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Outcomes of Patients with Syncope and Suspected Dementia

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Abstract

Objectives—Syncope and near-syncope are common in patients with dementia and a leading cause of emergency department (ED) evaluation and subsequent hospitalization. The objective of this study was to describe the clinical trajectory and short-term outcomes of patients who presented to the ED with syncope or near-syncope and were assessed by their ED provider to have dementia.

Methods—This multisite prospective cohort study included patients 60 years of age or older who presented to the ED with syncope or near-syncope between 2013 and 2016. We analyzed a sub-cohort of 279 patients who were identified by the treating ED provider to have baseline dementia. We collected comprehensive patient-level, utilization, and outcomes data through interviews, provider surveys, and chart abstraction. Outcome measures included serious conditions related to syncope and death.

Results—Overall, 221 patients (79%) were hospitalized with a median length-of-stay of 2.1 days. A total of 46 patients (16%) were diagnosed with a serious condition in the ED. Of the 179 hospitalized patients who did not have a serious condition identified in the ED, 14 (7.8%) were subsequently diagnosed with a serious condition during the hospitalization, and an additional 12 patients (6.7%) were diagnosed post-discharge within 30 days of the index ED visit. There were 7

deaths (2.5%) overall, none of which were cardiac-related. No patients who were discharged from the ED died or had a serious condition in the subsequent 30 days.

Conclusions—Patients with perceived dementia who presented to the ED with syncope or near-syncope were frequently hospitalized. The diagnosis of a serious condition was uncommon if not identified during the initial ED assessment. Given the known iatrogenic risks of hospitalization for patients with dementia, future investigation of the impact of goals of care discussions on reducing potentially preventable, futile, or unwanted hospitalizations while improving goal-concordant care is warranted.

Introduction

Syncope and near-syncope are common in patients with dementia, and are a leading cause of both emergency department (ED) evaluation and subsequent hospitalization.[1,2] Although the majority of underlying etiologies are benign, the lack of accurate risk stratification models and the potential for life-threatening causes often leads to hospitalization and additional diagnostic testing.[3–6] This may be compounded in patients with dementia, who often present with older age, multi-morbidity, frailty, atypical symptoms, incomplete historical information, and an increased reliance on collateral sources and surrogate decision-making.[5,7,8] Although dementia is associated with advancing age, older age alone is not an independent predictor of adverse outcomes for patients with syncope discharged from the ED.[9]

The marginal benefit of additional inpatient evaluation for patients with syncope or near-syncope of unknown cause and without an accompanying serious condition identified on the initial work-up has been questioned and is an area of ongoing investigation.[10,11] In addition, there are known significant risks associated with hospitalizations for patients with dementia, including prolonged lengths of stay, immobility, falls, protracted delirium, accelerated cognitive and functional decline, institutionalization, and an elevated risk of rehospitalization.[12–19] In addition to longer-term adverse outcomes, patients with dementia are at increased risk for an “intervention cascade” while hospitalized. With advancing stages of dementia, an increasing majority of patients’ and their family’s care preferences prioritize comfort and more conservative management that aims to limit intensive diagnostic evaluations and invasive interventions.[20–23]

Given the high prevalence of syncope and near-syncope in patients with dementia, the potentially low utility of hospitalizations for patients without a serious condition identified in the ED, and the increased iatrogenic risks and high morbidity burden associated with hospitalizations for patients with dementia, the ED clinical decision-making can have significant down-stream effects on this vulnerable patient population. Although short-term outcomes have been evaluated for older patients presenting to the ED with syncope, to our knowledge no study has characterized the clinical trajectory and outcomes of patients with suspected dementia who present to the ED with syncope or near-syncope.[24] The aim of this study was to describe the clinical presentation, management, disposition, and short-term outcomes of patients who presented to the ED with syncope or near-syncope and were identified by their ED provider to have dementia.

Methods

Study Design, Setting, and Population

This multisite prospective cohort study included 11 academic EDs across the United States.[25] Patients 60 years of age or older who presented to the ED with syncope or near-syncope between April 28, 2013 and September 21, 2016 were identified for initial inclusion in the study sample. Patients were excluded if they presented with loss of consciousness presumed secondary to seizure, stroke, transient ischemic attack, or hypoglycemia, as well as acute intoxication, loss of consciousness following head trauma, persistent confusion relative to baseline mental status, or required medical or electrical intervention to restore consciousness. In addition, patients were excluded if there were significant barriers to follow-up telephone interviews, including those who lacked either telephone access or a permanent address, or did not speak either English or Spanish. Only the index ED visit was included for patients with recurrent visits. Informed consent was obtained from all participating subjects or their legally authorized representatives using procedures approved by the Institutional Review Board (IRB). Capacity to consent was determined by the treating ED provider and research staff. Following an overview of the study, if potential participants could not accurately answer questions about the goals of the study and the attendant risks, benefits, and alternatives, then both surrogate consent from the legally authorized representative and formal assent from the patient were obtained. The final cohort included 3686 patients. The IRBs at all of the participating sites approved this study.

