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Elderly patients with emergency department return visit: descriptive analysis of adverse events

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Abstract: **Objective:** An emergency department (ED) visit is a critical event for elderly patients, often associated with an increased likelihood of early return visits (RVs), functional decline, and adverse events (AEs). This study aimed to investigate the proportion of ED RVs within 72 hours that were due to AE among elderly patients.
Methods: We conducted a retrospective review of hospital records for elderly patients aged 65 years and older who returned to the ED within 72 hours of discharge. The study focused on identifying AEs as a primary cause of RV and characterizing their type, severity, and preventability.
Results: Over a 6-month period, 69,557 patients presented to the ED, of whom 9,439 patients (13.6%) were aged 65 years and older, with a median age of 75. Among these elderly patients, 373 (3.9%) returned within 72 hours. Of these, 201 patients underwent a secondary review to detect AEs which revealed that 49 RVs (24.4%) were attributed to AEs. Diagnostic errors were the most common type of AEs, accounting for 34.7% of cases. Severe AE occurred in 36.7% of patients, and more than half (63.4%) were deemed preventable.
Conclusion: The results of our study indicate a concerning correlation between RV and AE in elderly patients. A substantial portion of these AEs is due to diagnostic and management errors, highlighting the necessity for strategies to enhance the quality of care for this vulnerable group. The study advocates for utilizing 72-hour ED RV as a trigger for identifying AEs.

Keywords: Adverse Event; Elderly; Emergency Department; Geriatrics; Quality Improvement; Return Visit

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1. Introduction

Despite substantial advancements in quality improvement and patient safety, there remains a critical gap in validated metrics for assessing high-quality care in the emergency department (ED) setting (1,2). Factors such as increasing patient acuity, time constraints, frequent transitions of care, overcrowding, and prolonged boarding significantly compromise patient safety and heighten the risk of adverse events (AEs). However, there is still a limited understanding of the nature of AEs and patient harm in the ED (3). Our knowledge regarding the most effective methods for identifying AEs in the ED, as well as the characteristics of AEs recorded by various detection techniques, particularly among vulnerable populations, is also limited (4).

Current surveillance and quality review processes in the ED—often reliant on event reporting systems, morbidity and mortality conferences, and selected screening criteria—have been shown to yield low detection rates of AEs, often below 2%. This under-recognition of AEs leaves preventable patient harm unaddressed and poses significant challenges to quality care (5). Novel methods, such as trigger tools like the global trigger tool developed by the institute for healthcare improvement (IHI), offer promising solutions by allowing for systematic record reviews that better identify potential AEs. These tools, however, remain underdeveloped for the unique dynamics of ED care (2). An ED-specific trigger tool is still under development and validation (6).

In light of the scarcity of well-known validated metrics to measure high-quality care in the ED, using criteria such as 72-hour return visit (RV)—which has historically been a surrogate metric for assessing quality and a trigger for detecting lapses in care—still seems reasonable (7-9).

Although many studies have explored the outcomes and risk factors associated with RVs, there is a notable lack of comprehensive analyses focusing on AEs within this context, particularly among older adults (1,10). From a quality improvement perspective, only the proportion of RVs resulting from AE is significant. Thus, ongoing research is necessary to clarify the relationship of RV with AE (10). Given that older age is consistently identified as a significant predictor of ED RVs and corresponding AEs, this vulnerable population warrants particular attention (7,11,12). Although prior research has investigated the risk factors associated with ED RV among older adults, no study focused on AEs among elderly patients with

ED RVs (13-17). Elderly patients often present with multiple comorbidities, higher rates of serious illness, and greater communication barriers, all of which increase their risk for AEs (13). Previous studies indicate that individuals over 65 years old face an elevated risk for adverse outcomes related to RVs (10,11). Thus, understanding the intersection of RVs and AEs in this cohort is crucial for improving patient safety and quality of care in the ED. Addressing AEs helps to improve organizational learning and to prevent repeating the same mistakes (18).

We hypothesize that a focused analysis on elderly patients returning to ED may add valuable data to the field and may help to highlight potential gaps in their care. This study aims to evaluate the association between RVs and AEs among older patients in ED. By concentrating on this group, the study highlights the unique challenges and risks they face in the ED setting. By identifying and quantifying the proportion of RVs attributed to AEs, we seek to enhance awareness of safety issues and inform targeted quality improvement initiatives. Ultimately, this research addresses the critical need for focused investigations into the complexities of care for older adults, with the goal of fostering a safer ED environment for this increasingly prominent demographic.

