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# Overnight Stay in the Emergency Department and Mortality in Older Patients

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**IMPORTANCE** Patients in the emergency department (ED) who are waiting for hospital admission on a wheeled cot may be subject to harm. However, mortality and morbidity among older patients who spend the night in the ED while waiting for a bed in a medical ward are unknown.

**OBJECTIVE** To assess whether older adults who spend a night in the ED waiting for admission to a hospital ward are at increased risk of in-hospital mortality.

**DESIGN, SETTINGS, AND PARTICIPANTS** This was a prospective cohort study of older patients (≥75 years) who visited the ED and were admitted to the hospital on December 12 to 14, 2022, at 97 EDs across France. Two groups were defined and compared: those who stayed in the ED from midnight until 8:00 AM (ED group) and those who were admitted to a ward before midnight (ward group).

**MAIN OUTCOMES AND MEASURES** The primary end point was in-hospital mortality, truncated at 30 days. Secondary outcomes included in-hospital adverse events (ie, falls, infection, bleeding, myocardial infarction, stroke, thrombosis, bedsores, and dysnatremia) and hospital length of stay. A generalized linear-regression mixed model was used to compare end points between groups.

**RESULTS** The total sample comprised 1598 patients (median [IQR] age, 86 [80-90] years; 880 [55%] female and 718 [45%] male), with 707 (44%) in the ED group and 891 (56%) in the ward group. Patients who spent the night in the ED had a higher in-hospital mortality rate of 15.7% vs 11.1% (adjusted risk ratio [aRR], 1.39; 95% CI, 1.07-1.81). They also had a higher risk of adverse events compared with the ward group (aRR, 1.24; 95% CI, 1.04-1.49) and increased median length of stay (9 vs 8 days; rate ratio, 1.20; 95% CI, 1.11-1.31). In a prespecified subgroup analysis of patients who required assistance with the activities of daily living, spending the night in the ED was associated with a higher in-hospital mortality rate (aRR, 1.81; 95% CI, 1.25-2.61).

**CONCLUSIONS AND RELEVANCE** The findings of this prospective cohort study indicate that for older patients, waiting overnight in the ED for admission to a ward was associated with increased in-hospital mortality and morbidity, particularly in patients with limited autonomy. Older adults should be prioritized for admission to a ward.

Invited Commentary

Supplemental content

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**Group Information:** The FHU IMPEC–IRU SFMU (Federation Hospitalo-Universitaire, Improving Emergency Care, and Initiative Recherche Urgences, Société Francaise de Médecine d'Urgence) Collaborators group members appear in Supplement 2.

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Strained hospital resources and a shortage of hospital beds have led to higher rates of unscheduled patients waiting in the emergency department (ED) for an inpatient bed, and consequently, an increased risk of overnight stay in the ED.[1-3] In crowded EDs, many patients spend the night on a wheeled cot (gurney/trolley). In France, the No Bed Challenge, a census of waiting overnight in the ED for admission to a hospital ward, reported that more than 100 000 patients had experienced overnight ED waiting in 2018.[4] In December 2022 in France and Europe, the coexistence of influenza, the COVID-19 pandemic, and a respiratory syncytial virus epidemic gave rise to an unusual winter surge of unplanned ED admissions and subsequent hospital bed shortages.[5-7]

Retrospective studies[8-10] have suggested that ED crowding and extended ED length of stay may be associated with increased mortality at 24 hours and 30 days after ED visit, longer inpatient length of stay, and increased risk of adverse events during hospital stay. Older patients currently represent approximately one-quarter of the total ED population, and this proportion is growing.[11,12] Given their greater level of frailty and higher number of comorbidities, these patients have a high risk of adverse events and death.[13] In this population, a longer waiting time for admission has been associated with missed routine medication administration and a greater risk of delirium during hospitalization.[14,15] In addition to the risk of prolonged immobilization on a trolley, subsequent sleep disruption in a crowded ED may further exacerbate the risk of death and adverse events.[16,17] However, the mortality and morbidity of older patients who spend the night on a trolley in the ED while waiting for admission are unknown.

