR paramedi*.mp. OR prehospital.mp. OR prehospital care.mp. OR pre-hospital.mp.
7. 5 AND 6

Fig. 1. Search Strategy (Medline)

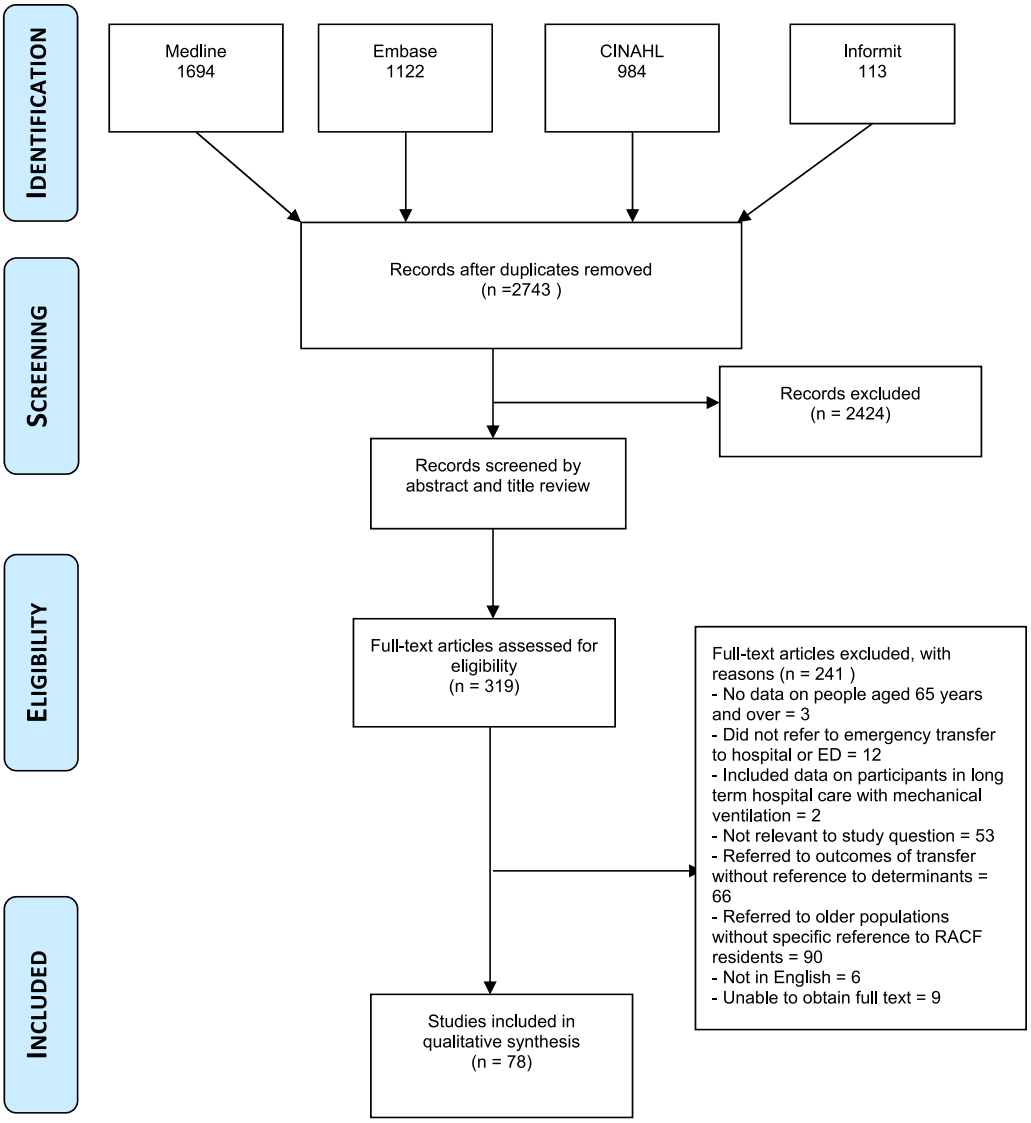

Fig. 2. Search Results (PRISMA).[14]

0 to 5 classified as low quality, 6 to 7 moderate quality, and ≥8 as high quality.[16,17] All studies were rated by R.D. with 25% of studies undergoing duplicate assessment by J.L. and J.S. Assessment of studies between authors demonstrated consistent scoring, suggesting adequate inter-rater reliability.

Data were extracted systematically from included papers. Key concepts were identified and grouped into 2 overarching categories, individual patient characteristics, and RACF characteristics, and are summarized in Table 1. Variables were then further categorized into relevant subgroups for each category enabling thematic analysis and production of a best evidence synthesis of the literature.[18–20]

Results

Summary of Included Studies

A total of 78 papers met the inclusion criteria for this review. The features of included studies along with the NOS quality rating score have been summarized in Table 2. All were observational studies with considerable variability in methodology. All studies included in analysis achieved NOS scores of 6 or more. In general, study quality was very good with the average score for cohort and case control studies being 8 out of 9, and cross-sectional studies being 7.5 out of 10, respectively. In total, 54 papers (69% of all papers) achieved a NOS score of 8 or more.