Study Protocol

For this analysis, we limited the study cohort to include patients who were identified to have “baseline cognitive impairment or dementia” and be at their baseline mental status by the treating ED provider based on patient history and review of the electronic medical record (n=279). We did not perform a formal cognitive assessment or confirmation of the ED providers’ determination of underlying dementia, either through screening tools or instruments to quantify dementia severity.[26–28] This approach is reflective of ED practice, as the majority of ED physicians and nurses do not formally screen for cognitive impairment. Because dementia is under-diagnosed, under-recognized, and frequently not documented in the medical record, false positives are unlikely in this study cohort but false negatives may exist.[29,30]

Patients were evaluated by the treating ED provider, which included attending and resident physicians, physician assistants, or nurse practitioners. Research assistants gathered information about the circumstantial events of the syncope or near-syncope through in-person interviews in the ED. Past medical history and medications were obtained from the treating providers. Information about the diagnostic work-up, treatment, and outcomes was obtained through manual chart abstraction. Thirty-day outcomes and post-discharge follow-up information were obtained through chart abstraction and follow-up telephone interviews. All potential serious outcomes were re-reviewed and adjudicated by a study physician. Inter-rater reliability was assessed for chart abstraction outcomes in a training set of 55 charts using a kappa coefficient.[31] Level of agreement was high (κ>0.8).

Measurements and Outcome Measures

Demographics, medical history, comorbidities, medications, and the circumstantial events of the syncope, including prodromal symptoms and situational circumstances, were collected via standardized questionnaires and interviews in the ED. A 12-lead ECG was categorized as normal, isolated non-specific ST-segment/T-wave abnormalities, or abnormal. Abnormal ECGs included non-sinus rhythms, multiple premature ventricular complexes, sinus bradycardias of ≤40 beats per minute, ventricular hypertrophies, short PR segment intervals of <10 milliseconds, axis deviations, atrioventricular node blocks, complete bundle branch blocks, Brugada patterns, Wolff-Parkinson-White patterns, prolonged QRS duration >120 milliseconds, QTc prolongation of >450 milliseconds, and evidence of acute or chronic ischemia. We used central physician overreads for 12-lead ECG determination, with high level of agreement (κ>0.8).[32]

The number and type of additional diagnostic tests were recorded both for patients who were hospitalized and discharged from the ED. Hospitalizations included admissions under both inpatient and observation status. Additional information collected on patients who were hospitalized from the index ED assessment included length of stay, inpatient consultations, and treatments. Treatments included blood transfusion, thrombolytic therapy, device placement of a pacemaker and/or implantable cardiac defibrillator (ICD), coronary revascularization via percutaneous coronary intervention (PCI) or coronary artery bypass grafting, valve replacement, other procedure, or medication change.

Thirty-day patient follow-up data was collected via a review of the electronic medical records conducted by local research personnel to evaluate for serious cardiac arrhythmias and serious outcomes, as well as telephone calls to enrolled patients at 30 days to identify out-of-hospital deaths, ED visits, and hospitalizations that occurred outside the study sites. If a patient or his or her authorized representative reported an ED or hospital visit that occurred outside of the study site, then the medical charts associated with those visits were obtained and reviewed. The loss to follow-up rate of the entire cohort was 3.6% (n=134).

Outcome measures included serious conditions related to syncope and death, and were stratified by the timing of the outcomes as occurring in the ED, in the hospital for admitted patients, or within 30 days following the index ED evaluation. Serious conditions included arrhythmia and type, myocardial infarction, a new diagnosis of structural heart disease, stroke, pulmonary embolism, aortic dissection, subarachnoid hemorrhage, cardiopulmonary resuscitation, internal hemorrhage or anemia requiring transfusion, recurrent syncope or fall resulting in major traumatic injury, or other. Mortality measures included death due to all causes, as well as syncope-related and cardiac-related causes.

Data Analysis

We describe patient demographics, medical history, comorbidities, medications, circumstantial events, and the diagnostic work-up both overall and stratified by ED disposition. Differences between discharged and admitted patients were assessed using Pearson’s chi-square test and Student’s t-tests. We considered p≤0.05 to be statistically

significant. Statistical analyses were performed using R (R Foundation for Statistical Computing, Vienna, Austria).

Results

Baseline characteristics of the 279 patients with perceived dementia presenting to the ED with syncope or near-syncope, both overall and stratified by disposition, are described in Table 1. The average age was 80 years, 55% were female and 87% were white. Overall, 221 patients (79%) were hospitalized. Baseline comorbidities, clinical presentation, and the standardized diagnostic work-up in the ED were largely similar between patients who were discharged and admitted from the ED, with the exceptions of diabetes mellitus, low hemoglobin, and use of nitrates being associated with hospitalization. In particular, known factors associated with cardiac causes of syncope were not associated with disposition status, including older age, male gender, infrequent prior syncope, lack of prodromal symptoms, association with exertion, and presence of cardiac comorbidities including coronary artery disease, structural heart disease, arrhythmia, or heart failure.[11,33–36] Additionally, although 61% of ECGs were abnormal, there was no difference based on disposition status.

Discretionary diagnostic testing of patients who were admitted to the hospital compared to those discharged from the ED are presented in Table 2. The majority of patients had a chest radiograph (80%) and computed tomography (CT) of the brain (60%). Patients who were discharged from the ED rarely had additional diagnostic testing related to syncope. Patients who were admitted to the hospital had, on average, 1.1 additional diagnostic tests overall compared to those patients discharged from the ED.

The hospital management of admitted patients is presented in Table 3. Thirty-seven percent of admissions were under observation status, and the median length of stay was 2.1 days (interquartile range 1.1–4.2). The most common treatment rendered was a medication change (41%). Other than echocardiograms (37%), the receipt of additional cardiac testing or intervention was uncommon (Tables 2 and 3). Two patients (0.9%) underwent PCI and six patients (2.7%) received an implanted device, either a pacemaker and/or ICD. No patients had coronary bypass grafting or valve replacement surgery.