2. Methods

2.1. Study Design, setting, and population

This study was a retrospective review of medical records for elderly patients (aged 65 years and older) who returned to the ED within 72 hours of their discharge. The review focused on all eligible patients who presented to our ED during the 6-month study period. The study was conducted at the ED of Imam Reza Hospital, a 1,000-bed tertiary care facility and the largest academic hospital in eastern Iran. This hospital is affiliated with Mashhad University of Medical Sciences and hosts an emergency medicine residency training program. The ED receives approximately 150,000 visits annually and serves as the primary referral center for the eastern region of the country. The department includes a resuscitation area with five beds, a post-resuscitation area with six intensive care equipped beds, a treatment area with 45 monitored beds, a waiting room that accommodates about eight stretcher beds, an area designated for minor trauma patients, and a fast-track area.

2.2. Study protocol

We utilized our electronic hospital information system (HIS) to identify all patients meeting the inclusion criteria. Patient records were initially reviewed by a senior ED nurse (a member of the hospital's patient safety committee) and a senior emergency medicine resident. These primary reviewers received training on a structured approach to case review and were tasked with documenting demographic characteristics, chief complaints, triage levels, and means of arrival. They also reviewed records to exclude patients whose return visit was scheduled, those who left the ED against medical advice during their initial visit, patients who left without being seen during the index visit or at the RV, those with incomplete documentation during their initial visit or RV or both, and patients who were referred by other specialists for admission to inpatient wards but attended the ED due to unavailability of inpatient beds. No further review was conducted for these excluded cases.

The charts (both the index and the return visit charts) of all remaining cases underwent secondary review by three experienced emergency medicine physicians, EP, EF and KD, to determine the reason for the RV and whether it was associated with an AE. The secondary reviewers completed free online training from the institute for healthcare improvement (IHI) and received training on AE measurement and classification. Considering the definition proposed by the IHI global trigger tool for AEs resulting in harm: "unintended physical injury resulting from or contributed to by medical care that requires additional monitoring, treatment, or hospitalization, or that results in death" (19), we defined an AE as: unintended harm or unfavorable outcome associated with the care provided during the index visit. Several types of issues can be considered as "associated with the care in the ED index visit", including complications from treatments or procedures, undiagnosed conditions, errors in management or upon discharge, and inadequate follow up. Based on a prior study by Calder et al., we classified AEs into six types (10). Table 1 shows the definition of these different types of AEs and also defines the severity of AEs which was assessed using national coordinating council on medical error reporting and prevention (NCC MERP) index (19). We utilize only categories E, F, G, H, and I, which describe harm. We also assessed whether the AEs were preventable or not. Assessment was performed separately by each reviewer and in the end, the results were compared. In cases where the reviewers did not agree with each other or were uncertain about a decision, a third reviewer helped to interpret the underlying implications and discussion continued until a consensus was reached. We chose to utilize a consensus approach among the reviewers. The goal was to reach a consensus among all three reviewers rather than relying solely on a majority decision. This approach ensured a thorough evaluation and a more robust interpretation of the results.

If the RV did not represent an AE, it was classified into one of the following four groups based on clinical judgment and medical record documentation: completely unrelated medical problem, patient non-compliance, recurrent symptoms, or disease related complications.

To control subjectivity in evaluating patient records, we implement the following strategies: 1- we used and adhered to clear, standard, objective criteria for evaluation in order to help minimize subjective interpretation. 2- We provide thorough training for evaluators to ensure a uniform understanding of the evaluation criteria and methods. 3- The reviewers did not know the outcome of the second ED visit when eval-

uating the index visit records, but they were aware that the patient had a RV. 4- The reviewers compare results of their independent assessments to ensure consistency. 5- A consensus meeting was held for the reviewers to discuss their assessments and come to a consensus on complex cases.

2.3. Statistical analysis

The collected data were analyzed using SPSS version 25 software. Descriptive statistics were employed to summarize variable descriptions, including measures of central tendency, dispersion, and frequency distribution. The normality of variable distributions was assessed using the Kolmogorov-Smirnov test.