The objective of this study was to assess differences in in-hospital mortality and morbidity between older patients who spent their first hospitalized night in the ED compared with their counterparts who spent it in a ward.

### Key Points

**Question** Is spending a night in the emergency department (ED) associated with increased in-hospital mortality and morbidity among older patients?

**Findings** This French cohort study of 1598 patients 75 years and older, those who spent a night in the ED showed a higher in-hospital mortality rate and increased risk of adverse events compared with patients admitted to a ward before midnight. This finding was particularly notable among patients with limited autonomy.

**Meaning** These findings suggest that older patients, particularly those with limited autonomy, who spend the night in the ED awaiting hospital admission may have a higher risk of in-hospital mortality and morbidity; they should be prioritized for admission to a ward.

## Methods

This multicenter retrospective cohort study was approved by the ethics committee of Sorbonne Université (Comité d'éthique de la recherche de Sorbonne Université, Paris, France). Because the study methodology included the analysis of routinely collected data of deidentified patients, informed consent was waived according to French law. The reporting of this study followed the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines.[18]

### Study Design

The study cohort comprised 97 EDs across France that accepted an invitation to participate from the Improving Emergency Care (IMPEC FHU) federation and the Initiative Recherche Urgence (IRU; Emergency Research Initiative) network of the Société Française de Médecine d'Urgence (SFMU; French Society of Emergency Medicine). The IMPEC FHU is an emergency medicine research federation in the Paris Metropolitan Area with previous large national and international collaborations.[19,20] The IRU is a research group of the French national society of emergency medicine that includes more than 100 EDs in France.[21,22]

### Study Population

In each participating center, a local investigator screened consecutive eligible patients who were present in the ED from 8:00 AM on Monday, December 12, 2022, through 8:00 AM on Wednesday, December 14, 2022. Patients were included if they were 75 years or older and were admitted to the hospital after the ED visit. Race and ethnicity data were not collected, in accordance with the laws in France.

Patients were dichotomized as having spent the night (from midnight to 8:00 AM) on a trolley in the ED (ED group) or having been admitted to an inpatient ward before midnight (ward group). Patients discharged home from the ED, admitted to the intensive care unit (ICU) from the ED, or admitted to a ward between midnight and 8:00 AM were excluded. Patients were followed up until hospital discharge or 30 days (whichever was first). Transfer to a long-term facility or nursing home was considered hospital discharge.

In France, and specifically in all of the participating EDs, the care, treatment, and monitoring of ED patients who are awaiting admission to a ward are the responsibility of the ED physicians, nurses, and nursing assistants. The patient continues to stay in the ED while waiting, with the same team managing their care (ie, with no difference in care management after decision to admit).

### Outcomes

The primary outcome was in-hospital mortality, truncated at 30 days. Secondary outcomes included in-hospital length of stay (including the ED stay), in-hospital adverse events (ie, a fall, nosocomial infection [defined as diagnosed >48 hours after ED admission], bleeding, myocardial infarction, stroke, deep vein thrombosis or pulmonary embolism, pressure ulcer, and dysnatremia). Adverse events were analyzed as the presence of at least 1 adverse event, and each adverse event separately.

### Data Collection

Electronic health records were reviewed for routinely collected data from patients who were prospectively identified

during the inclusion period. A standardized data collection instrument with clear criteria for recording both categorical and quantitative variables and a completion guide was shared, after being assessed in a small sample of patients. Regular meetings and monitoring were held to ensure data collection reliability. There was no blinding of abstractors, and no interrater reliability was performed. Hospital mortality was obtained through electronic health records or administrative hospital data if needed.

