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Original Study

Incidence and Risk Factors for Unplanned Transfers to Acute General Hospitals From an Intermediate Care and Rehabilitation Geriatric Facility

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A B S T R A C T

Objective: Unplanned acute hospital transfers (AT) from post-acute or long-term care facilities represent critical transitions, which expose patients to negative health outcomes and increase the burden of the emergency departments that receive these patients. We aim at determining incidence and risk factors for AT during the first 30 days of admission at an intermediate care and rehabilitation geriatric facility (ICGF).

Design and Setting: Prospective cohort study conducted in an ICGF of Barcelona, Spain. Sociodemographics, main diagnostics, and variables of the comprehensive geriatric assessment were recorded at admission. At the moment of AT, suspected diagnostic motivating the transfer was recorded. Multivariable Cox proportional hazard models were used to evaluate the association between admission characteristics and AT.

Results: We included 1505 patients (mean age + standard deviation = 81.31 ± 7.06, 65.7% women). AT were 217 (14.4%, 5.64/1000 days of stay) resulting in only 81 final hospitalizations (37% of AT), whereas 136 patients returned to ICGF after visiting the emergency department. Principal triggers of AT were cardiovascular, falls/orthopedic, and gastrointestinal problems. Being admitted to ICGF after a general surgery [hazard ratio (HR) 1.88; 95% confidence interval (CI) 1.21–2.94; $P < .001$], taking 8 or more drugs at admission (HR 1.98; 95% CI 1.37–2.86; $P < .001$) and living with a partner (HR 1.35; 95% CI 1.01–1.81; $P = .05$) were independently associated with a higher risk of AT.

Conclusions: In our sample, clinical and social characteristics at admission to an ICGF are associated with a higher risk of AT. A relevant proportion of AT is not admitted to the acute hospital, suggesting perhaps some avoidable AT. Identification of risk factors might be relevant to design strategies to reduce AT.

Unplanned acute hospital transfers (AT) and eventual readmissions may follow transitions of care and are associated with negative health outcomes and increasing costs.[1,2] Accumulating evidence has focused on readmissions after discharge from acute hospitals, when treatment reconciliation and adherence to new prescribed drugs on one hand, and adaptation to changed functional and clinical situation on the other, represent critical points. In the United States, 30-day unplanned readmissions after discharge from inpatient rehabilitation facilities are a national quality indicator.[3]

The risk of AT might be increased also after transitions between different levels of care, such as after discharge from acute hospitals to in-patient post-acute care and rehabilitation facilities or skilled nursing facilities. Depending on the setting (home, intermediate care, or nursing homes), frequency of unplanned readmissions vary from 4% up to 35%,[4,5] being higher in the first days following the discharge. This may be due to either individual factors (eg, adaptation to a new environment, risk of delirium) or organizational and process factors (eg, modification and reconciliation of drug prescriptions, change in protocols, different healthcare staff). Moreover, AT might happen in the absence of optimal conditions for patients' safety, such as adequate AT procedures or at night, when usual staff involved in the daily care planning is not available. After assessment and first management at the emergency department or other acute units, the patient might be either admitted to the acute hospital or discharged to the original place of care. Some of these situations are considered as potentially preventable, being a proxy for quality of the care setting.[6]

In intermediate care (IC) settings (inpatient rehabilitation, skilled nursing facilities, etc), as well as in nursing homes or in assisted living

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facilities, a wide range of factors have been shown to increase the risk for AT, including functional and social aspects or laboratory testing. However, this indication is mainly in nursing homes,[7] whereas it is scarce in IC. Moreover, intermediate care and rehabilitation tend to be heterogeneous among healthcare systems, so that AT data need to be specific and contextualized. The identification of risk factors for AT at admission to post-acute care could be relevant to adopt strategies to reduce unnecessary AT and readmissions.

The aim of our study was to evaluate the incidence, suspected diagnoses triggering AT, and factors associated with AT during the first 30 days of admission in an IC and rehabilitation facility.