3. Results

Over a six-month period, 69,557 patients presented to the ED, 9,439 (13.6%) were aged 65 years and older, with a median age of 75. Table 2 presents the baseline characteristics of various patient groups during their index visits. Among all elderly patients presented to the ED, 373 (3.9%) returned to the ED within 72 hours of their initial visit. In the primary review of these cases, 172 patients were excluded for the following reasons: scheduled RV (n=31, 18%), incomplete documentation of patient records (n=20, 11.6%), departure from the ED against medical advice during their index visit (n=57, 33.1%), leaving the ED without being seen during their index visit or RV (n=37, 21.5%), and referral visit to the ED by other specialist staff due to unavailability of inpatient beds (n=27, 15.7%). A total of 201 patients underwent a secondary review to identify the reasons for their RVs and to determine whether an AE was the cause of these RVs. Out of these 201 patients, 49 (24.4%) were identified as RVs due to AEs. Figure 1 illustrates the summary of patient enrollment flow. Over half (63%) of AEs deemed preventable. As shown in table 3, the most common category of AEs was diagnostic errors, which accounted for 34.7% of all detected AEs. Furthermore, 36.7% of the AEs were classified as causing severe harm, which included three fatalities.

For clarity, we provide a narrative summary of 5 patients with different AE types and severity in the appendix.

4. Discussion

In this study, 3.9% of elderly patients presenting to the ED during the study period (373 patients) had a RV within 72 hours. However, 172 patients were excluded in the primary review. Therefore, when considering the 201 patients who underwent a secondary review for AE detection, the positive predictive value of the 72-hour ED RV as a trigger for detecting AE is 24.4%. International studies report 72-hour RV rates from 0.8% to 5.5%, with less than 5% generally considered acceptable for quality care (9,17). Notably, in our study, while many RVs were harmless, a significant proportion of AEs (63.4%) were found to be preventable.

The most frequent type of AE was due to diagnostic errors (34.7%). Issues related to suboptimal management plan (16.3%) and medication adverse effects (14.3%) were in the second and third places. Although most of the AEs (63.3%) were not severe but permanent harm occurred in seven patients, nine patients required intervention to sustain life and death occurred in three patients, all considered preventable. It is important to note that with millions of ED visits per year, this could be translated to thousands of patients harmed annually.

Previous research on ED RV fail to address the incidence and nature of AEs (1,10), which our findings contribute to. The high prevalence of diagnostic errors highlighted in our analysis is alarming, as these errors often stem from cognitive mistakes in evaluating elderly patients, particularly those presenting with nonspecific symptoms, such as abdominal pain and generalized weakness.

The design and settings of the available studies are so heterogeneous that making useful comparisons becomes challenging. Our study's results align with those of Calder et al., the most comparable study to ours, that reported AEs in 12% of all adult patients within 72-hour RV to an academic ED in Canada. Management and diagnostic errors were the primary factors contributing to these AEs (10). Wang et al. reported a 72-hour ED RV of 8.64% among elderly patients in a regional hospital in Taiwan, but they did not evaluate the AEs (17). Additionally, Aaronson et al., who also screened for 72-hour ED RV to identify suboptimal care, found a deviation from optimal care in 2.49% of patients and reported that 96% of these cases were attributed to diagnostic errors (1).

Diagnostic errors represent a significant threat to patient safety and are often considered preventable. Studies indicate that there is typically at least one cognitive error involved as a leading cause of diagnostic errors, all occurring usually during the assessment phase of the diagnostic process (18).

In our study, abdominal pain was the most common chief complaint among both patients with RVs (20.9%) and those with AE (22.4%). Abdominal pain in elderly patients has consistently posed a diagnostic challenge in the ED. Factors such as unreliable physical examinations, nonspecific symptoms, and the presence of chronic underlying illnesses complicate the presentation of acute diseases, leading to diagnostic errors in geriatric patients with abdominal pain (20).

Generalized weakness was the second most frequent chief complaint among patients with RV (10%) and those with AE (20.4%). Nonspecific complaints like generalized weakness necessitate more thorough evaluations, as the risk of poor outcomes is higher in this group. Generalized weakness, which can encompass a variety of differential diagnoses, is often used by patients to describe many ambiguous subjective symptoms, making it another challenging diagnostic category in the ED (21).