Baseline characteristics were collected during the ED visit and included all items included in the Charlson comorbidity index (CCI) (eTable 2 in Supplement 1). The following vital parameters at ED presentation were collected: systolic arterial blood pressure, heart rate, peripheral saturation of oxygen ($SpO_2$), respiratory rate, and temperature. Autonomy for activities of daily living was assessed using the Groupe Iso-Ressource (GIR) scale.[23] This classification system describes the level of care required by older and disabled individuals, and ranges from 1 (most dependent) to 6 (completely autonomous). Patients classified as GIR 5 or 6 represent individuals who do not experience problems with autonomy in their daily tasks. Baseline characteristics, exposure, and outcomes were defined a priori and all terms in the case report form were predefined. We defined ED length of stay as the delay between ED presentation and admission to the ward, which was prospectively collected. The outcome in-hospital length of stay was calculated from ED entry, and therefore, included the time spent in the ED.

### Statistical Analysis

Patient characteristics were described overall and by group (ED and ward). Continuous variables were described using either mean (SD) or median (IQR), depending on the distribution. Distributional assumptions of continuous variables were verified graphically using histograms and density curves. Categorical variables were described as counts and proportions. Patients' characteristics differences and 95% CIs were calculated using the Agresti-Caffo method[24] for categorical variables, and the normal approximation or the Brookmeyer and Crowley method[25] for continuous variables, depending on the distribution.

The primary end point of mortality and the secondary end points of 1 or more adverse events and of hospital length of stay, truncated at 30 days, were compared between groups. The difference in proportions with 95% CIs between the groups was calculated using the Agresti-Caffo method.[24]

To account for adjustment factors, a generalized linear-regression mixed-model was used. Adjustment was for age, sex, a high level of comorbidity (CCI >6), high level of dependency (GIR <5), systolic arterial blood pressure, $SpO_2$, and trauma-related ED visit. Results were expressed as the difference using binomial distribution and logit link, and as risk ratio and 2-sided 95% CIs using Poisson distribution and log link. The center was included as a random effect in the mixed model.

A second model of adjustment was performed by adjusting for all chief concerns, ED length of stay, hours of ED visit (8:30 AM to 6:30 PM vs 6:30 PM to 8:30 AM), and ED characteristics (academic vs nonacademic, rural vs urban, <50 000 vs ≥50 000 annual ED visits), in addition to the covariates of the main analysis. Among the 97 participating EDs, 13 (13%) had a total number of ED visits greater than 70 000 in 2022, and 52 (54%) had fewer than 50 000. The details of the participating centers are reported in eTable 1 in Supplement 1.

The difference between the median of length of hospital stay for the 2 groups was calculated; 95% CIs were calculated using the Brookmeyer and Crowley method. Adjusted rate ratios (aRRs) and 2-sided 95% CIs were calculated using Poisson distribution and log link. To address missing data, which were considered as missing at random, multiple imputations were performed using the fully conditional specification method of PROC MI using SAS/STAT, version 14.3 (SAS Institute). The discriminative, logistic, and regression functions were used for categorical, binary, and continuous variables, respectively, and 15 data sets were created. All results were combined using PROC MIANALYZE (SAS Institute).

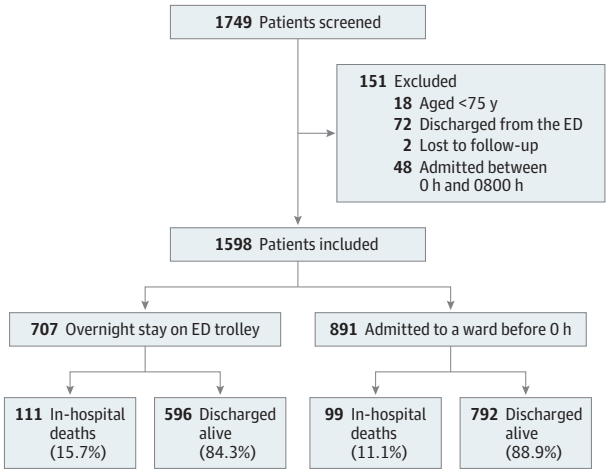
A prespecified sensitivity analysis was limited to patients with limited autonomy, defined by a GIR score of less than 5. Another sensitivity analysis was performed using a propensity score (PS) matching approach. The PS matching was performed by modeling the group (ED or ward group) using a 1:1 optimal matching algorithm without replacement, with distances determined by logistic regression model, including age, sex, high level of comorbidity (CCI >6), high level of dependency (GIR <5), systolic arterial blood pressure, $SpO_2$, temperature, chief concern for ED visit (respiratory, cardiovascular, neurologic, asthenia, infectious, or trauma), medical history (immunodeficiency, body mass index [BMI; calculated as weight in kilograms divided by height in meters squared], dementia, peripheral vascular disease, metastatic solid tumor), emergency arrival time (on or off hours), and health center's characteristics (<50 000 or ≥50 000 ED visits per year, academic/nonacademic, and urban/rural). The ED length of stay was not included in the model because of the strong collinearity (>0.8) with the group. The effect of group on mortality was estimated using a generalized linear-regression mixed-model after PS matching. The center was included as a random effect in the mixed model.

