The Association Between Age and Admission to an Inappropriate Ward: A Cross-Sectional Survey in France

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ABSTRACT: Half of elderly patient hospitalizations are preceded by an emergency department (ED) visit. Hospitalization in inappropriate wards (IWs), which is more frequent in case of ED overcrowding and high hospital occupancy, leads to increased morbidity. Elderly individuals are the most exposed to these negative health care outcomes. Based on a nationwide cross-sectional survey involving all EDs in France, the aim of this study was to explore whether age was associated with admission to an IW after visiting an ED. Among the 4384 patients admitted in a medical ward, 4065 were admitted in the same hospital where the ED was located, among which 17.7% were admitted to an IW. Older age was associated with an increased likelihood of being admitted to an IW (OR = 1.39; 95% CI = 1.02-1.90 for patients aged 85 years and older and OR = 1.40; 95% CI = 1.02-1.91 for patients aged 75-84 years, compared with those under 45 years). ED visits during peak periods and cardio-pulmonary presenting complaint were also associated with an increased likelihood of admission to an IW. Despite their higher vulnerability, elderly patients are more likely to be admitted to an IW than younger patients. This result reinforces the need for special attention to be given to the hospitalization of this fragile population.

KEYWORDS: Geriatrics, emergency department, elderly, hospital management

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Background

In many industrialized countries, a high proportion of emergency department (ED) visits are for non-urgent conditions,[1-3] largely contributing to the extensively described phenomenon of access block and overcrowding,[4,5] a source of additional morbidity[6,7] and medical errors.[8] Elderly individuals represent an increasing proportion of ED users.[9] It has been shown that they suffer from suboptimal care in Eds.[10-13] They wait longer than younger patients,[10,11] and are at higher risk of poor pain management[12] and adverse health outcomes after discharge.[13] These prolonged ED length of stay (LOSs) are largely due to the inability to access inpatient beds for these elderly people[14,15] often considered as bed blockers.[16,17]

In addition, there is the question of the appropriateness of the hospital ward in which the patient is admitted for this unscheduled hospitalization[18,19] which is crucial to consider in these frail patients. Advanced age actually brings a higher likelihood of presenting with multiple chronic conditions and is accentuated by frequent socioeconomic issues[20] leading to frailty. Frailty is the most problematic expression of population ageing.[20,21] Such a condition of extreme vulnerability exposes individuals, once hospitalized, to an increased risk of negative health-related outcomes leading to disability, institutionalization, and/or death.[20]

We took advantage of a nationwide cross-sectional survey that aimed to portray hospital-based emergency care in France to explore whether age was associated with the likelihood of being hospitalized in an inappropriate ward after a visit to an ED. We assume that older patients were more frequently admitted to an inappropriate ward than younger patients. We also assume that a ward inappropriate to the patient's needs was more likely to provide inappropriate care.[18,19]

The results of this work are potentially important from a healthcare organization perspective in a context where several reports have stressed the need to implement clinical pathways for direct admission (DA) to the hospital for elderly patients to improve the process and outcome.[22,23]

Method

French Emergency Survey

The French Emergency Survey (FES) is a nationwide cross-sectional survey with a 2-level design that aims to portray hospital-based emergency care in France by describing ED organizations and patients. It was developed by the French Society of Emergency Medicine (SFMU) and the French Directorate of Research, Studies, Evaluation and Statistics at the Ministry of Social Affairs and Health (DREES) and has already been described.[3,24]

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Collected data concerned the organization of the participating EDs, individual characteristics, and care delivered in EDs. The first part of the survey was the ED-centered questionnaire completed by each ED administrator. The second part of the survey was the patient questionnaire, completed by the patient or the accompanying person under the supervision of the emergency physician (EP) during the ED visit. Details regarding ED and patient questionnaires are available in previous papers describing the study.[3,24]

Ethics

This study was carried out in accordance with relevant guidelines and regulations. It was declared to be of public interest by the National Council for Statistical Information (CNIS) and was integrated into the public statistical program. It was also approved by the French Data Protection Authority (CNIL). According to French law, written informed consent was not required for this type of study.

Study participants

To the aim of this study we considered only patients with medical reason for ED referral who were admitted in a medical ward. Patients admitted in surgical wards were not included. They could be admitted to the same hospital where the ED was located or transferred to another hospital. Since information on the appropriateness of the ward was not available in the event of inter-hospital transfer, the patients concerned were not included in our main analysis and were described separately.

