Editorial

What we can learn from Medicare data on early deaths after emergency department discharge

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A recent study published in February 2017 in the *British Medical Journal* examined how more than 10,000 Medicare beneficiaries—with an average age of 69 years with no obvious life-limiting illness—fared in the 7 days after being discharged from U.S. emergency departments (EDs) over 6 years. The primarily finding was that 0.12%—or 12 in 10,000 people—had died, primarily from atherosclerotic heart disease, myocardial infarction, and chronic obstructive pulmonary disease. About 2% died from narcotic overdose, primarily after visits for musculoskeletal problems (1).

Understanding death after ED discharge is important when it comes to the quality of ED care: ED care is explicitly designed to rule out life-threats, where patients at risk for mortality within a short period of time due to their underlying condition should be admitted to the hospital for further, potentially life-saving care. Therefore, short-term post-ED death is an adverse outcome that can serve in part to measure the ability of the system to serve this purpose.

The first question is whether 12 in 10,000 is a high number or not. While ideally, the number would be zero, it is important to recognize that in reality, the rate is low indicating that EDs are doing an excellent job in differentiating patients at risk for short-term death. However, given the large size of the population of U.S. Medicare beneficiaries, this seemingly small number translates to more than 10,000 deaths per year. Therefore, efforts to reduce deaths after discharge may have a considerable impact on population health, assuming some of these deaths may be preventable.

When hospital factors were examined that predicted death rates, the authors found that one key factor—specifically ED "admission rates" predicted death after discharge. EDs in the lowest fifth of admission rates had 3.4 times higher death rates than the highest fifth. This suggests that the propensity to hospitalize, or not, is an important risk factor for an important, and potentially preventable adverse outcome.

In the new world of value-based care, hospital admission decisions are increasingly central to the discussion, as hospital care makes up to 32% of U.S. healthcare costs (2). According to the Healthcare Cost and Utilization Project data, of the 137.8 million U.S. ED visits in 2014, 19.4 million—or 14.1%—were admitted to the hospital. This is compared to 17.9 million admissions that originated from other sources (3), making the ED the front door of the hospital for more than half of U.S. admissions.

Recent studies have explored how emergency physicians make admission decisions and how they vary across physicians and hospital (4-6). Decisions are sometimes clear-cut—in the case of a minor illness or injury where no physicians would admit or for a critically ill patient where all physicians would admit or transfer to a higher level of care. However, a large middle group of "gray-area" patients exists where one physician or hospital would admit and another might discharge. "Gray-area" admissions have been termed "intermediate-complex" admissions and are

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estimated to make up 31–57% of all ED visits (7).

For example, a common ED complaint is chest pain. Chest pain has a variety of causes from simple musculoskeletal pain to more serious conditions, such as myocardial infarction and pulmonary embolism. Sending a patient home without diagnosing a serious cause of chest pain can lead to devastating consequences. In fact, missed acute myocardial infarction (AMI) is the leading cause for ED medical malpractice litigation in the U.S. (8). The rate of missed AMI has been estimated at 2% (9). A recent study that explored the impact of admission rate variation in Medicare patients found that hospitals with higher admission rates had lower rates of 30-day AMI and also lower death rates in patients with chest pain (10), confirming the *BMJ* study findings that admission rates matter.

Given that nearly 10,000 Medicare beneficiaries die a year after discharge, the next logical question becomes: how can we prevent these deaths? One answer may be to push hospitals to increase their admission rates. However, given trends toward lowering admission rates and moving care out of U.S. hospitals, this is unlikely to be a feasible solution (11).

The next answer is to focus on making ED admission decisions more efficient. Studies have demonstrated admission rate variation both at the hospital level or physician level and nearly 2-fold variation exists even after adjusting for measurable factors (5). Therefore, interventions to identify and remediate physicians and hospitals with inefficient admission practices or high death rates after ED discharge may help reduce admission rates safely. However, some factors that predict admission such as physician risk tolerance and malpractice fear may be more difficult to change (12,13). In addition, some ED settings and ED patients have less access to primary care physicians for re-evaluation after discharge, which can sometimes lead to "social admissions". These may be unavoidable if outpatient systems are unable or unwilling to meet patient needs.