Given the wide range of clinical presentations, information gaps, limited data available at the time of evaluation, and the need to make critical decisions under high levels of uncertainty, the ED is considered the most challenging clinical

Table 1 Classification and definition of AEs by their types and severity

	AEs	Definition
Type		
	Diagnostic error	Failure to act on documented signs, symptoms, or para-clinical results, or failure to order an indicated or necessary para-clinical test
	Management error	Suboptimal or inadequate management despite a correct diagnosis
	Procedure complication	Any harmful consequences experienced by the patient as a result of a procedure
	Medication adverse effects	Any symptoms or signs attributable to medication appropriately prescribed or not
	Disposition error	Placing the patient at unnecessary risk of death or serious harm upon discharge
	Follow up plan error	Developing new symptoms of disease, complications or unnecessary prolongation of symptoms due to miss-arrangement of follow-up visits or inadequate follow-up plans
Severity		
	Not severe	E Temporary harm requiring intervention
		F Temporary harm requiring initial or prolonged hospitalization
	Severe	G Permanent harm
		H Requiring intervention to sustain life
		I Resulting in death

Table 2 Characteristics of patients in the index ED visit

	Patients > 65 y/o N= 9439	Return visit N= 373	Evaluated for AE N= 201	With AE N= 49
Age				
Median (IQR)	75 (69-82)	78 (72-84)	80 (72-85)	83 (76-86)
Sex				
Male	N=4795 (50.8 %)	N= 198 (52.5 %)	N= 103 (51.2%)	N= 27 (55.1%)
Triage Level (ESI) in index visit				
1	N=387 (4.1%)	N= 19 (5.1%)	N= 9 (4.5%)	N= 2 (4.1%)
2	N= 3105 (32.9%)	N= 84 (22.5%)	N= 46 (22.9%)	N= 6 (12.2%)
3	N= 3832 (40.6%)	N= 198 (53.1%)	N= 108 (53.7%)	N= 34 (69.4%)
4	N=2030 (21.5%)	N=72 (19.3%)	N=38 (18.9%)	N=7 (14.3%)
5	N= 85 (0.9%)	N= 0	N= 0	N= 0
Arrived by EMS	N= 1605 (%17)	N= 58 (%15.5)	N= 36 (%17.9)	N=8 (16.3%)
Most common presenting chief complaints				
Chest pain	N= 1057 (11.2 %)	N= 11 (2.9 %)	N= 17 (8.5%)	N= 2 (4.1%)
Dyspnea	N= 1236 (13.1%)	N= 32 (8.6 %)	N= 26 (12.9%)	N= 6 (12.2%)
Decreased LOC	N= 698 (7.4%)	N=18 (4.8 %)	N= 10 (5%)	N= 2 (4.1%)
Weakness	N= 1245 (13.2%)	N= 71 (19%)	N= 33 (16.4%)	N= 10 (20.4%)
GIB	N= 320 (3.4%)	N= 15 (4 %)	N= 7 (3.5 %)	N= 1 (2%)
Nausea/diarrhea	N= 575 (6.1%)	N= 16 (4.3 %)	N= 11 (5.5%)	N= 2 (4.1 %)
Abdominal pain	N= 925 (10.8%)	N=78 (20.9 %)	N= 38 (18.9%)	N= 11 (22.4%)
Trauma	N= 1607 (17%)	N= 60 (16.1%)	N= 25 (12.4%)	N= 5 (10.2%)
Vertigo	N= 679 (7.2%)	N= 18 (4.8%)	N= 13 (6.5%)	N= 2 (4.1 %)
Others	N= 1097 (11.6%)	N= 54 (14.5 %)	N= 21 (10.4%)	N= 8 (16.3 %)

AE: Adverse event; IQR: Interquartile range; ESI: Emergency severity index; EMS: Emergency medical service; LOC: Level of consciousness; GIB: Gastrointestinal bleeding

Table 3 Types and severity of AEs in 49 patients

		AE severity					
			Not severe	Severe			
		E	F	G	H	I	Total
AE Type	Diagnosis	0	6	4	5	2	17
	Management	1	6	1	0	0	8
	Procedure	3	2	1	0	0	6
	Medication	1	4	1	1	0	7
	Disposition	0	2	1	2	1	6
	Follow up	2	3	0	0	0	5
	Total	8	23	7	9	3	49