Methods

Design, Population, and Setting

This prospective cohort study included all patients ≥65 years old admitted to the Hospital Socio-Sanitari Pere Virgili in Barcelona between January and November 2011. Pere Virgili is a public, monographic intermediate care and rehabilitation geriatric facility (ICGF) dedicated to psychophysical recovery after acute illnesses, completion of specific medical treatments and rehabilitation, management of comorbidities or complex nursing demands and end of life care, with home discharge as the final goal, whenever possible. Patients are admitted mainly from general university hospitals and a smaller proportion, directly from home.[8] There are 315 beds in the ICGF. Staff includes a 24-hour geriatrician (dedication of approximately 20 minutes per patient/day, plus 2 geriatricians on evening-night shift for the whole facility), nurses (1 hour per patient/day), and nursing assistants (1.6 hours per patient/day), plus physical, speech, and occupational therapists, social workers, and psychologists. Urgent and routine blood testing is available 24 hours and x-ray during the weekdays. Complementary explorations are available at tertiary hospitals. For unplanned AT, patients are transferred to the emergency department of the reference acute hospitals (mainly located within a 1.5-mile radius) and might either be admitted or may be returned to ICGF after diagnostic assessment and first management. The ICGF serves as a teaching institution for medical students, students of different others healthcare professions, and residents in geriatrics.

When patients are admitted, a consent signed by the patient or his/her legal representative authorizes the use of administrative and clinical data from the hospital's information system according to Spanish current laws on data protection. The Ethics Committee of the Universitat Autònoma de Barcelona approved the protocol of this study and the waiver of a specific informed consent.

Baseline Assessment

We recorded different characteristics at admission, including demographics (age, sex), main diagnostic at admission (International Classification of Diseases-Ninth revision), independency in daily baseline activities (Barthel Index before the acute event and at admission[9]), cognitive status (Pfeiffer Short Portable Mental Status Questionnaire [SPMQ][10] and the presence of depressive symptoms at admission), risk of pressure ulcers (EMINA scale[11]), risk of falls (Downton scale[12]), total number of medications prescribed at admission, and social situation (living with a partner and Gijon scale for social risk[13]). To increase clinical mining of continuous variables, we categorized age in tertiles and Pfeiffer SPMQ, Downton scale, EMINA and Gijon Scale according to cut-points proposed by original studies (normal-low and mild-high risk); we used cutoff for Barthel index in order to differentiate severe (<60) from moderate (≥60) disability, and ≥8 drugs as a cutoff for polypharmacy, according to described risks of adverse drug reactions in geriatric populations.[14]

AT Assessment

At the moment of AT, date, time, and the suspected diagnosis motivating AT were recorded. Data on final destination (return to ICGF or admission at the acute hospital) was also available.

Outcome

AT was defined as the first unplanned transfer to the emergency department during a patient's first 30-day stay in an ICGF, whether or not it ended with a hospital admission.

Statistical Analysis

Baseline variables showing a statistically significant univariable association with the outcome using Kaplan–Meier log-rank test ($P < .05$) were included in a multivariable Cox proportional hazard model. Data was censored at time of AT. In order to get a good fit to the model, proportional hazard assumption was checked using log-minus-log plot. Finally, we conducted an exploratory analysis looking at the risk factor for final readmission for patients who experienced AT, although the size of this subsample was reduced. Data were analyzed using SPSS 15.0 (SPSS Inc, Chicago, IL).

Results

During the study period, 1679 patients were admitted to our ICGF. Of these, we excluded 174 (10.4%) <65 years old, resulting in a final cohort of 1505 patients. Patients experiencing an AT were 217 (14.4%, incidence 5.64/1000 ICGF days); of these, 81 (5.4% of the total sample, incidence 2.10/1000 ICGF days, and 37% of the AT) were hospitalized, and 136 returned to ICGF after management at the emergency department. ATs occurred after a median ± standard deviation (SD) of 11.13 ± 8.69 days after admission, and one-half of the ATs within the first 9 days.