Stratified outcomes based on timing included death and serious conditions related to syncope and are presented separately for patients discharged (Table 4) and hospitalized (Table 5) from the ED. Overall, 72 patients (26%) experienced a serious condition and seven patients (2.5%) died within 30 days of the index ED visit. No deaths were cardiac- or syncope-related. A serious condition related to syncope was diagnosed in 46 patients (16%) during the initial ED evaluation resulting in hospitalization for all but four of these patients. No patients who were discharged directly from the ED died or had a serious condition diagnosed in the subsequent 30 days.

Of the 221 patients hospitalized from the ED, 42 (19%) had a serious condition related to syncope identified in the ED, most commonly an arrhythmia (26%). The majority of the conditions categorized as “other” were traumatic injuries (data not presented). Of the 179

hospitalized patients who did not have a serious condition identified in the ED, 14 (7.8%) were subsequently diagnosed with a serious condition during the hospitalization, and an additional 12 patients (6.7%) were diagnosed post-discharge within 30 days of the index ED visit.

Discussion

ED providers, when caring for patients with suspected dementia who have experienced syncope or near-syncope, face a clinically challenging scenario with diagnostic uncertainty and a lack of good risk stratification models.[3] In this multicenter study, we found that 84% of patients with perceived dementia presenting to the ED with syncope or near-syncope did not have a serious condition identified during the initial ED evaluation, but were frequently hospitalized. The extent of additional discretionary diagnostic testing and cardiac interventions in the hospital was limited. Adverse outcomes were uncommon both during the hospitalization and within 30 days of presentation. The 30-day mortality rate was 2.5%, which was similar to a rate of 1.6% observed in a previous study of older adults without dementia, with no deaths being related to syncope or cardiac causes.[24] The majority of all serious conditions related to syncope were diagnosed during the initial ED evaluation, and patients discharged home from the ED did not experience any serious conditions in the subsequent 30 days. Of those patients who were hospitalized without a serious condition identified in the ED, 7.8% had a serious condition identified in the hospital and 6.7% had a serious condition in the subsequent 30 days. This suggests the general effectiveness of assessing or ruling out serious conditions in the ED, although it is likely that the small percentage of patients without an identified serious condition in the ED who have an adverse outcome in the subsequent 30 days are the major drivers of ED decision-making.

Even in the absence of a validated statistical-based risk assessment tool, the results of this study demonstrate the low overall qualitative risk of short-term adverse outcomes related to syncope in the absence of a serious condition identified in the ED. This low risk must be weighed against the elevated risk exposure to iatrogenic complications and adverse cognitive and functional outcomes associated with hospitalizations for this vulnerable patient population. A previous study found that 15.3% of patients with dementia experienced an in-hospital complication, compared to 4.2% of patients without dementia.[18] These in-hospital complications included falls with injury (1.3%), pressure ulcers (4.9%), incontinence (5.5%), indwelling catheter complications (1.6%), and medications errors (4.4%). Additionally, 4.0% of patients with dementia lose the ability to independently perform at least one or more activity of daily living and 3.7% have significant cognitive decline between admission and discharge, although it is not known whether these deficits are transient or permanent.[14] There is evidence that older hospitalized patients, especially with attendant frailty, have a significantly increased likelihood of developing new or worsening disability.[37] Patients with dementia are also at increased risk of delirium that is associated with a more protracted course and an increased risk of consequent complications, with incidence estimates ranging from 25% to 56%.[16,38] Delirium in the setting of dementia is associated with a doubling of the rate of cognitive decline for the year proceeding hospitalization with sustained accelerated decline thereafter, in addition to an increased risk of functional decline, institutionalization, and death.[16,39] Furthermore, the delirium itself can

be protracted, with 75% of patients having no recovery at one month, and 58% having no recovery at 3 months.[17] Although intrinsic components of hospitalization are risk factors for delirium, the independent associated risk of delirium related to hospitalization itself is not known.[40] Lastly, hospitalizations for syncope are costly, averaging $7,200 per admission.[41]

The results of this study suggest an expansive role for goals of care discussions in the ED for patients with suspected dementia presenting with syncope. The explicit articulation of goals is important to achieve desired outcomes, and is particularly consequential in the context of a debilitating and incurable disease such as dementia.[42,43] Goals, and goal-directed decision-making, are dependent on a multitude of complex, and often competing, individual, demographic, medical, and psychosocial factors.[43,44] These factors include the severity of cognitive, functional, and physical impairment, presence of behavioral and psychological symptoms of dementia, advanced age, co-presence of multimorbidity or frailty, level of caregiving support, and medical care access. The upfront elicitation of goals may motivate provider recommendations of a goal-concordant care plan, such as discharge home if the primary goal is comfort or maintenance of function, and not life prolongation.

If the goals of care are consistent with possible hospitalization and additional diagnostic testing and therapeutic interventions, these defined goals can then act as a framework for subsequent goal-directed decision-making as they are crucial to achieving desired outcomes.[45] The translation of broader goals to an actionable outcomes-based plan of care requires dialogue between providers, who supply medical expertise and qualitative assessment of future risk, and patients, families, and caregivers, who provide the personalized contextual factors motivating care goals and preferences.[43,46] Decision aids can facilitate this translation, and have been an effective strategy in the commensurate context of ED patients with chest pain.[47] A randomized controlled trial of the decision aid “Chest Pain Choice” improved both patient and provider satisfaction, increased patients’ knowledge, and decreased hospitalization rates without an adverse effect on outcomes.[48] A similar tool to facilitate goals of care discussions and goal-directed decision-making in the ED for patients with dementia presenting with syncope or near-syncope has the potential to improve patient-centered care while avoiding unnecessary or burdensome hospitalizations that may be discordant with patient goals.[49] Beyond the development of improved risk stratification tools and decision aids, additional strategies are needed to ensure standardized dissemination and implementation of best practice decision-making support strategies in the ED to guide goal-directed care for patients with dementia.[50]