AE: Adverse event

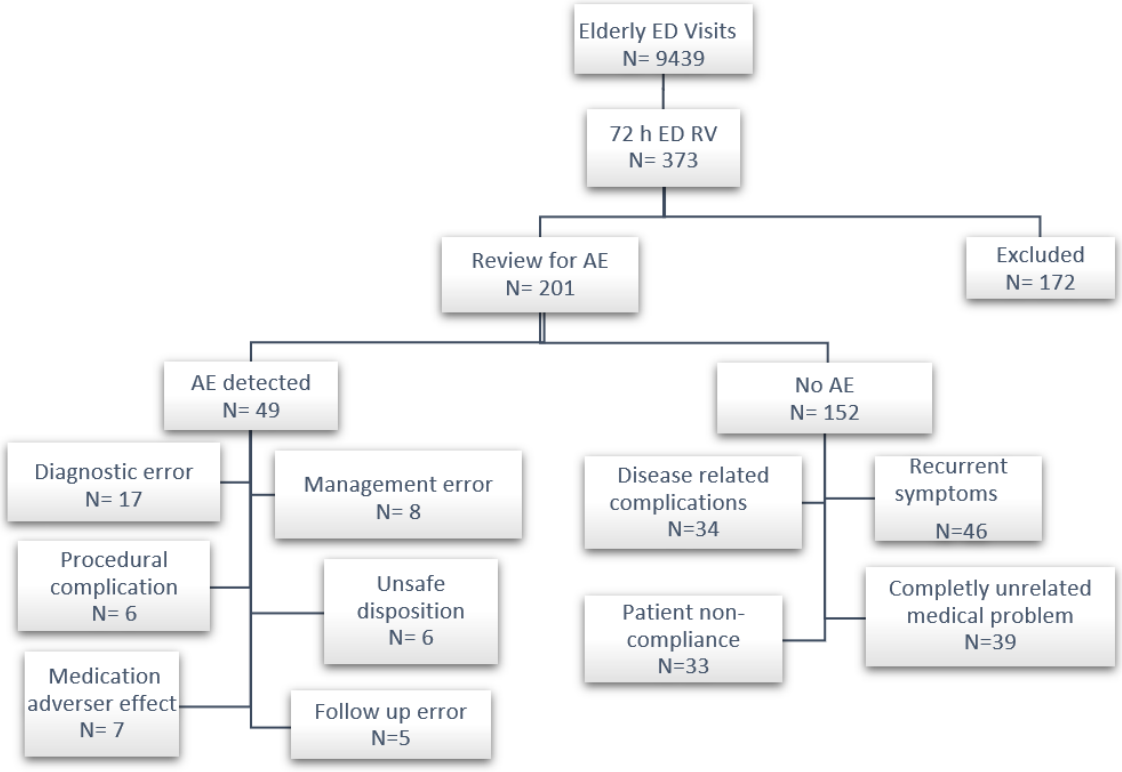

Figure 1 Summary of included patients

setting for diagnosis (18). The care of elderly patients further complicates this diagnostic dilemma. Common medical conditions in elderly patients often present with atypical symptoms, and the presence of multiple underlying comorbidities makes the evaluation of geriatric patients in the ED even more complex (14).

The aging population in Iran is increasing at a faster rate than the global average. The percentage of elderly individuals in Iran rose from 5.4% in 1986 to 9.6% in 2016, and it is projected to reach 14.8% by 2030 (22). The aging population necessitates improvements in ED care quality for older adults (23). Given that the positive predictive value of 72-hour ED RV serves as a credible trigger for identifying AEs, regular audits using this trigger could enhance patient safety. Integrating automated systems for tracking RVs can further facilitate this process and encourage early identification and remediation of quality lapses. This finding that 63% of AEs were deemed preventable underscores the potential for quality improvement initiatives. This emphasizes the need for targeted interventions in the ED to reduce preventable harm, a topic that has not been sufficiently addressed in prior research.

The implications of our findings are profound. Given that diagnostic errors were the leading cause of AEs, there is an urgent need for improved diagnostic protocols and training for ED staff. Implementing standardized assessment tools and checklists could enhance the accuracy of diagnoses, particularly for common presentations such as abdominal pain and generalized weakness. These conditions are often challenging to evaluate in elderly patients due to their nonspecific nature and the presence of chronic illnesses. Moreover, the study highlights the importance of effective communication and follow up care. Many AEs arise from inadequate follow up plans or unsafe dispositions upon discharge.