Statistical tests were 2-tailed and $P$ values < .05 were considered statistically significant. Data analyses were performed from April 1 to April 28, 2023.

## Results

During the inclusion period, 1749 individuals were screened, and 1598 patients (median [IQR] age, 86 [80-90] years; 880 [55%] female and 718 [45%] male) were included in the analysis, with 707 (44%) in the ED group and 891 (56%) in the ward group (**Figure**). Of the total, 677 patients (42%) had a CCI greater than 6, and 565 (35%) had a GIR of less than 5 (**Table 1**). There were no differences between groups in median age, proportion of women, median $SpO_2$, mean systolic blood pressure, nor patients with CCI greater than 6, GIR less than 5, or trauma-related ED visit. The median (IQR) length of in-hospital stay was 8 (4 -15) days; 104 (6.5%) patients stayed more than 30 days in the hospital; and there were 210 (13.1%) in-hospital deaths.

Figure. Flow Diagram of Study Patients




ED indicates emergency department.

The median (IQR) length of ED stay before admission was 23 hours 0 minutes (18 hours 12 minutes to 28 hours 17 minutes) in the ED group and 7 hours 35 minutes (5 hours 30 minutes to 10 hours 0 minutes) in the ward group. In the ED group, 80 patients (11.1%) stayed in the ED for 2 nights before admission to a ward.

There was a higher in-hospital mortality rate among the ED group (15.7%) compared with the ward group (11.1%), with an aRR of 1.39 (95% CI, 1.07-1.81), and a higher risk of adverse event (30.4% vs 23.5%; aRR, 1.24; 95% CI, 1.04-1.49). The risk of adverse events was significantly higher for the occurrence of nosocomial infection (15.8% vs 10.8%; aRR, 1.42; 95% CI, 1.09-1.85) and fall (6.4 vs 3.0; aRR, 2.23; 95% CI, 1.38-3.59) (**Table 2**). The median length of hospital stay was 9 days in the ED group vs 8 days in the ward group (aRR, 1.20; 95% CI, 1.11-1.31).

The second model of adjustment confirmed the significant higher risk of in-hospital mortality in the ED group (aRR, 1.50; 95% CI, 1.09-2.06), but not for the secondary end points of adverse event and length of hospital stay. In the prespecified subgroup analysis of patients with limited autonomy (GIR <5), there was a higher mortality risk in the ED group compared with the ward group (aRR, 1.81; 95% CI, 1.25-2.61). PS matching resulted in a mean of 705.2 matched pairs in the 15 imputed data sets (minimum, 703; maximum, 707), for which sensitivity analysis reported an aRR for in-hospital death of 1.48 (95% CI, 1.11-1.99) compared with the ward group.

## Discussion

In this large multicenter prospective cohort study in France, we found that older patients (≥75 years) who waited overnight in the ED, possibly on a wheeled cot, for admission to a ward had a significantly higher in-hospital mortality rate, a longer mean length of hospital stay, and an increased risk of adverse events compared with those admitted to a ward before midnight. This association with mortality and morbidity was worse in patients with limited autonomy, with an almost 2-fold higher risk of in-hospital death.