In addition to an expanded role of goals of care discussions, the results of this study also support the potential role of close ambulatory follow-up care as a substitute for hospitalization for low-risk patients without a serious condition identified in the ED. The timing of follow-up would ideally occur within 48 hours based on the concentration of adverse outcomes following syncope occurring in this time period.[35] Outpatient management strategies for low-risk patients with a number of acute medical conditions similar to syncope have not adversely affected mortality rates, disease-specific outcomes, or patient satisfaction compared to hospitalization.[51] Close outpatient follow-up can focus both on additional diagnostic evaluation if necessary, as well as risk mitigation for future syncope, falls, and injuries. Falls are a significant source of morbidity and mortality for

patients with dementia, and are frequently accompanied by syncope or near-syncope, regardless of the underlying etiology.[2,5] Approximately 50% of all syncope events in patients with dementia are due to orthostatic hypotension, of which more than half may have a potentially modifiable cause given that 47% are attributable to medications and 18% to volume depletion.[5] In this study, medication changes for hospitalized patients were common, and could easily be transferred to the outpatient setting through coordination with primary care providers. It should be noted, however, that the relationship between medication changes and future falls and syncope risk is not clearly defined, in particular for patients with dementia, and requires further investigation.[5,52]

Outpatient follow-up can also provide additional cardiac risk assessment and management for patients discharged from the ED. Although cardiac risk is a significant driver of ED decision-making, provocative testing for ischemia and coronary angiography were rarely done during the inpatient stay. This appears appropriate given that short-term adverse cardiac outcomes were infrequent in this study. Although six patients received a pacemaker and/or ICD in the hospital, only two patients had new arrhythmias diagnosed during the hospitalization and no patients had an arrhythmia within the 30 days following either hospital or ED discharge. It is hopeful that improved risk stratification models will allow earlier recognition of patients at increased short-term risk for adverse cardiac outcomes to guide ED management and better inform goal-directed decision-making.

Limitations

There are several limitations to this study. The lack of verification and severity staging of the dementia diagnosis was discussed previously. We did not adjust for multiple comparisons, so readers should interpret “statistically significant” findings near p=0.05 cautiously. In addition, there were no measures of decision-making or goals of care discussions that may have motivated the clinical trajectory of patients with dementia.[53] It is possible that the high rates of hospitalization were concordant with individual care preferences. However, the majority of patients with dementia and their families and/or caregivers prefer a more conservative approach to their care, making this limitation less likely.[20–23] Contrarily, the reason for the limited inpatient discretionary diagnostic work-up or interventions for hospitalized patients may be related to goals of care discussions and resultant goal-concordant care, which would subsequently affect the calculated diagnostic yield of inpatient evaluation. In addition, iatrogenic complications resulting from hospitalizations were not directly assessed in this study and would be an important area of future investigation. Although previous studies quantified the increased risk of in-hospital complications for patients with dementia, the generalizability to patients admitted for syncope evaluation is not known, especially given the median length of stay of 2.1 days in this study. Lastly, there were unmeasured psychosocial factors that may have influenced the disposition and outcomes of patients with suspected dementia who presented to the ED with syncope, such as level of caregiving and community social support, and access to timely ambulatory care. These are important components of ethical and effective geriatric emergency care, and warrant further investigation regarding the influence of these factors on outcomes and as potential areas of future intervention.

Conclusions

Patients with suspected dementia who presented to the ED with syncope or near-syncope were frequently hospitalized, although the diagnosis of an underlying cardiac or other serious condition was uncommon if it was not diagnosed during the initial ED assessment. Given the low short-term risk of adverse outcomes and known iatrogenic risks of hospitalizations for patients with dementia, further investigation in this population is warranted. This includes better defining the role of hospitalization in potentially preventing the subsequent development of a serious condition associated with syncope weighed against the iatrogenic risks of hospitalization for patients with dementia, as well as the impact of goals of care discussions and goal-directed decision-making on reducing potentially preventable, futile, or unwanted hospitalizations while improving goal-concordant care. Future work towards this goal includes the integration of improved risk stratification models into formal goal-directed decision aids specific for individuals with dementia.

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References

1. de Ruiter SC, de Jonghe JF, Germans T, Ruiter JH, Jansen RW. Cognitive impairment is very common in elderly patients with syncope and unexplained falls. J Am Med Dir Assoc. 2017; 18 (5) 409–13. [PubMed: 28108207]
2. Rudolph JL, Zanin NM, Jones RN, et al. Hospitalization in community-dwelling persons with Alzheimer's disease: frequency and causes. J Am Geriatr Soc. 2010; 58 (8) 1542–8. [PubMed: 20553338]
3. Sun BC, Emond JA, Camargo CA Jr. Characteristics and admission patterns of patients presenting with syncope to U.S. Emergency Departments, 1992–2000. Acad Emerg Med. 2004; 11 (10) 1029–34. [PubMed: 15466144]
4. Galizia G, Abete P, Mussi C, et al. Role of early symptoms in assessment of syncope in elderly people: results from the Italian Group for the Study of Syncope in the Elderly. J Am Geriatr Soc. 2009; 57 (1) 18–23. [PubMed: 19054186]
5. Ungar A, Mussi C, Ceccofiglio A, et al. Etiology of syncope and unexplained falls in elderly adults with dementia: Syncope and Dementia (SYD) Study. J Am Geriatr Soc. 2016; 64 (8) 1567–73. [PubMed: 27351866]
6. Ali NJ, Grossman SA. Geriatric syncope and cardiovascular risk in the emergency department. J Emerg Med. 2017; 52 (4) 438–448e3. [PubMed: 28131609]
7. Kenny RA. Syncope in the elderly: diagnosis, evaluation, and treatment. J Cardiovasc Electrophysiol. 2003; 14 (9 Suppl) S74–7. [PubMed: 12950524]
8. Grubb BP, Karabin B. Syncope: Evaluation and management in the geriatric patient. Clin Geriatr Med. 2012; 28 (4) 717–28. [PubMed: 23101580]
9. Grossman SA, Chiu D, Lipsitz L, Mottley JL, Shapiro NI. Can elderly patients without risk factors be discharged home when presenting to the emergency department with syncope? Arch Gerontol Geriatr. 2014; 58 (1) 110–4. [PubMed: 23993263]
10. Shen W-K, Sheldon RS, Benditt DG, et al. Guideline for the evaluation and management of patients with syncope: A report of the American College of Cardiology/American Heart

Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. J Am Coll Cardiol. 2017; 70 (5) e39–e110. [PubMed: 28286221]

11. Del Rosso A, Ungar A, Maggi R, et al. Clinical predictors of cardiac syncope at initial evaluation in patients referred urgently to a general hospital: the EGSYS score. Eur Heart J. 2008; 94 (12) 1620–6.
12. Brown CJ, Redden DT, Flood KL, Allman RM. The underrecognized epidemic of low mobility during hospitalization of older adults. J Am Geriatr Soc. 2009; 57 (9) 1660–5. [PubMed: 19682121]
13. Lyketsos CG. Dementia in elderly persons in a general hospital. Am J Psychiatry. 2000; 157 (5) 704–7. [PubMed: 10784461]
14. Pedone C, Ercolani S, Catani M, et al. Elderly patients with cognitive impairment have a high risk for functional decline during hospitalization: The GIFA Study. J Gerontol A Biol Sci Med Sci. 2005; 60 (12) 1576–80. [PubMed: 16424291]
15. Mecocci P, Strauss von E, Cherubini A, et al. Cognitive impairment is the major risk factor for development of geriatric syndromes during hospitalization: Results from the GIFA study. Dement Geriatr Cogn Disord. 2005; 20 (4) 262–9. [PubMed: 16103670]
16. Fong TG, Jones RN, Marcantonio ER, et al. Adverse outcomes after hospitalization and delirium in persons with Alzheimer disease. Ann Intern Med. 2012; 156 (12) 848–U121. [PubMed: 22711077]
17. Cole MG, Bailey R, Bonnycastle M, et al. Partial and no recovery from delirium in older hospitalized adults: Frequency and baseline risk factors. J Am Geriatr Soc. 2015; 63 (11) 2340–8. [PubMed: 26515438]
18. Tropea J, LoGiudice D, Liew D, Gorelik A, Brand C. Poorer outcomes and greater healthcare costs for hospitalised older people with dementia and delirium: a retrospective cohort study. Int J Geriatr Psychiatry. 2016; 32 (5) 539–47. [PubMed: 27114271]
19. Sirois M-J, Émond M, Ouellet M-C, et al. Cumulative incidence of functional decline after minor injuries in previously independent older Canadian individuals in the emergency department. J Am Geriatr Soc. 2013; 61 (10) 1661–8. [PubMed: 24117285]
20. Kaldjian LC, Shinkunas LA, Bern-Klug M, Schultz SK. Dementia, goals of care, and personhood: a study of surrogate decision makers' beliefs and values. Am J Hosp Palliat Care. 2010; 27 (6) 387–97. [PubMed: 20167835]
21. Volandes AE, Paasche-Orlow MK, Barry MJ, et al. Video decision support tool for advance care planning in dementia: randomised controlled trial. BMJ. 2009; 338: b2159. [PubMed: 19477893]
22. Mitchell SL, Teno JM, Kiely DK, et al. The clinical course of advanced dementia. N Engl J Med. 2009; 361 (16) 1529–38. [PubMed: 19828530]
23. Mitchell SL, Palmer JA, Volandes AE, Hanson LC, Habtemariam D, Shaffer ML. Level of care preferences among nursing home residents with advanced dementia. J Pain Symptom Manage. 2017; 54 (3) 340–5. [PubMed: 28797857]
24. Ungar A, Del Rosso A, Giada F, et al. Early and late outcome of treated patients referred for syncope to emergency department: the EGSYS 2 follow-up study. Eur Heart J. 2010; 31 (16) 2021–6. [PubMed: 20167743]
25. Nishijima DK, Laurie AL, Weiss RE, et al. Reliability of clinical assessments in older adults with syncope or near syncope. Acad Emerg Med. 2016; 23 (9) 1014–21. [PubMed: 27027730]
26. Wilding L, Eagles D, Molnar F, et al. Prospective validation of the Ottawa 3DY Scale by geriatric emergency management nurses to identify impaired cognition in older emergency department patients. Ann Emerg Med. 2016; 67 (2) 157–63. [PubMed: 26607333]
27. Carpenter CR, Bassett ER, Fischer GM, Shirshekan J, Galvin JE, Morris JC. Four sensitive screening tools to detect cognitive dysfunction in geriatric emergency department patients: brief Alzheimer's Screen, Short Blessed Test, Ottawa 3DY, and the caregiver-completed AD8. Acad Emerg Med. 2011; 18 (4) 374–84. [PubMed: 21496140]
28. Morris JC. The Clinical Dementia Rating (CDR): current version and scoring rules. Neurology. 1993; 43 (11) 2412–4.
29. Bradford A, Kunik ME, Schulz P, Williams SP, Singh H. Missed and delayed diagnosis of dementia in primary care: prevalence and contributing factors. Alzheimer Dis Assoc Disord. 2009; 23 (4) 306–14. [PubMed: 19568149]