A large proportion of studies reported retrospectively collected data from hospital or RACF chart reviews (29/78, 37%) or health administrative datasets (37/78, 47%). Overall, 28 of 78 (36%) studies included some prospective data collection through assessment interviews with patients, RACF facility staff, or hospital clinicians. Among studies with similar methods, such as chart review or use of administrative data, there were considerable differences in data extraction techniques, tools and databases used. Study sample sizes varied substantially from 46 participants to national datasets reporting more than 900,000 clinical encounters.

Most studies were conducted in the USA (42/78, 54%), with others from 13 different countries including Australia (9/78, 12%), Canada (8/78, 10%), Taiwan (4/78, 5%), and England (2/78, 3%). There were no studies identified from low-income countries. Given the heterogeneity of studies, meta-analysis of data was not possible.

Table 1
Factors Associated With Higher Numbers of Unplanned Transfers From Residential Aged Care Facilities to Hospital

Patient Factors
Cognitive impairment
Presence of a permanent indwelling device (eg, PEG tube)
Chronic respiratory or cardiac disease
Depression or anxiety
Low body weight
Pressure ulcers
Lower functional ability
High number of medications or recent commencement of new medication
Recent change in environment (eg, new admission to the facility)
Absence of an advance directive
Facility Factors
Privately owned or part of corporate chain
Those not aligned with an acute hospital
Absence of dementia special care unit
Lower quality of the physical environment
Lower RN to LPNs and RN to CNA staffing ratio
Higher rates of staff turnover
Lower number of physician hours per resident
Absence of specialized geriatrician consultation
Lower facility prevalence of advance directives

CNA, certified nurse assistant; LPN, licensed practitioner nurse; PEG, percutaneous endoscopic gastrostomy.

Patient Factors

Demographics

Aged care residents transferred to hospital were elderly, on average aged over 80 years.[3,4,11,12,21–40] This is consistent with population surveys that have identified up to 75% of all elderly people living in RACF are aged 80 years and over.[41] However, 2 studies, both involving retrospective analysis of routinely collected healthcare data for over 2000 residents, found that in contrast to community-dwelling patients, RACF residents were less likely to be transferred to hospital as age increased further to the very extremes of old age.[34,42]

Overall, there is a greater number of women living in care facilities with up to 70% of residents being female, likely reflecting their increased life expectancy compared with men.[41] Thus, females comprised a greater proportion of RACF residents seen in ED and admitted to hospital, with women accounting for 56% to 76% of transferred residents.[4,11,12,21–26,28–34,36,38–40] Many studies demonstrated that men had a higher rate of transfer to hospital and admission, higher ED usage, and higher readmission rates compared with female residents.[1,13,34,42–49] However, these associations were not investigated in detail and, therefore, the reason for these proportional differences is not clear.

It is possible that in some countries, there are ethnic influences on the decision to transfer residents to hospital for treatment. In US populations, both Ackerman et al[1] and Wang et al[33] noted a higher number of RACF residents presenting to ED were Caucasian. In contrast, subsequent studies have reported that being non-Caucasian was associated with increased risk of transfer to hospital in case of acute medical illness,[48] increased rate of admission for ACS conditions,[50] which are admissions that may be considered potentially avoidable, increased likelihood of a burdensome transition in the last 90 days of life,[13] and increased risk of dying in hospital compared with in the RACF.[51] In a primary study of the impact of race on rehospitalization rates of RACF residents, Li et al[47] found a 40% increased odds of 30-day re-hospitalization for black compared with Caucasian residents. Black RACF residents were more likely to reside in for-profit and lower resourced facilities, factors which were associated with increased rates of transfer to hospital, however, this only partially accounted for the differences in transfer rates in this study.[47]

Comorbidity

A number of disease-related factors were found to influence risk of acute medical illness, severity of deterioration, and rate of hospital transfer. One Taiwanese and several US studies found residents with cognitive impairment had higher risk of ED transfer or hospital admission for acute illness than those without cognitive impairment.[1,47,49,50,52,53] However, this may vary among healthcare settings as other studies reported that residents with a diagnosis of dementia, in particular those with more advanced cognitive deficit, were less frequently referred to ED.[54,55]

It has been reported that having permanent indwelling devices such as a percutaneous endoscopic gastrostomy tube or indwelling catheter may lead to increased rates of ED presentation.[46,48,49,56] Rehospitalization for tube complications has been reported in 20% to 35% of RACF residents within a short period after insertion.[56,57]

Many chronic comorbidities may lead to emergency transfer to hospital through acute exacerbation of symptoms or worsening of underlying disease states. Diagnoses of chronic obstructive pulmonary disease, asthma, congestive cardiac failure, diabetes, and chronic pain have been associated with higher risk of ED transfer and hospital admission.[42,43,48,58–62] Spector et al[49] found admissions for ACS conditions, were higher for those residents with urinary tract infection, congestive cardiac failure, asthma, chronic obstructive pulmonary disease, and diabetes. As well as physical disease, poor mental health may require increased health service usage. In particular, a diagnosis of major depression, anxiety, or less commonly psychosis has been associated with increased rate of medical consultation, ED visit and hospitalization.[50,52,63]

Physical status

Further markers of poor physical health such as low body mass index, recent illness, pressure ulcers, swallowing difficulties, and increased functional dependence have been shown to be associated with higher risk of acute hospital transfer.[42,44,46,47,49,52,62,64–68]

Medication

Large numbers of prescribed medications,[69] use of specific medications such as anxiolytics and hypnotics and recent initiation of new medication have all been associated with an increased risk of emergency hospital transfer.[42,46,49] This may reflect increased burden of disease or hazards of adverse drug reaction.

