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RESEARCH PAPER

A geriatric re-evaluation clinic is associated with fewer unplanned returns in the Emergency Department: an observational case–control study

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Key summary points

Aim To evaluate whether the referral to a dedicated Geriatric Revaluation Clinic after discharge from the Emergency Department is associated with fewer early unplanned returns.

Findings The referral to a Geriatric Revaluation Clinic was associated with fewer early unplanned revisits in a population of older age patients discharged from the Emergency Department.

Message The creation of facilities aimed to evaluate the clinical evolution, treatment compliance, and functional status of geriatric patients discharged from the Emergency Department may contribute to prevent early unplanned revisits.

Abstract

Purpose The increasing share of older adults is associated with heavier Emergency Health Services utilization. In this context, a significant problem is the rate of unplanned revisits of geriatric patients after discharge from the Emergency Department (ED). We aimed to evaluate whether the referral to a dedicated Geriatric Revaluation Clinic (GRC) after discharge from the ED is associated with fewer early unplanned returns.

Methods We conducted an observational, retrospective, case–control study comparing patients 65 years or older evaluated in a GRC after an ED visit and a control group of same age subjects accessing the ED during the study period and discharged with one of the ICD-9-CM diagnoses used for the cases, for whom defined post-ED assessment was not arranged. The intervention at the GRC consisted of a comprehensive geriatric evaluation. We calculated unadjusted and adjusted OR for unplanned ED revisits within 30 days from ED discharge using two logistic regression models including the variables with statistically significant differences among study groups at univariate analysis.

Results During the study period, 121 eligible patients were evaluated at the GRC and were matched to 242 subjects included in the control group. The median age of the study population was 85 years. The adjusted OR for unplanned return after ED discharge and unplanned hospital admission after ED discharge were 0.44 (CI 0.20–0.89) and 0.52 (CI 95% 0.18–1.74), respectively.

Conclusions In a population of older patients discharged from the ED, the referral to a GRC is associated with fewer early unplanned revisits.

Keywords Older adults · Emergency department · Unplanned revisits · Comprehensive geriatric evaluation

Introduction

All developed countries are experiencing progressive aging of the population. The rise in the number of older people in the population leads to an increase in the prevalence of chronic health conditions [1]. Consequently, health services utilization, including the emergency care system, among older adults is relevant. In 2012, 22% of

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the two million older people living in the Lombardy region had undergone at least one ED visit [2]. Another study estimated that 14.3% of old age subjects in Italy had at least one preventable ED visit over a one-year follow-up, defined as an ED visit that ended with a direct discharge home [3].

The risk of unplanned revisits after a first discharge in the geriatric population, estimated between 15.8% and 33% at 30 days of follow-up [4–6], further burdens EDs. There is evidence that up to six months after discharge unpredicted re-admission rate can reach 50% [7, 8].

Apart from the economic implications of this pattern of Emergency Services usage, ED admissions carry a high potential for adverse events in the following months, such as increased mortality (estimated at 3% at one month after discharge to 10% at three months) and a reduction in autonomy in the daily activities [9].

All the epidemiological issues we have illustrated justify research aimed to define and deliver interventions for preventing unpredicted ED revisits. A meta-analysis has identified three kinds of interventions potentially useful to ease the ED discharge process for older adults [10]: "referral", which is an assessment of the patient by a care provider (usually a nurse or social worker) in the ED, followed by recommendations to community-based agencies or referral for follow-up with the regular physician, "program or follow up" intervention, consisting in ongoing support or care for the patient after discharge from the index ED visit, and, finally, "integrated models of care," defined as those interventions in which a care facilitator was embedded into the patient's care plans.

A wide range of follow-up interventions has been proposed [10, 11], from telephone calls after discharge to complex transitional programs. The former were not associated with any reduction in the risk of unplanned returns in a systematic review of two large trials [12], probably because the intervention may not be enough to deal with the complexity of health issues experienced. The latter appear challenging to implement on a large scale in a busy ED, and their effectiveness has never been demonstrated in a clinical trial designed explicitly in an ED [11].

To explore such pressing problems, we proposed a model of care based on a geriatric clinic evaluation following ED discharge. The Geriatric ambulatory service, led by geriatric physicians also operating in the ED, offers a Global Geriatric Evaluation, a psycho-geriatric evaluation if needed, an assessment of the evolution of clinical conditions and of the adherence to the indications given at the ED discharge, and a pharmacologic therapy reconciliation based on validated appropriateness criteria.

This study aimed to investigate the efficacy of a referral to a dedicated Geriatric Comprehensive Evaluation after ED discharge in preventing unexpected ED revisit within 30 days. As a secondary outcome, we considered hospital admission within 30 days from ED discharge.