These findings are consistent with several retrospective studies that have reported an association between ED crowding and mortality.[26-28] More specifically, time to see a physician and time spent in the ED have been reportedly associated with higher risks of adverse events and short-term mortality.[10,15,29] Singer et al[10] found that a 12-hour wait for admission to a ward was associated with a nearly 2-fold increase in mortality risk compared with a less than 2-hour wait for admission. Jones et al[8] found an 8% increased risk in patients who waited more than 6 to 8 hours. However, these studies were retrospective studies on undifferentiated patients. Our study focused on an older and more frail population of ED patients who were 75 years or older. Furthermore, our study specifically focused on an overnight stay in the ED for older patients awaiting admission, which is a specific and vulnerable time for patients who are frail.

The increased mortality can be partially explained by the increased rate of adverse events reported in this study. These adverse events may have been favored by a night on a hard cot, and potentially, insufficient monitoring and care. Sleep disturbance in the ED may also have increased the mortality and morbidity risks: several studies have highlighted the risks caused by sleep deprivation in older patients, which includes functional and physical decline.[30] However, how sleep disturbance—1 night in a busy environment with light, noise, and other stressors and/or disruptions—affects patients has not been studied.[31] A study by Mannion et al that included 104 older patients (≥70 years) with overnight ED waiting for admission reported a significantly decreased quality of sleep compared with patients that were both admitted and in a bed for the night, but there was no statistically significant difference in 1-year mortality or rate of hospital re-admission.[16] However, that study may have lacked power to detect a significant effect on mortality, which was not the case for our study.

In this study, 44% of the admitted patients spent the night in the ED waiting for an inpatient bed in a ward. This high proportion is explained by the timing of the study: in December 2022, France and other countries in Europe experienced an extraordinary surge in both ED attendances and subsequent unplanned admissions (partially caused by the coexistence of COVID-19, influenza, and respiratory syncytial virus epidemics).[5-7]

### Limitations

This study was subject to several limitations. First, confounding variables may not have been included in the multivariable model. There was no adjustment to the final diagnosis, and the initial severity may not have been precisely captured. There was no measure of ED crowding, which could have allowed us to adjust on this confounding variable. Some other potential confounders, such as race and ethnicity or social determinants of health, could not be included in the model. Moreover, there might be unknown confounders that were not included in the model.