Recent RACF transfer

A recent change in environment may leave a resident more vulnerable to acute illness or injury. Both new admission to RACF or recent discharge from ED or hospital has been associated with increased risk of falls resulting in ED transfer and inpatient admission.[49,67,70] Transfer rates have been reported to be highest within the first 90 days of admission to the facility.[43,54]

Facility and Health System Characteristics

ED and hospital transfer rates varied considerably between different RACFs, with reports ranging from 15% to over 75% per year, suggesting that individual facility characteristics may significantly influence an individual's risk of ED transfer for acute illness.[1,2,13,37,65,71,72]

Ownership

Facility ownership could impact on policies and availability of resources needed to manage acute illness within the RACF. In the US, facilities that are privately owned (compared with those run by not-for-profit or government agencies), part of a corporate chain, those not linked with hospitals, and those with higher proportions of Medicaid patients compared with privately funded residents

Table 2
Characteristics of and NOS Score for Included References

Study	Country	Setting	Sample Size	Study Duration/Year	Methods	NOS Rating			
						Selection (4)	Comparability (2)	Outcome (3)	Total (9)
Cohort Studies									
Arendts et al, 2012[11]	Australia	District	4680	1 year (2006–2007)	Review of health administrative datasets for 6 hospital EDs	3	2	3	**8**
Avidan et al, 2005[67]	USA	District (single)	34163	1 year (2001)	Review of health administrative data (RAI/MDS) for RACF residents in one state	4	1	3	**8**
Barker et al, 1994[43]	USA	>2 RACF	2120	2 years (1982)	Review of health and administrative data for RACF residents from Monroe County Long-Term Care Program case management agency and hospital records and billing data	3	1	3	**7**
Becker et al, 2010[50]	USA	District	72,251	3 years (2003–2006)	Review of health administrative data for residents using Medicaid claims and enrollment and for RACFs using OSCAR for 1 district	4	2	3	**9**
Boockvar et al, 2005[74]	USA	>2 RACF	2153	2 years (1992–1995)	Prospective enrollment and follow-up of a cohort of RACF residents review of medical record, MDS data and interview with facility staff	4	2	3	**9**
Brookvar et al, 2008[66]	USA	>2 RACF	3618	3 years (1992–1995)	Prospective enrollment and follow-up of RACF residents review of medical record and Medicaid and Medicare data	4	2	3	**9**
Burton et al, 2001[54]	USA	>2 RACF	2153	3 years (1992–1995)	Prospective enrollment and follow-up of RACF residents, baseline interviews and examination, review of medical record	4	2	3	**9**
Carroll et al, 2001[93]	USA	>2 RACF	551	6/12 (1999)	Review of facility medical record, pharmacy record healthcare and administrative data	3	1	3	**7**
Chiang et al, 2012[52]	Taiwan	Single RACF	609	1 year (2006)	Prospective enrollment and follow-up of residents, baseline interview and assessment, review of facility and hospital medical record	3	1	3	**7**
Chou et al, 2009[3]	Taiwan	Single RACF	635	1 year (2006)	Review of hospital medical record and administrative data	3	1	3	**7**
Crilly et al, 2008[26]	Australia	Single hospital	9744	1 year	Review of hospital healthcare and administrative data and medical record	4	2	3	**9**
D'Arcy et al, 2013[84]	USA	Nationally representative data	66,551	1 year (2003–2004)	Use of nationally representative healthcare and administrative datasets (Medicare)	4	2	3	**9**
Girio-Fragkoulakis et al, 2011[40]	England	Single hospital	11760	6/12 (2007)	Review of hospital administrative data and hospital medical records	4	1	3	**8**
Givens et al, 2012[48]	USA	>2 RACF	323	1.5 years	Prospective enrollment and follow-up of residents, interview and examination of participants, review of medical records and hospital discharge summaries	3	2	3	**8**
Goldfeld et al, 2013[78]	USA	>2 RACF	291	6 years (2003–2009)	Prospective enrollment and follow-up of residents, interview and review of medical records, review of linked healthcare datasets (Medicare)	4	2	3	**9**
Gozalo et al, 2011[13]	USA	National	90,228	7 years (2000–2007)	Review of healthcare and administrative data from residents using national datasets (MDS, Medicare claim files)	3	2	3	**8**
Graverholt et al, 2011[37]	Norway	District	2451	2 years (2007–2008)	Review of linked healthcare and administrative datasets (hospital and ambulance records)	3	1	3	**7**
Graverholt et al, 2013[34]	Norway	District	2451	2 years (2007–2008)	Review of health administrative data through hospital patient record and ambulance records	3	2	3	**8**
Grunier et al, 2010[83]	Canada	District (single)	64,589	1 year (2005)	Review of healthcare and administrative data for residents and facilities (LOC, NACRS, registered persons database, Ontario drug benefit claims, the Canadian Institute for Health Information Discharge Abstract Database, OHIP)	3	1	3	**7**

(*continued on next page*)

Table 2 (*continued*)