In bivariate analyses, sex, living with a partner, ≥8 drugs at admission, risk of pressure ulcers at admission (EMINA scale), admission to ICGF for general surgery, and respiratory problems were associated with an increased risk of AT, whereas orthopedic surgery with a reduced risk (Table 1). In the multivariable Cox proportional hazard model, being admitted to ICGF after a general surgery [hazard ratio (HR) 1.88; 95% confidence interval (CI) 1.21–2.94; $P = .00$], ≥8 drugs at admission (HR 1.98; 95% CI 1.37–2.86; $P = .00$) and living with a partner (HR 1.35; 95% CI 1.01–1.81; $P = .05$) were independently associated with a higher risk of an AT (Figure 1). Most prevalent principal diagnoses at admission to intermediate care for patients that eventually experienced an AT were similar for those finally readmitted or not readmitted to the acute hospital (post-orthopedic surgery/falls and cardiovascular, plus neurological in the group not readmitted) (Table 2). On the other hand, among principal suspected diagnoses motivating ATs, cardiovascular is the most frequent for both those who are readmitted and those who only visited ED and are not readmitted, being the second most prevalent infectious diseases for readmitted patients and gastro-intestinal reasons for those who are not readmitted (Table 2).

We also conducted an exploratory analysis of risk factors for final readmission in the group that experienced ATs, including also suspected diagnoses at the moment of the AT. The only significant finding was that AT episodes motivated by a suspected diagnosis of gastro-intestinal and post-general surgery were associated with a higher probability of returning to intermediate care after an ED visit without admission, adjusting for different covariates (HR 1.81; 95% CI 1.12–2.93) and (HR 1.93; 95% CI 1.14–3.19) respectively, $P = .01$ in both cases.

Table 1
Demographic, Clinical, and Social Characteristics of the Sample

Baseline Characteristics	Total N = 1505	AT		*P* Value
		No AT N = 1288	AT N = 217	
Age (tertiles)				
67–77 years	415 (27.6%)	348 (27.9%)	67 (30.9%)	.19
78–84 years	570 (37.9%)	484 (37.6%)	86 (39.6%)	
>84	520 (34.6%)	456 (35.4%)	64 (29.5%)	
Women	989 (65.7%)	868 (67.4%)	121 (55.8%)	<.001
Depressive symptoms (no/yes)	149 (11.1%)	120 (10.5%)	29 (14.8%)	.07
Previous moderate disability Barthel ≥60) vs severe	967 (75.4%)	827 (75.4%)	140 (75.7%)	.99
Moderate disability (Barthel ≥60) vs severe	267 (29.3%)	239 (29.9%)	28 (24.6%)	.23
Altered cognition (Pfeiffer ≥5)	289 (20.2%)	241 (19.7%)	48 (23.6%)	.16
Ulcers risk (EMINA ≥4)	1067 (72.6%)	900 (71.5%)	167 (78.8%)	.03
Falls risk (Downton ≥5)	615 (44.7%)	519 (43.9%)	96 (49.7%)	.11
Polypharmacy (≥8 drugs)	1057 (70.2%)	877 (68.1%)	180 (82.9%)	<.001
Lives with a partner	538 (35.7%)	438 (34%)	100 (46.1%)	<.001
Social risk (Gijon scale ≥10)	773 (74.5%)	678 (75%)	95 (70.9%)	.29
Principal diagnoses at admission				
Neurologic	183 (12.2%)	156 (12.1%)	27 (12.4%)	.83
Infectious diseases	9 (0.7%)	8 (0.6%)	1 (0.5%)	.94
Cardiovascular	175 (11.6%)	143 (11.1%)	32 (14.7%)	.10
Respiratory	94 (6.2%)	73 (5.7%)	21 (9.7%)	.04
Hematologic	113 (7.5%)	97 (7.5%)	16 (7.4%)	.49
Postorthopedic surgery	542 (36%)	477 (37%)	65 (30%)	.01
Post-general surgery	101 (6.7%)	77 (6%)	24 (11.1%)	<.001
Gastrointestinal	90 (6%)	76 (5.9%)	14 (6.5%)	.70

Data are mean ± SD or N (%).