30. Carpenter CR, DesPain B, Keeling TN, Shah M, Rothenberger M. The Six-Item Screener and AD8 for the detection of cognitive impairment in geriatric emergency department patients. Ann Emerg Med. 2011; 57 (6) 653–61. [PubMed: 20855129]
31. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977; 33 (1) 159–74. [PubMed: 843571]
32. Nishijima DK, Lin AL, Weiss RE, et al. ECG predictors of cardiac arrhythmias in older adults with syncope. Ann Emerg Med. 2017.
33. Berecki-Gisolf J, Sheldon A, Wieling W, et al. Identifying cardiac syncope based on clinical history: A literature-based model tested in four independent datasets. Eur Heart J. 2013; 8 (9) e75255.
34. Sun BC, Derose SF, Liang L-J, et al. Predictors of 30-day serious events in older patients with syncope. Eur Heart J. 2009; 54 (6) 769–778. e1–5.
35. Costantino G, Perego F, Dipaola F, et al. Short- and long-term prognosis of syncope, risk factors, and role of hospital admission: results from the STePS (Short-Term Prognosis of Syncope) study. Eur Heart J. 2008; 51 (3) 276–83.
36. Colivicchi F, Ammirati F, Melina D, et al. Development and prospective validation of a risk stratification system for patients with syncope in the emergency department: the OESIL risk score. Eur Heart J. 2003; 24 (9) 811–9. [PubMed: 12727148]
37. Gill TM, Allore HG, Gahbauer EA, Murphy TE. Change in disability after hospitalization or restricted activity in older persons. JAMA. 2010; 304 (17) 1919–28. [PubMed: 21045098]
38. Fick DM, Steis MR, Waller JL, Inouye SK. Delirium superimposed on dementia is associated with prolonged length of stay and poor outcomes in hospitalized older adults. J Hosp Med. 2013; 8 (9) 500–5. [PubMed: 23955965]
39. Gross AL, Jones RN, Habtemariam DA, et al. Delirium and long-term cognitive trajectory among persons with dementia. Arch Intern Med. 2012; 172 (17) 1324–31. [PubMed: 23403619]
40. Ahmed S, Leurent B, Sampson EL. Risk factors for incident delirium among older people in acute hospital medical units: a systematic review and meta-analysis. Age Ageing. 2014; 43 (3) 326–33. [PubMed: 24610863]
41. Sun BC, Emond JA, Camargo CA Jr. Direct medical costs of syncope-related hospitalizations in the United States. Am J Cardiol. 2005; 95 (5) 668–71. [PubMed: 15721118]
42. Bogardus ST, Bradley EH, Tinetti ME. A taxonomy for goal setting in the care of persons with dementia. J Gen Intern Med. 1998; 13 (10) 675–80. [PubMed: 9798814]
43. Bradley EH, Bogardus ST, Tinetti ME, Inouye SK. Goal-setting in clinical medicine. Soc Sci Med. 1999; 49 (2) 267–78. [PubMed: 10414834]
44. Brett AS. Limitations of listing specific medical interventions in advance directives. JAMA. 1991; 266 (6) 825–8. [PubMed: 1865521]
45. Hogan TM, Richmond NL, Carpenter CR, et al. Shared decision making to improve the emergency care of older adults: A research agenda. Acad Emerg Med. 2016; 23 (12) 1386–93. [PubMed: 27561819]
46. Kaldjian LC. Teaching practical wisdom in medicine through clinical judgment, goals of care, and ethical reasoning. J Med Ethics. 2010; 36 (9) 558–62. [PubMed: 20817821]
47. Stacey D, Legare F, Col NF, et al. Decision aids for people facing health treatment or screening decisions. Cochrane Database Syst Rev. 2014; (1) CD001431. [PubMed: 24470076]
48. Hess EP, Knoedler MA, Shah ND, et al. The chest pain choice decision aid: a randomized trial. Circ Cardiovasc Qual Outcomes. 2012; 5 (3) 251–9. [PubMed: 22496116]
49. Stacey D, Légaré F, Lewis KB. Patient decision aids to engage adults in treatment or screening decisions. JAMA. 2017; 318 (7) 657–8. [PubMed: 28810006]
50. Kanzaria HK, Booker-Vaughns J, Itakura K, et al. Dissemination and implementation of shared decision making into clinical practice: A research agenda. Acad Emerg Med. 2016; 23 (12) 1368–79. [PubMed: 27561951]
51. Conley J, O'Brien CW, Leff BA, Bolen S, Zulman D. Alternative strategies to inpatient hospitalization for acute medical conditions: A systematic review. JAMA Intern Med. 2016; 176 (11) 1693–702. [PubMed: 27695822]

52. Boyé NDA, van der Velde N, de Vries OJ, et al. Effectiveness of medication withdrawal in older fallers: results from the Improving Medication Prescribing to reduce Risk Of FALLs (IMPROveFALL) trial. Age Ageing. 2017; 46 (1) 142–6. [PubMed: 28181639]

53. Dy SM. Instruments for evaluating shared medical decision making - A structured literature review. Med Care Res Rev. 2007; 64 (6) 623–49. [PubMed: 17804824]