Study	Country	Setting	Sample Size	Study Duration/Year	Methods	NOS Rating			
						Selection (4)	Comparability (2)	Outcome (3)	Total (9)
Grunier et al, 2012[70]	Canada	District (single)	64589	1 year (2005)	Review of healthcare and administrative data for residents and facilities (LOC, NACRS, registered persons database, Ontario drug benefit claims, the Canadian Institute for Health Information Discharge Abstract Database, OHIP)	3	2	3	**8**
Grunier et al, 2014[92]	Canada	District (single)	>100,000 episodes	6 years (2002–2008)	Review of linked healthcare administrative data (LOC, NACRS, Registered persons database, Ontario drug benefit claims, the Canadian Institute for Health Information Discharge Abstract Database, OHIP) and influenza surveillance data	4	1	3	**8**
Hillen et al, 2011[32]	Australia	Single hospital	3310	6 years (1999–2005)	Review of hospital administrative data and medical records	3	2	2	**7**
Hutt et al, 2002[58]	USA	>2 RACF	2414	1 year (1994)	Review of resident medical records and healthcare administrative data (Medicare provider analysis and review file)	4	2	3	**9**
Ingarfield et al, 2009[30]	Australia	District	6165	3 years (2003–2006)	Review of hospital and ambulance healthcare and administrative data	3	2	3	**8**
Intrator et al, 1999[44]	USA	Districts (multiple)	2080	1 year (1993)	Review of healthcare administrative data for residents and RACFs (RAI-MDS, OSCAR)	4	2	3	**9**
Intrator et al, 2004[71]	USA	Districts (multiple)	54631	1 year (1997)	Review of healthcare and administrative data (MDS, OSCAR) across 4 states	4	2	3	**9**
Jayasinghe et al, 2007[25]	Australia	Single hospital	737	8.5/12 (2004)	Review of hospital and ED administrative records and patient medical records, smaller groups followed up within 48 hours with assessment interview	3	1	2	**7**
Jones et al, 1997[21]	USA	Two hospitals	709	1 year (1993)	Review of patient medical record and transfer documents, completion of questionnaire by ED treating physician while patient in hospital	3	1	2	**6**
Kaw et al, 1994[57]	USA	Single hospital	46	2 years (1988–1990)	Review of patient medical records from hospital, RACF, and family physician	3	1	3	**7**
Ku et al, 2013[68]	Taiwan	>2 RACF	940	1 year (2009–2010)	Interview and assessment of individual participants with follow-up over study period. Review of patient medical record	3	2	3	**8**
Kuo et al, 2009[56]	USA	National data		2 years (2000–2002)	Review of nationally representative healthcare and administrative data (MDS, Medicare claim files)	4	1	3	**8**
Lane et al, 2012[38]	Australia	Single hospital	228	6/12 (2009)	Review of hospital medical record for individual participants	3	2	3	**8**
Leung et al, 2013[69]	Hong Kong	>2 RACF	169	1 year	Prospective enrollment and assessment of residents. Use of routine healthcare data (RAI MDS 2.0)	3	1	3	**7**
Li et al, 2011[47]	USA	National	>500,000	<1 year (2008)	Review of nationally representative routine healthcare and administrative data (MDS, OSCAR, 2008 Area Resource File)	4	2	3	**9**
Mitchell et al, 2004[88]	USA	District (single)	2492	3 years (1994–1997)	Review of routinely collected healthcare and administrative data (MDS, National death index)	4	2	3	**9**
Mitchell et al, 2009[89]	USA	>2 RACF	323	1.5 years (2003–2007)	Prospective enrollment and follow-up of residents, interview and examination of participants, review of medical records	3	2	3	**8**
Nelson et al, 2013[39]	USA	Single hospital	100	4/12 (2011)	Review of hospital medical record and electronic ED record and survey of treating clinician	3	1	3	**7**
Ouslander et al, 2010[81]	USA	District (single)	377 RACF	1.5 years (2005–2006)	Review of routinely collected healthcare and administrative data (MDS, Medicare claims data)	3	2	3	**8**
Peng et al, 2009[60]	Taiwan	Single RACF	574	1 year	Prospective enrollment of participants with baseline interview and assessment, review of healthcare and administrative data (MDS)	4	2	3	**9**