Discussion

In our sample, almost 1 out of 6 patients had contacts with the emergency department during the 30 days following ICGF admission, but only one-third of these contacts finally ended with an acute hospital admission. Two-thirds of patients returned promptly to ICGF after diagnostic evaluation and/or first management. A general surgery as the reason for ICGF admission, ≥8 drugs at admission, and living with a partner were independently associated with an increased risk of AT.

In recent years, an extensive literature has been published about risk factors for rehospitalization after discharge from acute hospitals or nursing homes. Few studies have been conducted in post-acute

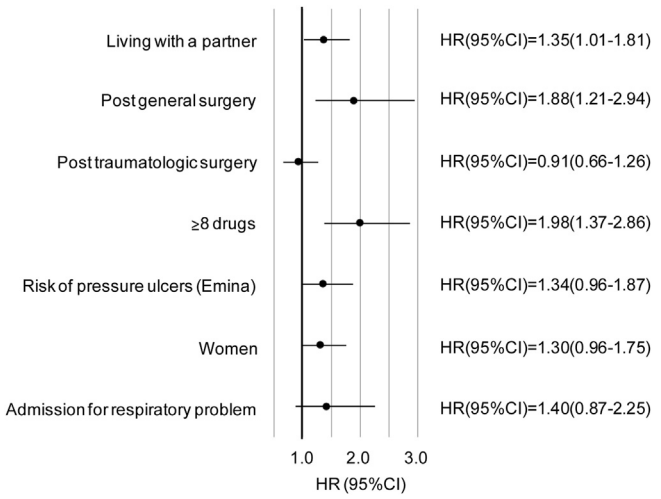

Fig. 1. Multivariable association between baseline characteristics and unplanned AT. Cox proportional hazards model.

Table 2
Main Diagnoses at Admission and Suspected Diagnoses of Transfers to the Acute Hospital, by Final Readmission to the Acute Hospital

	Principal Diagnosis at Admission to Intermediate Care		Suspected Diagnosis Motivating AT	
	Readmitted to Acute Hospital N = 81	Not Readmitted to Acute Hospital N = 136	Readmitted to Acute Hospital N = 81	Not Readmitted to Acute Hospital N = 136
Cardiovascular	11 (13.6%)	21 (15.4%)	20 (24.7%)	23 (16.9%)
Gastrointestinal	8 (9.9%)	6 (4.4%)	6 (7.4%)	21 (15.4%)
Respiratory	9 (11.1%)	12 (8.8%)	9 (11.1%)	7 (5.1%)
Hematologic	5 (6.2%)	11 (8.1%)	2 (2.5%)	8 (5.9%)
Infectious disease	1 (1.2%)	0 (0%)	11 (13.6%)	10 (7.4%)
Neurological	6 (7.4%)	21 (15.4%)	4 (4.9%)	16 (11.8%)
Post-general surgery	8 (9.9%)	16 (11.8%)	7 (8.6%)	18 (13.3%)
Postorthopedic Surgery/falls	25 (30.9%)	40 (29.4%)	10 (12.3%)	17 (12.5%)
Others	8 (9.9%)	9 (6.6%)	12 (14.8%)	16 (11.8%)

Data are N (%).

intermediate care settings similar to our ICGF. In Morandi et al's retrospective analysis of 2735 patients admitted to an in-hospital rehabilitation facility, rehospitalizations were 4%. Baseline independent predictors of 30-day unplanned rehospitalization included polypharmacy, functional change across rehabilitation stay, and previous length of stay in the acute hospital.[15] Dombrowski et al examined 50 patients consecutively admitted to a skilled nursing facility; a history of malignant solid tumors, recent hospitalizations for gastrointestinal conditions, and low serum albumin were associated with 30-day rehospitalizations.[16] As a novel approach, we selected any first AT, independent of final hospital admission, as an outcome because transfers to an emergency department might expose, per se, negative health consequences and increase the burden and costs for the healthcare system. Moreover, including events of AT that did not result in an admission, might capture less severe AT determinants and, in turn, potentially avoidable AT.