Table 1

Baseline Study Cohort Characteristics

Characteristic	Overall (N=279)	Discharged from ED (n=58)	Admitted to Hospital (n=221)	P Value
Age (mean, SD)	79.9 (9.2)	79.5 (9.8)	80.1 (9.0)	0.70
Gender (n, %)				
Male	127 (45.5)	24 (41.4)	103 (46.6)	0.57
Female	152 (54.5)	34 (58.6)	118 (53.4)	
Race				
White	243 (87.1)	51 (87.9)	192 (86.9)	0.35
Black	28 (10.0)	4 (6.9)	24 (10.9)	
Other	8 (2.9)	3 (5.2)	5 (2.3)	
Ethnicity				
Latin or Hispanic origin	7 (2.5)	1 (1.7)	6 (2.7)	1
Presentation				
Syncope	188 (67.4)	36 (62.1)	152 (68.8)	0.42
Near-syncope	91 (32.6)	22 (37.9)	69 (31.2)	
Syncope in previous year	121 (43.4)	24 (41.4)	97 (43.9)	0.85
Comorbidities				
Coronary artery disease	77 (27.6)	10 (17.2)	67 (30.3)	0.07
Heart failure	39 (14.0)	5 (8.6)	34 (15.4)	0.27
Aortic stenosis	16 (5.7)	4 (6.9)	12 (5.4)	0.91
Structural heart disease (other)	28 (10.0)	7 (12.1)	21 (9.5)	0.74
Arrhythmia	82 (29.4)	22 (37.9)	60 (27.1)	0.15
Transient ischemic attack or stroke	60 (21.5)	14 (24.1)	46 (20.8)	0.71
Seizure disorder	7 (2.5)	5 (8.6)	2 (0.9)	0.004
Diabetes mellitus	74 (26.5)	9 (15.5)	65 (29.4)	0.05
Hypertension	174 (62.4)	32 (55.2)	142 (64.3)	0.26
Chronic kidney disease	41 (14.7)	6 (10.3)	35 (15.8)	0.40
Peripheral vascular disease	21 (7.5)	1 (1.7)	20 (9.0)	0.11
Medications				
Diuretic	63 (24.5)	10 (18.9)	53 (26.0)	0.37
Beta blocker	106 (40.8)	17 (30.9)	89 (43.4)	0.13
Alpha blocker	18 (7.0)	4 (7.4)	14 (6.9)	1
Nitrate	18 (7.1)	0 (0.0)	18 (9.0)	0.05
Antiarrhythmic	11 (4.4)	3 (5.8)	8 (4.0)	0.86
Calcium channel blocker	45 (17.6)	8 (15.1)	37 (18.3)	0.73
Prodromal symptoms				
None	110 (39.4)	22 (37.9)	88 (39.8)	0.91
Palpitations	34 (12.2)	3 (5.2)	31 (14.0)	0.11

Characteristic	Overall (N=279)	Discharged from ED (n=58)	Admitted to Hospital (n=221)	P Value
Chest pain	24 (8.6)	6 (10.3)	18 (8.1)	0.79
Dyspnea	63 (24.8)	13 (26.5)	50 (24.4)	0.90
Nausea	60 (21.5)	13 (22.4)	47 (21.3)	0.99
Neurologic	108 (38.7)	23 (39.7)	85 (38.5)	0.99
Situational circumstances				
Exertional	57 (20.4)	13 (22.4)	44 (19.9)	0.81
Positional	75 (26.9)	12 (20.7)	63 (28.5)	0.30
Situational	59 (21.1)	17 (29.3)	42 (19.0)	0.13
Post-prandial	81 (29.0)	19 (32.8)	62 (28.1)	0.59
Positive orthostatic vital signs	27 (24.8)	4 (19.0)	23 (26.1)	0.69
Hemoglobin ≤10	29 (10.4)	1 (1.7)	28 (12.7)	0.03
Blood urea nitrogen:creatinine ratio >20	133 (47.8)	31 (53.4)	102 (46.4)	0.42
Electrocardiogram				
Normal	91 (33.6)	17 (31.5)	74 (34.1)	0.84
Isolated non-specific ST-segment/T-wave abnormality	14 (5.2)	2 (3.7)	12 (5.5)	0.84
Abnormal	166 (61.3)	35 (64.8)	131 (60.4)	0.66

Abbreviations: ED = Emergency Department; SD = Standard deviation

Table 2

Emergency Department Diagnostic Evaluation of Study Cohort

Characteristic	Overall (N=279)	Discharged from ED (n=58)	Admitted to Hospital (n=221)	P Value
Total number of tests (mean, SD)	2.5 (1.3)	1.6 (1.0)	2.7 (1.3)	<0.001
Chest radiograph (n, %)	223 (79.9)	38 (65.5)	185 (83.7)	0.004
Echocardiogram	83 (29.7)	1 (1.7)	82 (37.1)	<0.001
Stress test	4 (1.4)	0 (0.0)	4 (1.8)	0.68
Coronary angiography	2 (0.7)	0 (0.0)	2 (0.9)	1
Holter/event monitor/loop recorder	13 (4.7)	1 (1.7)	12 (5.4)	0.40
Electrophysiology study	0 (0.0)	0 (0.0)	0 (0.0)	1
Tilt-table test	2 (0.7)	0 (0.0)	2 (0.9)	1
Perfusion ventilation chest scan	2 (0.7)	0 (0.0)	2 (0.9)	1
CTA of chest	9 (3.2)	1 (1.7)	8 (3.6)	0.76
CT/CTA of brain	168 (60.2)	31 (53.4)	137 (62.0)	0.30
MRI/MRA of brain	16 (5.7)	0 (0.0)	16 (7.2)	0.07
EEG	6 (2.2)	0 (0.0)	6 (2.7)	0.45
Carotid ultrasound	16 (5.7)	1 (1.7)	15 (6.8)	0.25
Transcranial ultrasound	1 (0.4)	0 (0.0)	1 (0.5)	1
GI endoscopy	7 (2.5)	0 (0.0)	7 (3.2)	0.37
Other	140 (50.4)	20 (34.5)	120 (54.5)	0.01