Outcome of interest

We chose the inappropriateness of the ward (IW) in which the patient was hospitalized as the criterion of interest (binary variable yes/no). A person was considered to be hospitalized in an IW if he or she was hospitalized in a ward that was not appropriate for his or her reason for referral to the ED. An example could be a patient with pneumonia who was admitted in a gastroenterology ward. For people aged 75 years and over, whatever the reason for referral to the ED, geriatric units were considered appropriate. In the case of IW, clinical management and care were provided by the professionals of the hosting ward and the risk-benefit ratio for the patient was debatable.

Explanatory and adjustment variables

All explanatory variables at the patient level as well as adjustment variables are summarized in Supplemental Appendix 1.

Statistical analysis

Missing data management. We performed a fully conditional specification imputation[25] to handle missing data for individual characteristics (except for the outcome of interest) under the assumption of missing at random (MAR). Ten imputed datasets were created for analysis, and the regression coefficients were acquired by combining the results from the imputed datasets and applying Rubin's rules.[26]

Descriptive analysis. The characteristics of the study population (individual characteristics and ED visit-related variables) before and after imputation were described (Supplemental Appendix 2), as well as characteristics at the ED level (characteristics of health care demand and supply). Categorical variables were reported as numbers (%).

Multilevel model.
To analyze whether age influence the IW, a multilevel logistic regression model was built for those who were hospitalized in the same hospital where the ED was located.[3] We also performed sensitivity analysis, including inter-hospital transfers, considering them as admissions to appropriate wards.

A multilevel logistic regression model allowed us to consider the hierarchical structure of the data and explain admission to an IW according to the study population's characteristics after adjustment for variables at the ED level. First, we tested the non-adjusted model (the empty model), considering only the cluster effect but no explanatory variable. The aim of this first step was to confirm possible inter-group (inter-ED) heterogeneity and justify the multilevel approach. The intraclass correlation coefficient obtained in the empty model indicated that approximately 25% of the total variance of admission to an IW was explained by the ED level. We also tested the county level but did not find intergroup heterogeneity. Variables that were statistically significant in univariate analysis at $P < .20$ were introduced in our models. Sex, supplementary health insurance coverage and living conditions were introduced in our models even if P value was $> .20$.

All statistical analyses were performed using SAS software (SAS/STAT Package 2002–2003 by SAS Institute Inc., Cary, NC, USA).

Results

Characteristics of study participants

Among the 4384 patients admitted to a medical ward, 4065 (92,7%) were admitted to the same hospital where the ED was located, and 319 (7,3%) were transferred.

Admission to the same hospital where the ED was located. The descriptive results are summarized in Table 1. Among the 4065 patients who were admitted to the same hospital where the ED was located, 51.1% (n = 2077) were women and 50.1% (n = 2038) were elderly (75 years or older). Approximately 80% of these ED visits (n = 3113) occurred between 8 a.m. and 8 p.m. A gradient of admission to an IW with age is observed from 16.6% to 18.6%.

Transfers. The descriptive results are summarized in Table 2. Among the 319 patients transferred, 47.3% (n = 151) were

Table 1. Characteristics of study population after multiple imputations.

	HOSPITALIZATION IN AN INAPPROPRIATE WARD					
	NO		YES		TOTAL	
	N	% ROW	N	% ROW	N	% COL
Age (y)						
15-44	503	83.4	100	16.6	603	14.8
45-74	1178	82.7	246	17.3	1424	35.0
75-84	841	82.1	183	17.9	1024	25.2
⩾85	825	81.4	189	18.6	1014	25.0
Sex						
Male	1635	82.2	353	17.8	1988	48.9
Female	1712	82.3	365	17.6	2077	51.1
Supplementary health insurance coverage						
Universal supplementary health coverage or none	454	82.9	94	17.1	548	13.5
Private	2893	82.3	624	17.7	3518	86.5
How the patient reached the ED						
By his own means or ambulance	2643	82.0	582	18.0	3224	79.3
Firefighters or SAMU	704	83.8	136	16.2	841	20.7
Living conditions						
Home	3038	82.3	655	17.7	3693	90.9
Institution	309	83.1	63	16.9	372	9.1
Times of ED arrival (h)						
8-12	817	85.0	144	15.0	961	23.7
12-20	1762	81.9	390	18.1	2152	52.9
20-8	768	80.7	184	19.3	952	23.4
Presenting complaint						
Falls, head injury, and other traumatic injury (without surgical need)	1087	78.5	237	21.5	1323	32.5
Cardio-pulmonary	1148	85.4	196	14.6	1344	33.1
Gastro-enterologic	432	79.4	112	20.6	545	13.4
Neurologic	395	80.7	94	19.3	489	12.0
Other	286	82.1	79	17.9	365	9.0
Having a referent general practitioner						
No	123	81.1	29	18.9	151	3.7
Yes	3224	82.4	689	17.6	3914	96.3