Methods

This is an observational, retrospective, case–control study in which patients evaluated in a geriatric clinic after an ED visit were compared to subjects for whom specific post-ED assessment was not arranged. The study took place at Ordine Mauriziano Hospital, a 450-bed university-affiliated Hospital located in the urban area of Turin with a mean census of about 50,000 visits/year.

The study protocol was approved by the local Ethical Committee (protocol number 159/2021).

In this study, cases are patients consecutively sent to the Geriatric Re-evaluation Clinic (GRC) after an ED visit between October 22nd, 2018, and March 3rd, 2020, and between June 22nd, 2020, and October 26th, 2020. The activity of the GRC was suspended during COVID-19 pandemic.

The control group was constituted of subjects 65 years or older, discharged from the ED between October 5th, 2018, and March 2nd, 2020, and between June 1st, 2020, and October 26th, 2020, for whom an evaluation to the GRC was not scheduled. The minimal difference in the recruiting periods was adopted to take into account the waiting time between ED discharge and the GRC evaluation.

Exclusion criteria for the control group were:

- Incomplete ED access (left without being seen, leave against medical advice, leave without notification to ED personnel after the medical visit);
- Age less than 65 years;
- Hospital admission after ED evaluation;
- ICD-CM9 diagnosis codes not included among those employed in ED discharge of the cases;
- GRC evaluation after ED discharge.

A synthesis of the selection of the subjects included in the control group is presented in Fig. 1. For each patient in the control group, only the first ED access during the study period was taken into account.

The population identified by the inclusion and exclusion criteria underwent a further selection and balancing process using a propensity score matching technique based on age, gender, and ICD-9 discharge diagnosis to create a 1 case: 2 controls ratio.

In 2018, a Geriatric Re-evaluation Clinic (GRC) was established at our Institution, led by geriatricians who also work in the ED, specifically aimed to manage patients aged 65 years or older directly discharged from the ED.

At the GRC, functional status is assessed employing the Barthel Index [13] and the Instrumental Activities of Daily

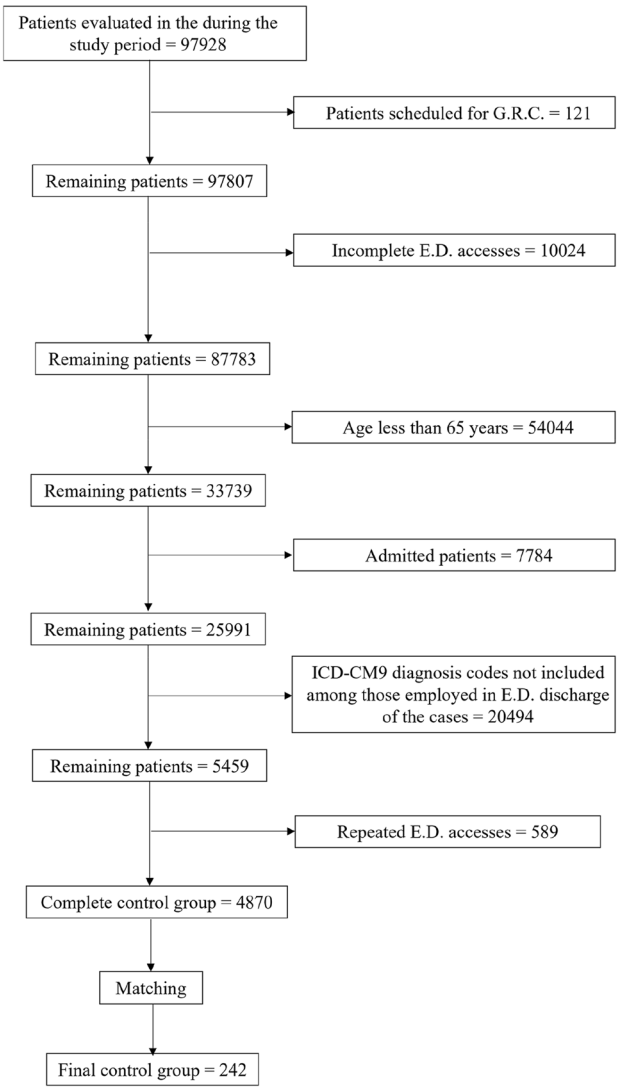

Fig. 1 The selection process for the control group

Living scale [14], while the cognitive function is evaluated using the Short Portable Mental Status Questionnaire [15]. The screening for pharmacologic therapy appropriateness is conducted following the indications of the STOPP&START framework [16] with monitoring of the adherence to ED discharge instructions. In selected cases was offered counseling about social security interventions and home-based assistance.