Romero-Ortuno et al, 2012[35]	Ireland	Single hospital	1938	8 years (2002–2010)	Review of hospital healthcare and administrative data, review of patient medical records	3	2	3	**8**
Ronald et al, 2008[45]	Canada	District (single)	6826	3 years (1996–1999)	Review of health administrative data from BCLHD	3	1	3	**7**
Saliba et al, 2000[23]	USA	>2 RACF	100	8/12 (1994–1995)	Retrospective review of RACF and hospital records and transfer documentation	3	2	3	**8**
Simoni-Wastila et al, 2009[61]	USA	>2 RACF	3037	2 years (2003–2005)	Review of health administrative dataset (Market Scan Medicaid)	3	2	3	**8**
Smallbrugge et al, 2006[63]	Netherlands	>2 RACF	350	1.5 years (1999–2001)	Prospective recruitment of participants with individual interview and assessment	4	2	3	**9**
Spector et al, 2013[49]	USA	National	62745	2 years (2006–2008)	Review of nationally representative health administrative datasets (NH Stay file, MDS, OSCAR, Brown University State policy data)	3	2	3	**8**
Street et al, 2012[36]	Australia	Single hospital	4637	1 year (2009)	Review of hospital health and administrative data (VEMD, VAED)	3	2	3	**8**
Tang et al, 2010[46]	Hong Kong	District (single)	1820	<1 year (2001)	Review of health administrative data (MDS-RAI 2.0) and medical records and individual interview with patients	3	2	3	**8**
Temkin-Greener et al, 2013[51]	USA	National data	>2.5 million	5 years (2003–2007)	Review of national administrative healthcare datasets (CCW, MDS)	4	2	3	**9**
Teno et al, 2011[87]	USA	Nationally representative data	15784 RACF	6 years (1999–2007)	Use of nationally representative healthcare and administrative datasets (MDS, Medicare enrollment and inpatient hospitalization data, OSCAR)	3	1	3	**7**
Unroe et al, 2012[76]	USA	Nationally representative data	164,672	2 years (2006–2007)	Review of national health administrative datasets (Medicare provider and analysis review claims from CMS, MDS, Nursing Home Compare Website)	3	2	3	**8**
Vossius et al, 2013[4]	Norway	Single hospital	940	1 year (2011)	Review of health administrative data (AMIS, NIMES, Municipal medical file)	3	2	3	**8**
Walsh et al, 2012[75]	USA	National data	958,837	1 year (2005)	Review of national health administrative datasets (CCW, CMS, OSCAR)	4	2	3	**9**
Wang et al, 2011[33]	USA	National	>500,000	3 years (2005–2008)	Review of national health administrative datasets (NHAMCS)	3	2	3	**8**
Yeung et al, 2011[85]	Hong Kong	Single hospital	2942	1 year (2006–2007)	Review of hospital administrative data, review of medical record, weather information form the HK Government Observatory	3	2	3	**8**
Zimmerman et al, 2002[73]	USA	>2 RACF	2015	2 years (1992–1995)	Prospective enrollment and follow up of participants. Individual interview and assessment of residents, review of medical records	4	2	3	**9**
Zweig et al, 2004[42]	USA	>2 RACF	1031	3 years (1995–1998)	Prospective enrollment and follow-up of resident. Review of medical record and use of MDS data for participants	3	2	3	**8**

Study	Country	Setting	Sample Size	Study Duration/Year	Methods	NOS Rating			
						Selection (4)	Comparability (2)	Exposure (3)	Total (9)
Case-Control Studies									
Alrawi et al, 2013[12]	England	Single hospital	314	2 years (2005–2007)	Review of health administrative data and medical records for participants	3	1	3	**7**
Resnick et al, 2008[59]	USA	National	13,507	1 year (2004)	Review of nationally representative data (NNHS)	4	2	3	**9**

Study	Country	Setting	Sample Size	Study Duration/Year	Methods	NOS Rating			
						Selection (5)	Comparability (2)	Outcome (3)	Total (10)
Cross-Sectional Studies									
Ackerman et al, 1998[1]	USA	District (single)	1488	1 year (1995)	Review of hospital medical records, review of data from 1995 State of Georgia Annual Nursing Home Questionnaire	3	1	3	**7**
Aigner et al, 2004[79]	USA	>2 RACF	203	1 year (1997–1998)	Review of participant RACF medical records	2	2	3	**7**
Aminzadeh et al, 2004[2]	Canada	>2 RACF	178	1 year (2002–2003)	Interview with participants and review of medical records	5	2	3	**10**

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Table 2 (*continued*)

Study	Country	Setting	Sample Size	Study Duration/Year	Methods	NOS Rating			
						Selection (5)	Comparability (2)	Outcome (3)	Total (10)
Carter et al, 2009[27]	Scotland	Single hospital	107	1/12 month	Questionnaire completed by treating physician whilst patient in ED and review of medical record	2	1	3	**6**
Cwinn et al, 2009[28]	Canada	Single hospital	457	6/12 (2004)	Review of hospital administrative data (NACRS), medical record, ambulance record and transfer documentation	2	1	3	**6**
de Souto Barreto et al, 2013[53]	France	>2 RACF	5684	1 year	Review of participants medical record, information on RACF organization and structure recorded	3	2	3	**8**
Finn et al, 2006[24]	Australia	Single hospital	541	6/12 (2002)	Review of hospital and ambulance records and documents	3	2	3	**8**
Finucane et al, 1999[22]	Australia	Single hospital	239	3/12 (1998)	Review of hospital record and transfer documents, phone interview with ED and NH staff to gather further information as needed	3	1	3	**7**
Jensen et al, 2009[29]	Canada	District (single)	606	1 year (2000)	Review of district wide healthcare and administrative datasets (HHS, paramedic records)	3	2	3	**8**
Konetzka et al, 2004[65]	USA	Nationally representative data	766	1 year (1996)	Use of nationally representative dataset (from Medical Expenditure Panel Survey) review of participants medical record	3	2	3	**8**
Langmore et al, 2002[64]	USA	Districts (multiple)	102842	1 year (1993–1994)	Use of MDS health administrative data from 3 states (through University of Michigan Assessment Archive Project)	4	2	3	**9**
Lee et al, 2003[82]	Singapore	Single hospital	201	3/12 (2001)	Completion of questionnaire by patient's treating ED physician	3	2	3	**8**
Lima et al, 2012[62]	USA	>2 RACF	18680	1 year (2006–2007)	Review of health administrative datasets (MDS, CMS, OSCAR) and survey of American Medical Directors Association members	3	2	3	**8**
Madden et al, 1998[86]	USA	Single hospital	420	1 year (1995–1996)	Collection of data from hospital transfer record and survey of treating clinicians	3	1	3	**7**
Mamhidir et al, 2012[55]	Sweden	>2 RACF	719	2 years (2000–2002)	Interview with and assessment of participants, review of medical record and MDS data	3	1	3	**7**
McGregor et al, 2010[90]	Canada	>2 RACF	369	6 years (2001–2007)	Review of individuals medical records	3	1	2	**6**
Mitchell et al, 2007[80]	USA	Nationally representative data	91521	1 year (2000)	Use of nationally representative healthcare and administrative datasets (RAI MDS, CMS, OSCAR)	4	2	3	**9**
Mitchell et al, 2010[31]	Scotland	Single hospital	615	1 year (2006)	Review of hospital administrative data and medical records	3	2	3	**8**
Parsons et al, 2007[72]	USA	District (single)	3985	1 year (2003)	Use of healthcare administrative data and review of EMS records	2	1	3	**6**
Platts-Mills et al, 2012[77]	USA	Single hospital	128	6/12 (2009)	Questionnaire completed by treating physician whilst patient in ED, review of medical record and Nursing Home Compare website	3	2	3	**8**