Table 1. Baseline Patient Characteristics

| Characteristic | Total, No. (%) | ED group, No. (%) | Ward group, No. (%) | Difference (95% CI) |
|---|---|---|---|---|
| Patients, No. | 1598 | 707 | 891 | NA |
| Age, y | | | | |
| Median (IQR) | 86 (80 to 90) | 86 (80 to 90) | 86 (80 to 90) | 0 (−1.1 to 1.1) |
| Missing data | 41 | 12 | 29 | NA |
| Sex | | | | |
| Female | 880 (55) | 386 (55) | 494 (55) | −0.8 (−5.8 to 4.1) |
| Male | 718 (45) | 321 (45) | 397 (45) | |
| GIR score | | | | |
| Median (IQR) | 5 (4 to 6) | 5 (3.5 to 6) | 5 (4 to 6) | 0 |
| Score <5 | 565 (39.0) | 252 (40.0) | 313 (39.0) | 1.4 (−3.6 to 6.5) |
| Missing data | 161 (10.1) | 79 (11.2) | 82 (9.2) | NA |
| Charlson comorbidity index | | | | |
| Median (IQR) | 6 (5 to 8) | 6 (5 to 8) | 6 (5 to 8) | 0 |
| Index >6 | 677 (42.0) | 304 (43.0) | 373 (42.0) | 1.1 (−3.7 to 6.0) |
| Health facility | | | | |
| Annual ED visits ≥50 000 | 947 (59.3) | 495 (70.0) | 452 (50.7) | 19.3 (14.5 to 23.9) |
| Urban hospital | 1116 (69.8) | 529 (74.8) | 587 (65.9) | 8.9 (4.4 to 13.4) |
| Academic hospital | 714 (44.7) | 369 (52.2) | 345 (38.7) | 13.5 (8.6 to 18.3) |
| **Medical history** | | | | |
| ≥1 Comorbidity | 1506 (94) | 673 (95) | 833 (94) | 1.7 (−0.6 to 4.0) |
| Ischemic heart disease | 376 (24) | 175 (25) | 201 (23) | 2.2 (−2.0 to 6.4) |
| Hypertension | 1112 (70) | 500 (71) | 612 (69) | 2.0 (−2.5 to 6.5) |
| Complicated diabetes | 270 (17) | 124 (18) | 146 (16) | 1.2 (−2.5 to 4.9) |
| Chronic respiratory disease | 223 (14) | 107 (15) | 116 (13) | 2.1 (−1.3 to 5.6) |
| Chronic kidney disease | 280 (18) | 121 (17) | 159 (18) | −0.7 (−4.5 to 3.0) |
| Chronic heart failure | 378 (24) | 175 (25) | 203 (23) | 2.0 (−2.2 to 6.2) |
| Tumor without metastasis | 280 (18) | 130 (18) | 150 (17) | 1.6 (−2.2 to 5.3) |
| Leukemia | 29 (2) | 13 (2) | 16 (2) | 0.4 (−1.3 to 1.4) |
| Lymphoma | 35 (2) | 14 (2) | 21 (2) | −0.4 (−1.8 to 1.1) |
| Metastatic solid tumor | 75 (5) | 37 (5) | 38 (4) | 1.0 (−1.1 to 3.1) |
| Immunodeficiency | 85 (5) | 28 (4) | 57 (6) | −2.4 (−4.6 to −0.2) |
| BMI >25 | 331 (21) | 150 (21) | 181 (20) | 0.9 (−3.1 to 4.9) |
| Peripheral vascular disease | 275 (17) | 106 (15) | 169 (19) | −4.0 (−7.6 to −0.3) |
| Stroke | 253 (16) | 104 (15) | 149 (17) | −2.0 (−5.6 to 1.6) |
| Dementia | 338 (21) | 160 (23) | 178 (20) | 2.7 (−1.4 to 6.7) |
| Systemic disease | 130 (8) | 54 (8) | 76 (9) | −0.9 (−3.6 to 1.8) |
| Ulcer | 78 (5) | 30 (4) | 48 (5) | −1.1 (−3.2 to 1.0) |
| Mild liver disease | 32 (2) | 13 (2) | 19 (2) | −0.3 (−1.7 to 1.1) |
| Moderate/severe liver disease | 29 (2) | 12 (2) | 17 (2) | −0.2 (−1.5 to 1.2) |
| Hemiplegia | 32 (2) | 15 (2) | 17 (2) | 0.2 (−1.2 to 1.7) |
| AIDS | 3 (0.2) | 3 (0.4) | 0 | 0.4 (−0.1 to 1.0) |
| **Reason for ED visit** | | | | |
| Trauma | 405 (25) | 173 (25) | 232 (26) | −1.6 (−5.8 to 2.7) |
| Respiratory | 556 (35) | 278 (40) | 278 (31) | 8.1 (3.4 to 12.8) |
| Asthenia | 550 (34) | 283 (40) | 267 (30) | 10.1 (5.3 to 14.7) |
| Infectious | 427 (27) | 209 (30) | 218 (25) | 5.1 (0.7 to 9.5) |
| Cardiovascular | 254 (16) | 98 (14) | 156 (18) | −3.6 (−7.2 to −0.5) |
| Neurologic | 242 (15) | 114 (16) | 128 (14) | 1.8 (−1.8 to 5.3) |
| Abdominal | 186 (12) | 83 (12) | 103 (12) | 0.2 (−3.0 to 3.4) |
| Social | 111 (7) | 55 (8) | 56 (6) | 1.5 (−1.0 to 4.1) |
| Urologic | 78 (5) | 29 (4) | 49 (6) | −1.4 (−3.5 to 0.7) |