Patients were scheduled for the GRC evaluation after ED discharge at the discretion of the Emergency Physician.

Data collection

We extracted data from the electronic health records archived in the Hospital Database. After association with a five-digit numeric code, randomly generated data were entered in a spreadsheet using Excel 365 (Microsoft Corp, Redmond, WA).

The following data were collected: age, sex, number of drugs taken every day, hospital admissions and number of ED accesses during the year preceding study enrollment, chronic comorbidities, ICD9-CM codes for ED discharge diagnosis, ED revisits, and hospital admission at 30 days follow-up. The comorbidities burden was addressed using Charlson Comorbidity Index [17].

Outcomes

The main outcome of the study was unplanned ED revisits within 30 days from ED discharge. Unplanned revisits are returns to the ED which were not previously agreed upon (e.g., to complete diagnostic workup). The secondary outcome was unplanned hospital admission within 30 days from ED discharge.

Statistical analysis

Descriptive statistics for primary demographic and clinical data were conducted using medians with Interquartile Range (IQR) and proportions with 95% confidence intervals as needed. Proportions were compared using Chi-square test or Fisher Exact Test as indicated. Medians were compared with Wilcoxon Rank SumTest. A difference was considered statistically significant if $p < 0.05$.

We estimated the enrollment ratio (1 case: 2 controls) using the number of cases available and the results of a previously unpublished data collection conducted at our Institution, from which a potential 50% reduction of ED revisits was estimated.

We calculated unadjusted odds ratios (OR) to estimate intervention efficacy. Aiming to take into account potential imbalances among study groups, we estimated adjusted OR using logistic regression. The models employed included the variables with statistically significant differences among the two study groups at univariate analysis.

Statistical analysis was conducted using R v. 4.0.3 [18].

Results

During the study period, 142 patients were evaluated at the GRC. Due to a lack of follow-up data and repeated evaluation to the GRC, 21 subjects were excluded, leaving 121 cases for the study analysis. The process of selection of the 242 subjects included in the control group is reported in Fig. 1.

Overall, median age of the subjects enrolled was 85 years. Men and women were equally represented (Table 1).

Table 1 Demographic characteristics and medical history of the study population

	Patients scheduled to the G.R.C. ($n=121$) (%, C.I. 95%)*	Patients not scheduled for G.R.C. ($n=242$) (%, I.C. 95%)*	p
Age (years), median (IQR.)	85 (81–88)	85 (80–88)	0.27
Age ≥ 85 years	54.6 (45.3–63.8)	50.4 (43.9–56.9)	0.53
Women	57 (47.7–66)	55.8 (49.3–62.1)	0.91
Chronic heart failure	14.9 (8.1–21.6)	26.5 (20.7–32.2)	0.02
Cerebrovascular disease	47.1 (37.8–56.4)	36.4 (30.1–42.6)	0.06
Diabetes	24 (16–32)	15.3 (10.6–20)	0.06
Hypertension	68.6 (59.9–77.3)	67.4 (61.3–73.5)	0.91
Chronic kidney failure	8.3 (2.9–13.6)	9.1 (5.3–12.9)	0.95
Cancer**	17.4 (10.2–24.5)	19 (13.9–24.2)	0.81
Dementia	52.9 (43.6–62.2)	21.9 (16.5–27.3)	< 0.01
Charlson comorbidity index, median (IQR.)	6 (5–8)	6 (5–7)	0.01
Charlson comorbidity index ≤ 6	52.9 (43.6–62.2)	67.4 (61.3–73.5)	0.01
Number of daily drugs, median (IQR.)	5 (3–7)	4 (2–6)	0.01
Polypharmacotherapy***	45.5 (36.2–54.7)	34.3 (28.1–40.5)	0.05
Hospital admission during the previous year	14.9 (8.1–21.6)	11.6 (7.3–15.8)	0.47
ED visit during the previous year	52.1 (42.8–61.4)	43.8 (37.3–50.3)	0.17
Married	37.2 (28.2–46.2)	59.7 (46–73.3)	0.01

*If not otherwise indicated; **including both solid and hematological neoplasms; ***patients assuming five or more drugs daily. *CI* confidence interval; *GRC* Geriatric Re-evaluation Clinic; *IQR* interquartile range

Patients in both study groups had a relevant and comparable burden of comorbidities; a substantial difference could be detected for dementia and chronic heart failure. The clinical complexity of this group of patients was confirmed by the higher number of drugs taken every day, which was higher among cases. Patients referred to the GRC more frequently had a final diagnosis of dementia or were visited in the ED for behavioral issues presumably due to cognitive decline, demonstrating that the Emergency Physicians felt that this category of patients is at high risk of ED frequent use.