AMIS, Acute Medical Information System (Norway); BCLHD, British Columbia Linked Health Database (Canada); CCW, Chronic Conditions Data Warehouse (USA) supported by CMS; CMS, Centers for Medicare and Medicaid Services (USA); HHS, Hamilton Health Services administrative database (Canada); LOC, levels of care classification (Canada); NACRS, National Ambulatory Care Reporting System (Canada); NH Stay file, links subset of MDS with inpatient claims data (USA); NHAMCS, National Hospital Ambulatory Medical Care Survey (USA); NHS, National Nursing Home Survey (USA); NIMES, Nirvaco Medical Systems (Norway); OHIP, Ontario Health Insurance Plan Claims database (Canada); OSCAR, Online Certification and Reporting System for Nursing Homes (USA); RAI MDS, Resident Assessment Index Minimum Data Set (USA); RAI MDS 2.0, Resident Assessment Index Minimum Data Set 2.0 (HK); VAED, Victorian Admitted Episodes Dataset (Australia); VEMD, Victorian Emergency Minimum Dataset (Australia).
Healthcare and Administrative Datasets used in above studies.
Note: Bold values are statistically significant.

(indicating lower resourced organizations) frequently reported higher rates of hospitalization and readmission.[46,47,49,50,65,71,73–76] One study focused on residents living in facilities with additional resources such as dementia special care units, and reported reduced odds of admission to hospital.[44] Another study identified increased rates of hospitalization associated with factors related to low-resourcing such as a poorer physical environment, less resident privacy, and less visitation by family members.[73] In addition, 1 study reported that quality of information transfer from RACF to ED might be worse for those residents from facilities with higher proportion of Medicaid- funded residents, possibly because of facilities having fewer financial resources, operating closer to capacity, and having higher staff turnover rates.[77] As well as these facility factors, Goldfeld et al,[78] have demonstrated that different cost reimbursement policies may impact on transfer rates, with those residents who have their costs covered by fee-for-service plans experiencing more acute hospital transfers compared with those covered by a more comprehensive managed care plan under Medicare.

Size of facility

It has been suggested that, independent of ownership, larger facilities may have lower rates of transport to ED possibly because of greater staffing and treatment capacity.[37,43] However, findings are mixed with some studies reporting higher rates of transfer from RACF with greater number of beds.[47,50]

Staffing

One of the most important aspects of care within RACF is staffing. RACFs can be staffed by a range of clinicians including specialist nurse practitioners (NP), registered nurses (RNs), licensed practitioner nurses (or enrolled nurses), personal care workers or certified nurse assistants, physicians, and allied health professionals. A number of the included observational studies have found that both quantity and type of staffing to be associated with differences in rates of hospitalization and capacity of facilities to provide acute care to residents.[2,65,71,79,80]

Staffing mix and staff-to-resident ratios vary markedly between facilities; and greater staff-to-resident ratios and increased proportions of senior staff have been associated with reduced hospital admission rates.[2,65,80] Furthermore, more RNs or higher RN: licensed practitioner nurse ratios within facilities has been associated with reduced emergency transfer,[65,71] whereas higher personal care worker to nursing ratios were associated with increased emergency transfer rate.[71] In addition, specialist NPs work independently or in a team with physicians. In a study of 2 pre-existing models of care, Aigner et al[79] in their retrospective, observational study, found a NP and physician team compared with a physician only was associated with an increased number of acute visits by clinicians to RACFs but with no significant difference in the proportion of residents transferred to ED or admitted to hospital.[79] Others have found employment of a NP or a physician assistant was associated with reduced hospital transfer rates and lower rates of admissions with ACS conditions.[44,71,81]

In addition to staff profile, staff satisfaction and engagement have also been highlighted as important factors, with poorer physical environment, less importance placed on staff satisfaction and higher RN turnover all associated with increased rates of hospitalization of residents.[73]