Abbreviations: ED, emergency department; SAMU, emergency medical service.
Universal supplementary health coverage: A large proportion of the population has private supplemental health insurance to cover reinsurable copayments not covered by public insurance schemes. Below a certain income threshold, individuals can benefit from free universal supplementary health insurance called Couverture Maladie Universelle Complementaire (CMU-C), which can be considered here as a proxy for poor socioeconomic status.
Due to multiple imputations, counts have been rounded to the nearest integer

Table 2. Characteristics of inter-hospital transfers.

	N	%
Age (y)		
15-44	41	12.8
45-74	117	36.7
75-84	81	25.4
⩾85	80	25.1
Sex		
Male	168	52.7
Female	151	47.3
Supplementary health insurance coverage		
Universal supplementary health coverage or none	44	13.8
Private	275	86.2
How the patient reached the ED		
By his own means or ambulance	224	70.2
Firefighters or SAMU	95	29.8
Living conditions		
Home	276	86.5
Institution	43	13.5
Times of ED arrival (h)		
8-12	96	30.1
12-20	150	47.0
20-8	73	22.9
Presenting complaint		
Falls, head injury, and other traumatic injury (without surgical need)	26	8.2
Cardio-pulmonary	103	32.2
Gastro-enterologic	33	10.5
Neurologic	58	18.2
Other	99	30.9
Having a referent general practitioner		
No	18	5.6
Yes	301	94.4

Abbreviations: ED, emergency department; SAMU, emergency medical service. Universal supplementary health coverage: A large proportion of the population has private supplemental health insurance to cover reinsurable copayments not covered by public insurance schemes. Below a certain income threshold, individuals can benefit from free universal supplementary health insurance called Couverture Maladie Universelle Complementaire (CMU-C), which can be considered here as a proxy for poor socioeconomic status.Due to multiple imputations, counts have been rounded to the nearest integer.

women and 50.5% (n = 161) were elderly. Among all transfers, 30% (n = 98) of patients were transferred to a for-profit private hospital. About 50% of transfers (n = 148) were justified by a lack of available beds in the same hospital where the ED was located. Insufficient means (whether diagnostic or therapeutic) justified 37% of transfers (n = 119). The others were justified by patient's choice or return to the original hospital (in case of previous hospitalization).

Characteristics of health care demand and supply at the ED level

Among the 555 EDs involved in the study, only 17.1% (n = 95) were in for-profit private hospitals, 30.7% (n = 171) had more than 30 000 annual visits and 37.4% (n = 210) had at least 1 access block patient on the day of the study (Table 3). Among hospital with at least 1 access block patient on the day of the study, the median number was 3.5 access block patients per 100 ED visits.

Multilevel regression models

After adjustment for characteristics of health care supply and demand at the ED level, older age was associated with an increased likelihood of admission to an IW (OR = 1.39; 95% CI = 1.02-1.90 for patients aged 85 years and older and OR = 1.40; 95% CI = 1.02-1.91 for patients aged 75-84 years compared with those under 45). ED visits during peak periods (in the afternoon or at night vs in the morning) was also associated with an increased likelihood of admission to an IW (Table 4). At the opposite, cardiopulmonary presenting complaints were associated with a decreased likelihood of IW.

At the ED and departmental level, high ED attendance and high elderly rate in the ED were the only factors associated with an increased likelihood of admission to an IW.

Sensitivity analysis. When considering inter-hospital transfers as admissions to an appropriate ward, the results from the multilevel regression model were similar (Supplemental Appendix 3).