Establishing clear discharge protocols that include follow up appointments and patient education can mitigate these risks. Additionally, integrating multidisciplinary teams, including geriatric specialists, into the ED could provide valuable insights and improve the management of elderly patients.

5. Limitations

While this study provides valuable insights, it is not without limitations. The single-center design may limit the generalizability of the findings. Future research should aim to replicate this study across multiple centers to validate the results and explore the broader applicability of the findings. Additionally, prospective studies could provide a more comprehensive understanding of the causal relationships between RVs and AEs.

6. Conclusion

This study enriches the current literature by providing focused insights into the prevalence, types, and preventability of AEs associated with RV among elderly patients in the ED, thereby informing future research and quality improvement

efforts in ED settings. The findings of our study reveal a concerning association between RV and AE in elderly patients. Diagnostic and management errors account for a significant proportion of these AEs, thereby underscoring the need for enhanced strategies aimed at improving quality of care for this vulnerable population. The study supports the use of 72-hour ED RV as a trigger for identifying AEs, suggesting that regular audits based on this metric could enhance patient safety. This approach could lead to better detection of lapses in care and foster a culture of safety within EDs

7. Declarations

7.1. Acknowledgment

The authors would like to thank the administrative staff of Imam Reza hospital for their cooperation to access the patients' records.

7.2. Authors' contribution

The study designed, conceptualized and registered by EP and KD; Review of records, data collection and interpretation were performed by EP, KD and RF; AS participated in the design, interpretation and data analysis; EP wrote the manuscript and all authors reviewed and approved it.

7.3. Conflict of interest

The authors have no relevant competing interests to declare.

7.4. Funding

This study was carried out by the financial support of vice chancellor of research, Mashhad University of medical sciences.

7.5. Ethics approval and consent to participate

The study was approved by ethical committee of Mashhad University of medical sciences, Mashhad, Iran.

7.6. Consent for publication

All authors agree to publish the article in the present form.

7.7. Availability of data and materials

The dataset analyzed during the current study is available upon reasonable request from the corresponding author.

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Appendix 1

Case summary	Adverse events		
	Type	**Severity**	**Preventability**
A 76-year-old man was referred to the ED from an outpatient clinic due to back pain and ST depression on ECG. He was discharged after 6 hours of observation, during which he showed symptom relief, had negative troponin results, no ST changes on the ECG, and no risk factors for coronary artery disease. The patient returned to the ED the following day in a state of shock. A bedside ultrasound revealed abdominal free fluid and a suspicious flap within the aortic lumen. Unfortunately, the patient expired 5 hours after arriving at the ED.	Diagnostic error	I (death)	Preventable
An 83-year-old man, opium addict, presented with abdominal pain and constipation. An abdominal ultrasound and routine laboratory tests were normal, and his pain was relieved with intravenous opioids. He was discharged with a diagnosis of nonspecific abdominal pain. The patient returned to the ED two days later with persistent abdominal pain. A CT scan revealed mesenteric ischemia. Unfortunately, he expired before being transported to the operating room, approximately 8 hours after his arrival at the ED.	Diagnostic error	I (death)	Preventable
A 72-year-old man with a history of colon cancer was admitted to the ED with a COPD exacerbation and remained there for 4 days before being discharged. He returned to the ED, two days later with pain in his right lower limb. An ultrasound revealed deep vein thrombosis. Notably, the patient did not receive prophylactic anticoagulants during his previous admission.	Management error	F (temporary harm needs hospitalization)	Preventable
A 70 y/o woman with a history of hepatic failure was admitted to the ED for therapeutic abdominocentesis and was subsequently discharged. She presented to the ED three days later with abdominal pain and was admitted with bacterial peritonitis.	Procedural complication	F (temporary harm needs hospitalization)	Preventable
A 73 y/o woman presented to the ED with palpitation and pre-syncope. She was admitted in the ED for 2 days with diagnosis of new atrial fibrillation and was discharged with warfarin after cardiology consult. Three days later, the patient returned to the ED with epistaxis. Her INR was found to be 9.5, and she was admitted with warfarin toxicity.	Medication adverse effect	F (temporary harm needs hospitalization)	Non preventable

ED: Emergency department; ECG: Electrocardiogram; COPD: Chronic obstructive pulmonary disease; INR: International normalized ratio