Primary healthcare

It has been estimated that the decision to transfer a resident to hospital involves the primary care physician or general practitioner 41% to 71% of the time; and in only 11% to 44% of cases has the doctor reviewed the patient prior to transfer.[22,24,25,82,83] Greater involvement of medical staff through full-time staff appointments to larger facilities, greater availability of facility medical director and primary care physician, increased physician hours per resident, and a more formal, structured appointment that links the physician to the facility has been associated with lower rates of hospital admission and readmissions.[43,44,62,81] In addition, given the frequently complex medical treatment needed by many residents, involvement of a specialist geriatrician may lead to improved care; with D'Arcy et al[84] noting that residents receiving at least 1 geriatrician consultation during a 12-month period had a 12% reduction in monthly ED use compared with those who did not.[84]

Season/temperature

There is some suggestion that residents may be vulnerable to changes in season with some studies finding increased rates of falls and of hospital presentations by RACF residents increasing during the colder, winter months,[25,26,29,85] although the reasons for this variation have not been explored. Others have failed to find significant variability in rates of presentation across the year.[1,82]

Advance Directives

Advance directives (AD) are individualized, written documents that guide the end-of-life care and resuscitation treatment of a patient. They encompass a range of plans including do not resuscitate (DNR) and do not hospitalize (DNH) orders, advance care plans, and living wills and play an important role in directing medical and palliative care. Ideally, these documents should be completed in consultation with a patient, their next of kin, and current treating physician and should include discussion of prognosis, expected complications, and possible treatment options. Among residents seen in ED, the prevalence of advanced directives was variable with reported rates of 3% to 37% for documentation of resuscitation status, and up to 7.9% for DNH orders.[4,27,38,86] Within the broader population of RACF, prevalence of DNR and DNH orders vary significantly between different facilities with estimates ranging from 54% to 73% and 2.1% to 49%, respectively.[13,42,48,80,87] Prevalence of ADs may also vary according to health characteristics of residents with 1 study finding that individuals with advanced dementia were less likely to have an AD than those with other terminal conditions such as cancer, possibly due to under-recognition of dementia as an end-of-life disease.[88]

For residents, presence of these documents influences the risk of hospitalizations. Individually, presence of an AD, DNR, or DNH order may reduce the probability of transfer to hospital for acute treatment, reduce the risk of a burdensome transition in the last 90 days of life, and reduce the risk of dying in hospital compared with the home facility.[13,42,44,48,51,58] Mitchell et al[89] found residents whose healthcare proxy had an adequate understanding of the clinical course and possible complications of advanced dementia were less likely to undergo burdensome interventions such as ED transfer and hospitalization in the last 3 months of life.[89] However, in this study cohort, only 18% of healthcare proxies reported they had received prognostic information from a physician, and only 33% stated a physician had counseled them about the clinical complications expected in advanced dementia.[89]

At a facility level, higher prevalence of ADs has been associated with reduced rates of hospital admissions.[71,81] It has been proposed that prevalence of ADs could provide an indicator of quality of care for acute illness and at end of life within facilities. Teno et al[87] found over an 8-year period, that an increase in the proportion of completed AD within a facility was associated with decreased rate of terminal hospitalizations of residents. Broadly, factors associated with a higher proportion of residents having a completed AD, and fewer

hospitalizations at the end of life included not-for-profit facilities, urban area location, fewer Medicaid beds and those not part of a corporate chain, employment of a NP or physician assistant, facilities with greater staffing per resident, greater continuity of care by family physician and increased physician visits, and those facilities with dementia special care units.[42,80,87,90]

Many of these studies reported on rates of hospitalization or admission, and it is, therefore, not clear if they also reflect changes in rates of ED visits, where patients may be transferred, assessed, and treated in ED without being admitted to hospital.

Discussion

This review has identified a number of determinants, including patient and facility characteristics that influence risk of unplanned emergency hospital transfer for frail, elderly people living in RACF. Individual patient factors are all readily observable and are frequently recorded in residents' administrative and medical records. They may, therefore, serve to risk stratify residents and enable implementation of focused strategies to reduce risk of acute deterioration such as increased frequency of physician visits.

Rates of transfer vary according to age and gender with those at the very extremes of old age being less likely experience a transfer. This possibly reflects instigation of end-of-life care within the RACF and decisions not to hospitalize those residents surviving to very old ages. A number of studies describe transfer rates being greater in male compared with female residents. The reason for this has not been clearly elucidated but may be due to differences in life expectancy and disease burden between the sexes or may include some gender bias in the care of these residents. A few studies also identified difference in frequency of transfer according to ethnicity. It is postulated this may relate to differences in socioeconomic characteristics of these patients and the facilities in which they reside. However, this variation may also reflect cultural differences between groups, which may influence the level and intensity of care provided to these frail populations, particularly toward the end of life. Additional research is needed to explore how gender, age, and cultural background may influence medical management and decision-making by patients, families, and healthcare professionals for this population of vulnerable adults.