(continued)

Table 1. Baseline Patient Characteristics (continued)

| Characteristic | Total, No. (%) | ED group, No. (%) | Ward group, No. (%) | Difference (95% CI) |
|---|---|---|---|---|
| **Vital signs at ED presentation** | | | | |
| Systolic blood pressure, mean (SD), mm Hg | 141.6 (29.6) | 140.6 (29.6) | 142.5 (29.6) | 1.9 (−1.0 to 4.8) |
| Missing data | 8 | 3 | 5 | NA |
| $SpO_2$ (%), median (IQR) | 96 (94 to 98) | 96 (94 to 98) | 96 (94 to 98) | 0 |
| Missing data | 28 (1.8) | 11 (1.6) | 17 (1.9) | NA |
| Heart rate, mean (SD), bpm | 84.6 (19.8) | 85.6 (18.9) | 83.8 (20.)5 | −1.7 (−3.7 to 0.2) |
| Missing data | 10 (0.6) | 2 (0.3) | 8 (0.9) | NA |
| Respiratory rate, median (IQR), cycle/min | 20 (18 to 25) | 20 (18 to 26) | 20 (18 to 24) | 0 (−1.4 to 1.4) |
| Missing data | 902 (56.4) | 378 (53.5) | 524 (58.8) | NA |
| Temperature, mean (SD), °C | 36.7 (1.0) | 36.8 (1.0) | 36.6 (1.0) | −0.2 (−0.3 to −0.1) |
| Missing data | 44 (2.8) | 20 (2.8) | 24 (2.7) | NA |
| Length of stay in ED, h (time span) | 11:21 (07:03 to 22:03) | 23:00 (18:12 to 28:17) | 07:35 (05:30 to 10:00) | 15:25 (14:47 to 16:04) |
| Missing data | 103 (6.5) | 58 (8.2) | 45 (5.1) | NA |

Abbreviations: BMI, body mass index calculated as weight in kilograms divided by height in meters squared; bpm, beats per minute; ED, emergency department; GIR, Groupe Iso-Ressource score; NA, not applicable; $SpO_2$, peripheral saturation of oxygen.

Table 2. In-Hospital Deaths and Secondary Outcomes Among Patients in the Emergency Department (ED) Overnight (ED Group) vs Patients Admitted to a Ward (Ward Group)

| Outcome | ED group (n= 707), No. (%) | Ward group (n= 891), No. (%) | Difference (95% CI) | aRR (95% CI)[a] | aRR (95% CI)[b] |
|---|---|---|---|---|---|
| **Primary outcome** | | | | | |
| In-hospital death | 111 (15.7) | 99 (11.1) | 3.78 (0.40 to 7.16)[c]<br>3.96 (0.57 to 7.35)[d] | 1.39 (1.07 to 1.81) | 1.50 (1.09 to 2.06) |
| **Secondary outcomes** | | | | | |
| Adverse event | 215 (30.4) | 209 (23.5) | 6.07 (1.51 to 10.64)[c]<br>6.11 (1.55 to 10.68)[d] | 1.24 (1.04 to 1.49) | 1.07 (0.84 to 1.36) |
| In-hospital length of stay, d | 9 (5 to 17) | 8 (3 to 13) | 1.0 (−0.1 to 2.1) | 1.20 (1.11 to 1.31) | 1.05 (0.93 to 1.18) |
| Missing data | 2 (0.3) | 3 (0.3) | NA | NA | NA |
| **Adverse events** | | | | | |
| Nosocomial infection | 112 (16) | 96 (11) | 5.1 (1.7 to 8.5) | 1.42 (1.09 to 1.85) | 1.32 (0.93 to 1.88) |
| Hypernatremia | 42 (6) | 38 (4) | 1.7 (−0.5 to 3.9) | 1.33 (0.86 to 2.06) | 1.37 (0.91 to 2.07)[e] |
| Fall | 45 (6) | 27 (3) | 3.3 (1.2 to 5.5) | 2.23 (1.38 to 3.59) | 2.13 (1.29 to 3.50)[e] |
| Hemorrhage | 26 (4) | 34 (4) | −0.1 (−2.0 to 1.8) | 0.96 (0.58 to 1.60) | 0.97 (0.57 to 1.64)[e] |
| Pressure ulcer | 33 (5) | 26 (3) | 1.7 (−0.2 to 3.7) | 1.53 (0.92 to 2.55) | 1.60 (0.95 to 2.69)[e] |
| DVT/PE | 8 (1) | 13 (2) | −0.3 (−1.5 to 0.9) | 0.70 (0.28 to1.71)[e] | 0.70[e] (0.28 to 1.71) |
| Stroke | 7 (1) | 13 (2) | −0.5 (−1.6 to 0.7) | 0.68 (0.27 to 1.69)[e] | 0.68 (0.27 to 1.69)[e] |
| Myocardial infarction | 7 (1) | 7 (0.8) | 0.2 (−0.8 to 1.2) | 1.26 (0.44 to 3.61)[e] | 1.26 (0.44 to 3.61)[e] |