Discussion

Based on a nationwide cross-sectional survey involving all EDs in France, the aim of this study was to explore whether age was associated with admission to an IW after visiting an ED, assuming that a ward inappropriate to the patient's needs was more likely to provide inappropriate care. We showed that older age was associated with an increased likelihood of being admitted to an IW (OR = 1.39; 95% CI = 1.02-1.90 for patients aged 85 years and older and OR = 1.40; 95% CI = 1.02-1.91 for patients aged 75-84 years, compared with those under 45 years). ED visits during peak periods and cardio-pulmonary presenting complaint were also associated with an increased likelihood of admission to an IW.

Older people suffer a double penalty when upstream coordination fails (ie, when patients are referred to EDs before

Table 3. Characteristics of emergency departments.

	N	%
Type of hospital		
Public academic	360	64.9
Public non-academic or not-for-profit-private hospitals	100	18.0
For-profit private hospitals	95	17.1
Emergency department attendance (number of annual visits)		
Less than 15000 or equal	143	25.8
15001-30000	241	43.4
30001-45000	106	19.1
More than 45001	65	11.7
Number of hospitalization beds in acute medical unit in the hospital		
<30	45	8.1
30-49	77	13.9
50-69	65	11.7
More than 70	344	62.0
Elderly rate		
<15%	290	52.3
⩾15%	265	47.8
County rate of dependent elderly persons		
<20.6%	300	54.1
⩾20.6%	255	46.0
Number of long-term care and nursing home beds per 100000 patients older than 75y in the county		
<123.4	257	46.3
⩾123.4	298	53.7
Number of acute care beds per 100000 inhabitants in the county		
<395	269	48.5
⩾395	286	51.5

hospitalization), they are not only more vulnerable, but they are also less likely to be hospitalized in a ward appropriate to their needs compared with younger patients. Our study shows that 17.7% of ED patients hospitalized in a medical ward were admitted to a service that was inappropriate to their needs and that older age was over-represented.

These results suggest that hospital occupancy is so high that priority for elderly is no longer possible due to adaptation capacities already being exceeded.[27] Indeed, about 50% of

Table 4. Multilevel regression model of being admitted to an inappropriate ward.

	OR	95%CI
Individuals characteristics		
Age (y)		
15-44	Ref	
45-74	1.18	0.88-1.58
75-84	1.40	1.02-1.91
⩾85	1.39	1.02-1.91.39
Sex		
Male	Ref	
Female	1.01	0.84-1.22
Supplementary health insurance coverage		
Private	Ref	
Universal complementary health coverage or none	1.06	0.79-1.43
How the patient reached the ED		
By his own means or ambulance	Ref	
Firefighters or SAMU	0.83	0.65-1.07
Times of ED arrival (h)		
8-12	Ref	
12-20	1.29	1.02-1.63
20-8	1.41	1.07-1.85
Presenting complaint		
Falls, head injury, and other traumatic injury (without surgical need)	Ref	
Cardio-pulmonary	0.55	0.31-0.96
Gastro-enterologic	0.90	0.46-1.74
Neurologic	0.81	0.43-1.51
Other	0.72	0.40-1.31
ED and department characteristics		
Type of hospital		
Public academic	Ref	
Public non-academic or not-for-profit-private hospitals	0.62	0.42-0.92
For-profit private hospitals	0.9	0.48-1.68

(Continued)

Table 4. (Continued)

	OR	95%CI
Emergency department attendance (number of annual visits)		
Less than 15000 or equal	Ref	
15001-30000	1.96	1.15-3.33
30001-45000	3.36	1.87-6.02
More than 45001	3.35	1.79-6.26
Number of hospitalization beds in acute medical unit in the hospital (per 10000 ED annual visits)		
<30	Ref	
30-49	1.16	0.36-3.76
50-69	1.68	0.54-5.20
More than 70	2.42	0.85-6.87
Elderly rate		
<15%	Ref	
⩾15%	1.5	1.10-2.04
County rate of dependent elderly persons		
<20.6%	Ref	
⩾20.6%	1.14	0.85-1.53
Number of long-term care and nursing home beds per 100000 patients older than 75y in the county		
<123.4	Ref	
⩾123.4	1.23	0.92-1.66
Number of acute care beds per 100000 inhabitants in the county		
<395	Ref	
⩾395	1.09	0.80-1.49

inter-hospital transfers of patients were explained by a lack of available bed in the hospital where the ED was located. And high levels of ED attendance and elderly rate were the only factors, at ED level, that were associated with higher likelihood of admission to an IW.