Among the population of elderly patients in supported residential care a high proportion of individuals have advanced functional and cognitive impairments. Degree of functional impairment is an indicator of both increased risk of transfer and of poorer outcomes following an emergency visit to hospital.[7,9,44]

Further, it is known that elderly people living in RACFs frequently present to hospital with infection, in particular respiratory and urinary, and with fall-related injuries.[33,91] Among residents, increased risk of falling was associated with increasing age, poor balance, recent ED visit, increasing functional impairment, dementia and cognitive impairment, insomnia, depression, stroke, arthritis, previous falls and visual impairment.[46,67,68]

With regards to infection, provision of immunizations may influence rate of development of acute infectious illness. Rates of hospitalization for influenza and pneumonia are higher among elderly people living in RACF compared with community dwelling individuals.[92] Carroll et al,[93] found significant deficits in the management of influenza risk in RACF in Virginia, USA. In this cohort of over 500 residents, 50% received an influenza vaccination, 13% were not vaccinated, and documentation about vaccination status was missing in the remaining patient records.[93] In addition, only 4.5% had documented evidence of pneumococcal vaccination. In this study, there was a significantly higher proportion of residents who developed an influenza like illness among those who did not receive the influenza vaccine, compared with those who did, frequently resulting in hospitalization.[93]

Overall, some individual health variables, such as medication use and vaccination, are modifiable and can be regularly evaluated through routine, structured primary healthcare. Presence of co-morbidities and functional disability may be less modifiable. However, their presence may signal the probability of future deterioration or falls, which can be anticipated and planned for to avoid need for acute, disruptive transfer out of the facility. There is considerable potential for improved planning for these more predictable deteriorations with earlier intervention within facilities. This may include triggers to increase frequency of review by a patient's usual treating physician, structured guidelines, protocols, and training programs for facility staff in the management of common acute medical conditions, improved infection prevention strategies including vaccination, infection control practices, and antibiotic stewardship, and earlier engagement of appropriate outpatient and palliative care services, which may mitigate the need for transfer to hospital. This review found that specialist consultation, in particular with geriatricians may reduce the need for frequent transfer to the ED. However, currently, only a small proportion of residents of RACF may receive regular specialist geriatric medical care.[22,84]

In line with this, advance care planning is gaining recognition as an important component of care in people with chronic or life-threatening illness, particularly amongst RACF populations. These documents are particularly important in the ED during an acute deterioration when treatment decisions must frequently be made quickly and often by clinicians who have only limited knowledge of the patient, their treatment preferences, and their current functional and cognitive abilities and quality of life. Frail, elderly people residing in RACF are highly vulnerable to acute deterioration in health and functional ability and, therefore, advance care planning and provision of a written document should be viewed as an essential component of their care. In hospital, presence of an advance care plan has been associated with improved knowledge of a person's end-of-life wishes and greater perceived quality of end-of-life care by family members.[94] Findings from this review suggest that presence of AD may reduce hospital admissions and rate of burdensome hospital transitions at the end of life, however, evidence as to the efficacy of ADs is limited by considerable variability in the prevalence and quality of these documents.

As well as these variations between individual patients groups, rates of residents experiencing unplanned hospital transfer differed between facilities and between geographical areas. This suggests that local training and administrative systems influence clinical care and propensity to transfer residents to hospital for acute care. It has been suggested that hospital transfer rates should be regarded as a key performance indicator and that facility managers and administrators should monitor how their facilities perform.[95] It could be that these rates provide a proxy measure of quality of care within individual organizations, and it would, therefore, be important to identify facilities with consistently high proportions of residents being transferred. In addition, it is evident that facilities with fewer resources and poorer staffing ratios or skill mix have greater need to transfer residents to the ED. As well as the potential for disruptive, adverse outcome for patients, these transfers may have downstream impacts on the broader healthcare system through over-utilization of emergency and acute care services[4,40] and should, therefore, be monitored and addressed at a system as well as individual facility level.

There were some limitations to this review. The broad study types and disparity and inconsistency of study methodologies inhibited quantitative synthesis of results and meta-analysis and made comparison of quality using the NOS difficult. Most lower scoring studies,

falling into the moderate category of quality, provided evidence supportive of findings from higher quality studies, and NOS scores have been reported in Table 1 to allow comparison and review of results. Studies were observational and incorporated participants from a range of differing facility types and healthcare systems, which limit the generalizability of findings and precludes confirmation of cause and effect. However, this systematic synthesis of current peer-reviewed literature provides a comprehensive overview of the key determinants for risk of ED and acute hospital transfer as well as identifying important directions for further investigation.

Conclusions

Unplanned transfer to hospital for elderly residents of aged care facilities is a frequent occurrence, yet considerable gaps remain in the evaluation of this current model of emergency care. Most studies exploring these determinants of acute transfer to hospital are based on participants from USA with a smaller number of reports from Australia and Europe. Both population and health system characteristics can vary markedly between countries, so it is important to undertake further investigation within local settings. There are a number of potentially modifiable patient and facility factors that could be addressed by clinicians and facility administrators, which should reduce the need for burdensome transfer to the ED and improve the quality of acute care for this population. In addition to this, there is the potential to develop models to identify individuals at highest risk of experiencing an unplanned hospital transfer, to improve planning for and management of predictable deteriorations in health without the need for an unplanned emergency transfer. A number of key determinants including facility staffing, role of specialist geriatricians, and advance directives require further examination ideally through interventional trials to evaluate their impact on the prehospital and emergency care of patients.

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