Admission decisions are also more complicated in the older adults studied in the *BMJ* article, who can have atypical presentations of serious medical illness (14). Yet, hospitalization itself is not free of risk; admissions can also sometimes cause problems in older adults, including hospital-acquired infections and altered functional status (15). A 2010 study highlighted difficulties faced by ED providers in estimating how long a patient will need to be hospitalized, where less than 1 in 10 patients were discharged by inpatient providers within 24 h (16). However, the same inpatient providers also were imperfect in identifying patients safe for discharge after a brief observation period as 1 in 50 "one-day admissions" died within 60 days of discharge, and 1 in 10 were re-hospitalized within 30 days.

One solution is the use of risk stratification scores to help guide ED admission decisions. Evidence-based risk stratification could safely allow for lower admission rates, and also perhaps reduce the premature discharge of higher risk patients. For example, a recently developed and validated risk score in chest pain is the HEART score, where low risk patients can be identified with a less than 1.7% of major adverse cardiac events (17).

Yet, one limitation of the HEART score is that even low-risk patients still have measurable risk of a major adverse cardiac event. Therefore, increased use of this score, particularly as a way to justify discharge may actually increase post-ED mortality. The HEART score was validated in 2013, well after the last enrollment in the *BMJ* study. The HEART score also only addresses chest pain syndromes, not the general older adult population. Broader risk-stratification tools may be more effective; however, given the heterogeneity of presentations to U.S. EDs, it may be difficult to validate a useful instrument.

Examining ED returns may also be a way to provide feedback to physicians and hospitals. Notably, most hospitals do not receive feedback that a patient died or was readmitted unless the patient returns to the same hospital, or feedback is generated in another way, such as through malpractice litigation or directly from the patient, family, or outpatient physicians. Closely examining ED returns may be a way to prompt educational programs aimed at improving admission decisions.

For example, several programs use 72-h return admissions for this purpose where rates vary from 0.5% to 1.2% of all ED visits in the literature (18-20). Risk factors for return admissions include older age (the population studied in the *BMJ* study), as well as living alone, insurance status, and specific diagnoses such as mental disorders, symptom-based diagnoses such as abdominal pain and chest pain, dehydration, and septicemia. Notably, in the *BMJ* study, the death after discharge was also system based on vague, symptom-based complaints such as dyspnea, altered mental status and fatigue. However, a very low rate of 72-return have ED quality issues on the first visit or any change in outcome due to misdiagnosis (21).

Another solution could be to establish a system that

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ensures follow-up for patients discharged from the ED with vague, potentially undiagnosed complaints or specific care needs. Alternatively, establishing a program for high risk discharges whereby patients can be followed closely by their primary care physician or even by the ED. In the era of expanding telemedicine technology, a tele-ED health follow up may be another solution particularly as the capacity of primary care may be unlikely to handle surges of post-ED re-evaluations.

Improving care transitions at hospital discharge may reduce adverse events after short-term admissions. Several new care models, such as the geriatric patient-centered medical home, the Program for All-inclusive Care of Elders, and the Interventions to Reduce Acute Care Transfers II programs have the potential to reduce low-acuity ED visits or the number of return visits in the future (22,23).

Undoubtedly, the best solution would be to detect those patients in the ED who are at high risk of death after discharge and admit them to the hospital. Biomarkers may be a useful way to help risk stratify patients, particularly in older adults. Lactate levels are promising candidates which have been associated with death in older adults up to 60 days with and without infections (24). In addition TNF-α, IL-6, IL-18, Fas (Apo1), BNP, C-reactive protein and cystatin C values have been helpful identifying higher risk patients with heart failure in patients aged 70 years and older (25). However, further research may help elucidate how best to use these biomarkers and other data in helping improve risk stratification in the ED.

Ultimately, ED physicians face difficult decisions every day about whether to discharge patients from the hospital, particularly patients with unclear diagnoses. The new value-based care movement in the U.S. will increasingly move care into ambulatory settings. Therefore, it is likely the pressure to discharge will only increase. ED physicians need to remain vigilant of the risks of discharge, apply appropriate diagnostic testing, and work with physicians outside the hospital to ensure smooth and safe transitions, and ideally make ED discharge safer for everyone.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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