To the best of our knowledge, no previous study assessed incidence of AT independent of final hospital admissions. Focusing on the smaller proportion of patients that were finally rehospitalized, our data are similar to previous reports from analogous facilities.[15] The characteristics of our facility (eg, 24-hour availability of a specialist physician) and a very close and fluid functional relationship and coordination with the reference acute general hospital might explain the relatively few final admissions, as suggested by previous studies.[15,17] In particular, it highlights the lower readmission rates of European reports, including ours, compared with US data. This could partly be a consequence of differences between health systems. First, patients transferred to our ICGF might be relatively stable. In Spain, length of stay (LOS) of acute hospital may vary from 7.84 days in hospitals of >1000 beds to 6.18 in those with <200 beds,[18] which is comparable with other European hospitals and differs from the US (average LOS = 5 days).[19] Second, LOS in European post-acute care tend to be longer compared with the US data (median LOS of 12 days[20]); therefore, physicians might have more time to manage clinical instability during the rehabilitation process. Interestingly, also in our sample, ATs tended to occur early after admission, similar to previous reports on readmissions postdischarge from acute hospitals.[21] The main suspected diagnoses motivating AT in our sample (cardiovascular, postorthopedic surgery/falls, gastrointestinal, and infectious diseases), have been reported as causes of rehospitalizations in recently studies.[4,15,21] Some of them could be considered as "ambulatory case sensitive conditions," which could be potentially managed outside of an acute hospital, identifying potentially avoidable AT from ICGF.[2,22]

In fact, current programs implemented in nursing homes, such as the Interventions to Reduce Acute Care Transfers (INTERACT2) project, have established nursing strategies and protocols for the early detection of symptoms associated with similar conditions.[23]

Regarding potential risk factors for AT, results on polypharmacy are in line with previous studies on rehospitalizations from geriatric rehabilitation facilities,[15] as well as from home, either after hospital[24] or nursing home[25] discharge. We speculate that different concurrent mechanisms could contribute. On one hand, polypharmacy might be a proxy for a higher comorbidity; on the other hand, it represents a risk factor for adverse drug reactions[14] and might be associated with problems in reconciliation after the transition from the acute hospital to a different care setting. This finding seems particularly relevant in light of the promising results of geriatric drug management and reconciliation programs.[26,27] Finally, although it might seem intuitive that a better social support protect toward readmissions,[28,29] we found the opposite effect. This is in line with recent multifactorial intervention programs considering it as a cause of avoidable transfers from nursing homes.[30] One might speculate that, in some cases, the caregiver, facing changes in patients' health, could promote additional diagnostic and therapeutic efforts and a less conservative approach. Following another possible speculation, patients with good support might be less likely discharged to a post-acute facility from an acute hospital, unless they are selected for a certain degree of severity or complexity, whereas lack of support could be a reason in itself for discharging to a post-acute resource, independent of severity or complexity. This might explain, in part, why having a partner could be associated with a higher risk of AT in this setting. Regarding post-surgical patients, previous studies found that patients that did not return home after colorectal surgery have a higher risk of hospital readmission.[31] The exploratory analysis conducted in the AT group found that gastrointestinal and complications post-general surgery might motivate ATs, which finally are not admitted to the acute hospital, but only visit ED. These suspected diagnoses, if further investigated, might be conditions susceptible of management in intermediate care. However, this was only an exploratory analysis, in a smaller cohort, and larger studies should better explore this aspect.

Strengths of our study include the large prospective cohort, reflecting "real world" intermediate care because of the absence of exclusion criteria besides age, the availability of a comprehensive geriatric assessment including functional, mental, and social aspects and a careful registration of suspected diagnosis motivating AT. Among the limitations is the fact that data represent administrative and routine clinical records and not an ad hoc collection for the study, the absence of specific assessments of comorbidity, and laboratory parameters.

Conclusions

If confirmed by further longitudinal studies, the identification of risk factors for unplanned ATs of patients admitted to intermediate care facilities (including geriatric rehabilitation, skilled nursing facilities etc) might promote the development of new strategies or adapt existing interventions[23,32] to reduce potentially avoidable transfers to emergency departments and consequent rehospitalizations.

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