Abbreviations: aRR, adjusted risk ratio; DVT, deep vein thrombosis; GIR, Groupe Iso-Ressource score; NA, not applicable; PE, pulmonary embolism.

[a] Adjusted by age, sex, high level of comorbidity (Charlson comorbidity index >6), high level of dependency (GIR score <5), systolic arterial blood pressure, peripheral saturation of oxygen, and trauma-related ED visit. Health care facility was included as a random effect in the model.

[b] Further adjusted by all chief concerns, ED length of stay, hours of ED visit (8:30 AM to 6:30 PM vs 6:30 PM to 8:30 AM), and ED characteristics (academic vs nonacademic, rural vs urban, <50 000 vs ≥50 000 annual ED visits).

[c] Minimal difference among 15 imputed data set.

[d] Maximal difference among 15 imputed data set.

[e] Unadjusted risk ratio owing to insufficient number of events to perform adjusted analysis.

Second, the validity of CCI can be challenged because advances in medical treatments since its derivation are not reflected in the weight of its different components.[32] For example, the weight given to AIDS does not reflect its current prognosis. Third, although most patients in France who wait overnight in the ED for admission do spend the night on a trolley, some participating EDs may have some beds available for patients in the ED, rather than trolleys. In this study, 6 (6%) centers reported the regular use of beds in the ED. Fourth, there were some missing variables for the GIR score used to describe patients' dependency. This may have biased the adjustment and the prespecified sensitivity analysis on patients with GIR greater than 5. Fifth, we included patients only during a 2-day period. This period was characterized by an exceptionally high demand on the ED owing to a triple epidemic of influenza, respiratory syncytial virus, and COVID-19, when 44% of patients spent a night in the ED. Consequently, the generalizability of our findings to other time periods or under dif-

ferent circumstances may be limited. However, this limitation can also be seen as a strength. The specific time frame offers an opportune glimpse into the system's response under extreme strain, reflecting potential vulnerabilities in bed availability and patient care. This insight may serve as a valuable guide for planning and managing similar high-demand situations in the future. Additionally, we excluded patients who were admitted to the ICU and to a ward between midnight and 8:00 AM, which may have introduced a selection bias. Given that our study comprised a sample of 97 EDs in France, including 18 (18%) EDs with an annual census of less than 30 000, it may not be representative of all EDs in France, where 66% have fewer than 30 000 visits per year.[33]

## Conclusions

This multicenter prospective cohort study reports a significant association between waiting overnight in the ED and increased in-hospital mortality among older patients. This increased risk was greater in patients who required assistance with activities of daily living.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**Author Contributions:** Drs Freund and Simon had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
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