Some studies have shown that better management of inpatient beds (such as early morning admissions) is associated with increased systemic capacity and reduces the number of ED access blocks.[5,28] In our study, ED visits during peak periods (in the afternoon or at night vs in the morning) was associated with higher likelihood of admission to IW, which directly reflects the local organization of hospital discharges. The few beds available at the beginning of the afternoon (usual time of hospital discharges) are occupied by the first patients to arrive, that is those who are already waiting for an available bed (access block patients) and those arrived in the ED in the morning.

Other solutions proposed would be to improve the balance between the demand and supply of hospital beds by reducing the demand (improving upstream services and identifying vulnerability) and increasing the supply. For example, several studies have shown that acute geriatric unit LOS increased when the patient was waiting for long-term care facilities and/or a nursing home.[29-31] Holstein et al[30] proposed dividing acute geriatric unit LOS into "medical stay" (with a high concentration of medical explorations and costs) and "social stay" (including waiting time for long-term care). The duration of the "social stay", which could reach up to 18% of LOS, depends on the availability of beds in long-term care units and/or nursing homes.[30] The duration of this "social stay" might differ according to the principal diagnosis. In our study, cardio-pulmonary presenting complaints were associated with lower likelihood of admission to an IW compared with falls. It is known that repeated falls might be an entry mode into dependency and thus, might be here a proxy for hospitalizations that usually need a transfer to long term care and/or nursing home. Increasing the number of beds in the entire geriatric pathway as well as social service resources would allow all vulnerable elderly patients to be identified early and receive suitable geriatric and social expertise to improve geriatric service.[16,31,32] Few studies have investigated the link between primary care interventions on coordination of care and appropriateness of ward admission for elderly patients.[33,34] An integrated primary care model for very frail elderly individuals decreases the risk of unplanned hospital admission and increases the rate of planned admissions.[33] Additionally, DA to geriatric intermediate care units might represent a potential alternative to acute hospitalization for selected older patients.[34] Possible barriers to the diffusion of DA are the difficulty of organizing it in routine practice within a reasonable time[35,36] and a common belief that access to certain tests, particularly radiological tests, would be easier from the ED than from hospitalization wards. From experts' views, strategies of reserving beds dedicated to DA could enhance their availability, and thus, encourage physicians to organize geriatric care pathways, especially for fragile patients living in institutions.

Limitations

The main limitation of our study concerns the exclusion of inter-hospital transfers (because of missing data on the outcome of interest). However, sensitivity analysis (assuming that all patients were transferred to an appropriate ward) did not show differences in the results of the multilevel models.

Conclusion

Older age is associated with higher likelihood of being admitted in an inappropriate ward after a visit to an emergency

department. This result reinforces the need for special attention to be given to the hospitalization of this fragile population.

Author Contributions

DN and NPF were involved in the study data analysis, interpretation of results and drafting of the manuscript. DN and HP were involved in statistical analysis. All authors critically revised the manuscript.

Ethical Approval and Consent to Participate

This study was carried out in accordance with relevant guidelines and regulations. It was declared to be of public interest by the National Council for Statistical Information (CNIS) and was integrated into the public statistical program (Visa no. 2013X080SA and publication in the official Journal of French Republic, September 17, 2013). It was also approved by the French Data Protection Authority (CNIL) (identification no. 1663413). According to French law, written informed consent was not required for this type of study.

Consent for Publication

According to French law, written informed consent was not required for this type of study. Patients were informed by staff and a short handout and posters were in the waiting area; 0.3% refused to participate.

Availability of Data and Materials

The data that support the findings of this study are available from the French Directorate of Research, Studies, Evaluation and Statistics at the Ministry of Social Affairs and Health (DREES) but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the French Directorate of Research, Studies, Evaluation and Statistics at the Ministry of Social Affairs and Health (DREES). Data information and questionnaires are available at the following address http://www.data.drees.sante.gouv.fr/ReportFolders/reportFolders.aspx?IF_ActivePath=P,432,507

SUPPLEMENTAL MATERIAL

Supplemental material for this article is available online.

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