We found a 9.1% prevalence of 30 days ED unplanned returns in patients scheduled for a Comprehensive Geriatric Assessment compared to 18.6% in a matched cohort of patients for whom no formal follow-up to the clinic was arranged. The unadjusted OR for unplanned return in the ED within 30 days of discharge is 0.44 (CI 95% 0.22–0.89), suggesting a positive impact of the GRC referral in our study population. An unadjusted OR for unplanned admission within 30 days after discharge was 0.56 (CI 95% 0.18–1.74).

Study groups were not balanced for every parameter. For this reason, we built two logistic regression models for estimating the adjusted OR. The first included the Charlson Comorbidity Index, the number of Table 2 daily drugs, and mental disorders related discharge diagnosis from the ED. The beneficial effects of the GRC referral remained, with an adjusted OR of 0.44 (CI 0.20–0.89) for 30 days unplanned ED re-admission and 0.52 (CI 0.14–1.56) for 30 days unexpected hospitalization.

In the second model, we substituted the Charlson Comorbidity Index with history of dementia and heart failure obtaining similar adjusted OR: 0.43 (CI 0.21–0.92) and 0.55 (CI 0.16–1.87) for 30-days unplanned ED return and 30-days unexpected hospitalization, respectively.

Data for marital status were available only for 57 patients (23.6%) in the control group: for this reason, we did not include the parameter in the final model. Finally, also hematological discharge diagnoses were not balanced in the study groups due to issues in control group selection operated by the statistical software. Still, they were not included in the multivariate model because of the marginal prevalence and the absence, to our knowledge, of any evidence of impact on unplanned short-term returns in the ED.

Discussion

In developed countries, the population is aging. As a major consequence, the prevalence of chronic diseases is increasing, which in turn relates to an ever-growing utilization of emergency health services. Nowadays, compelling evidence demonstrates a negative impact of ED admission and prognosis in older and frail patients [19]. Assuring a specialist follow-up to senior patients after an ED visit

Table 2 Diagnosis at discharge from the ED using ICD9-CM classification

	Patients scheduled to the G.R.C. ($n=121$) (%, C. I 95%)	Patients not scheduled for G.R.C. ($n=242$) (%, I.C. 95%)	p
Symptoms, signs, and ill-defined conditions	33.1 (24.3–41.9)	28.5 (22.6–34.4)	0.44
Mental disorders	24 (16–32)	9.1 (5.3–12.9)	< 0.01
Injury and poisoning	12.4 (6.1–18.7)	16.9 (12–21.9)	0.33
Diseases of circulatory system	11.6 (5.5–17.7)	13.6 (9.1–18.2)	0.70
Diseases of the nervous system and sense organs	5 (1–8.9)	6.6 (3.3–10)	0.70
Diseases of musculoskeletal systems and connective tissue	5 (1–8.9)	5.8 (2.6–8.9)	0.94
Endocrine, nutritional, and metabolic diseases, and immunity disorders	2.5 (0–5.3)	3.3 (1–5.6)	0.76
Diseases of the blood and blood-forming organs	0.8 (0–2.5)	7.4 (3.9–11)	< 0.01
Other diseases	5.8 (1.2–10.4)	8.7 (4.9–12.4)	0.44

Other diagnoses: diseases of the respiratory system, congenital anomalies, diseases of the digestive system, diseases of the genitourinary system, diseases of the skin and subcutaneous tissue, neoplasms, infectious diseases

may reduce unplanned returns in the hospital, contributing to easing pressure on these frequently over-crowded services.

Referral to GRC, which was at the discretion of the discharging emergency physician, was more frequent for patients with cognitive impairment-related issues. Even though the decision to schedule patients to the GRC was mainly based on physician gestalt, the relevance of dementia as a risk factor for repeated attendances to ED has been reported by other authors [20–24]. Unplanned returns to the ED are related to caregiver burden [25], which is particularly high for patients affected by cognitive impairment [26], and the opportunity for a comprehensive evaluation of geriatrics issues may contribute to reducing its intensity [27]. In our opinion, this "emotional" unloading constitutes the major explanation for our findings, along with the chance to re-evaluate the effectiveness of, and the compliance to, the therapeutic instructions given at discharge from the ED.

Apart from mental disorders, the other covariates included in the logistic regression model were also validated in the literature as significant predictors of unplanned revisits in the ED [8, 20, 21, 28–30]. For example, Gips and co-authors reported an increased probability of repeated ED visits in patients with a Charlson Comorbidity higher than 4 [20]. Polypharmacy, defined as taking three or more medications daily, was present in 22% of patients with an unplanned return to the ED vs. 17% in the control group in the study by McCusker et al. ($p=0.03$) [21].

Other studies investigated the implementation of in-person follow-up. Ballabio et al. published a report of an observational, before-after study, including 222 patients ≥ 75 years old, discharged from the ED. They showed a reduction of ED unplanned re-admission from 20% in the three months before enrollment to 11% in the three months of follow-up. The reported positive effect on cognitive performance and caregiver burden is of great interest [27].

In a quasi-randomized trial in Denmark, patients aged 75 years or more discharged from the ED or a geriatric ward were allocated to an intervention consisting of a follow-up home visit the working day after the discharge. Hazard ratio for re-admission within 30 days was 0.49 (95% C.I. 0.33–0.72). The findings of this study cannot be directly compared to ours because it included patients both discharged from the ED or an acute geriatric ward. Nonetheless, it demonstrates an in-person follow-up evaluation strategy's strong efficacy in preventing unplanned hospital returns after a discharge for an acute health condition [31].

Finally, Runciman and collaborators evaluated the potential impact of an evaluation by a health visitor in a population of patients 75 years or older discharged from the ED in a randomized controlled trial which included 424 patients. The health visitor assessed the needs of the study subjects and arranged a package of appropriate services. Twenty-eight days after ED discharge, 11.6% of patients in the intervention group and 9.3% in the control group were readmitted at the ED, suggesting no advantage from the intervention [32]. The findings can be partly explained by the low overall prevalence of unplanned returns in this study, requiring a much larger sample size. Another reason could be that the health visitor is not a physician, preventing the possibility of implementing essential elements of geriatric follow-up like therapeutic reconciliation.

Our study has some limitations. The use of a case–control design to investigate the association between the exposure to an intervention and a subsequent outcome has been used infrequently employed in medical literature [33]; in our case, the adoption was motivated by the minimal number of patients sent to the GRC. Moreover, the case–control design may introduce selection bias. We are aware that our study has an exploratory scope and aims to generate working hypotheses that should be verified with a more robust research strategy.

The lack of randomization makes it possible for unaccounted confounders to affect our estimations of efficacy. In particular, the inability to acquire data on clinical frailty and dependence in daily activities for the patients in the control group prevented us from taking these parameters into account in the final efficacy estimates. The monocentric nature of our work and the discretional referral to the GRC affect the generalizability of the results. We only considered unplanned return visits in our ED; for this reason, we cannot exclude an underestimation of outcome occurrence, being possible for the patients to seek care in other hospitals in our city [34].

Due to the study's retrospective design, we cannot estimate the proportion of patients in whom the behavioral alterations leading to the ED admission were caused by delirium. Even though this limitation may have determined an overestimation of dementia prevalence among the subjects included in the intervention group, in our opinion does not affect the finding about the overall usefulness of the GRC in the post-ED discharge management of older patients.

In a population of older patients discharged from the ED, the referral to a GRC was associated with a lower rate of unplanned returns. The strengths of our study are the real-world setting in which it has been conducted, the relevance of the association between the intervention and the outcome, and the clear description of a model which could be readily applied to everyday practice.

The involvement of a geriatrician in managing the more complex patients through an in-person evaluation may contribute to better identification of all patient's health issues, apart from the acute complaints which drove him to the ED. Notably, an assessment of adherence to treatment and of its effectiveness is important in preventing future decompensations leading to ED admission. In our opinion, our model is relatively less expensive both in terms of human and financial resources required compared to others available in the literature, making it worth consideration even in a low-resource setting.

If the effectiveness of the proposed intervention will be confirmed in studies with more robust designs, such as randomized clinical trials, new research perspectives will open aimed at evaluating its beneficial effects. Indeed, the chance of reducing unplanned returns to the ED could impact favorably by lowering the risk of adverse effects and increased disability related to repeated ED visits in the geriatric population [9]. Also, it is reasonable to hypothesize positive consequences on the side of health organizations, bearing in mind the organizational and economic burden [35] related to ED revisits.

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Availability of data and material Not applicable.

Code availability Not applicable.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval The study protocol was approved by the Ethical Committee of AOU "Città della Salute e della Scienza" in Turin, AO "Ordine Mauriziano" and ASL "Città di Torino".

Consent to participate Not applicable.

Consent for publication Not applicable.

informed consent Informed consent was available for the intervention group; for the control group it was waived, considering the retrospective design of the study.

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