Abbreviations: ED = Emergency Department; SD = Standard Deviation; CTA = Computer tomography angiogram; CT = Computed tomography; MRI = Magnetic resonance imaging; MRA = Magnetic resonance angiography; EEG = Electroencephalogram; GI = Gastrointestinal

Table 3

Hospital Management of Study Cohort

Characteristic	Overall (N=221)
Admission status (n, %)	
Inpatient	140 (63.3)
Observation	81 (36.7)
Hospital length of stay (median, IQR)	2.1 [1.1, 4.2]
Consultations	
Cardiology	65 (29.4)
Electrophysiology	16 (7.2)
Neurology	37 (16.7)
Gastroenterology	12 (5.4)
Other	78 (35.3)
Treatment	
Blood transfusion	19 (8.6)
Thrombolytic therapy	0 (0.0)
Device (pacemaker/ICD)	6 (2.7)
PCI	2 (0.9)
CABG	0 (0.0)
Valve replacement	0 (0.0)
Other procedure	19 (8.7)
Medication change	91 (41.2)

Abbreviations: IQR = Interquartile range; ICD = Implantable cardiac defibrillator; PCI = Percutaneous coronary intervention; CABG = Coronary artery bypass grafting

Table 4

Emergency Department and 30-day Outcomes for Discharged Patients

	Timing of Outcome		
Characteristic	**Overall (N=58)**	**In Emergency Department**	**30-days Post-Discharge**
Serious Conditions Related to Syncope (n, %) *	4 (6.9)	4 (6.9)	0 (0.0)
Arrhythmia **	1 (1.7)	1 (1.7)	0 (0.0)
Sick sinus disease	1 (1.7)	1 (1.7)	0 (0.0)
Cardiopulmonary resuscitation	1 (1.7)	1 (1.7)	0 (0.0)
Recurrent syncope/fall resulting in major traumatic injury	1 (1.7)	1 (1.7)	0 (0.0)
Other	1 (1.7)	1 (1.7)	0 (0.0)
Death			
All-cause	1 (1.7)	1 (1.7)	0 (0.0)
Syncope-related	0 (0.0)	0 (0.0)	0 (0.0)
Cardiac-related	0 (0.0)	0 (0.0)	0 (0.0)

* No patients experienced myocardial infarction, new structural heart disease, stroke, pulmonary embolism, aortic dissection, spontaneous subarachnoid hemorrhage, or internal hemorrhage/anemia requiring transfusion.

** No patients experienced ventricular fibrillation, ventricular tachycardia >30 seconds, symptomatic ventricular tachycardia <30 seconds, sinus pause >3 seconds, Mobitz type II atrioventricular heart block, complete heart block, symptomatic supraventricular tachycardia, symptomatic bradycardia, or pacemaker or implantable cardiac defibrillator malfunction.

Table 5

Emergency Department and 30-day Outcomes for Hospitalized Patients

		Timing of Outcome		
Characteristic	**Overall (N=221)**	**In Emergency Department (n=221)**	**During Hospitalization (n=179)***	**30-days Post-Discharge (n=179)***
Serious Conditions Related to Syncope (n, %)**	68 (30.8)	42 (19.0)	14 (7.8)	12 (6.7)
Arrhythmia***	13 (5.9)	11 (5.0)	2 (1.1)	0 (0.0)
Symptomatic ventricular tachycardia (<30 seconds)	1 (0.5)	1 (0.5)	0 (0.0)	0 (0.0)
Sick sinus disease	2 (0.9)	1 (0.5)	1 (0.6)	0 (0.0)
Complete heart block	2 (0.9)	2 (0.9)	0 (0.0)	0 (0.0)
Symptomatic supraventricular tachycardia	6 (2.7)	5 (2.3)	1 (0.6)	0 (0.0)
Symptomatic bradycardia	2 (0.9)	2 (0.9)	0 (0.0)	0 (0.0)
Myocardial infarction	4 (1.8)	1 (0.5)	2 (1.1)	1 (0.6)
Structural heart disease (new)	2 (0.9)	0 (0.0)	2 (1.1)	0 (0.0)
Stroke	4 (1.8)	0 (0.0)	2 (1.1)	2 (1.1)
Pulmonary embolism	4 (1.8)	3 (1.4)	1 (0.6)	0 (0.0)
Cardiopulmonary resuscitation	1 (0.5)	0 (0.0)	0 (0.0)	1 (0.6)
Internal hemorrhage/anemia requiring transfusion	12 (5.4)	8 (3.6)	3 (1.7)	1 (0.6)
Recurrent syncope/fall resulting in major traumatic injury	2 (0.9)	0 (0.0)	0 (0.0)	2 (1.1)
Other	26 (11.8)	19 (8.6)	2 (1.1)	5 (2.8)
Death				
All-cause	6 (2.7)			
Syncope-related	0 (0.0)			
Cardiac-related	0 (0.0)			

*Refers to the number of patients who were admitted to the hospital without a serious condition identified in the emergency department

**No patients experienced aortic dissection or spontaneous subarachnoid hemorrhage.

***No patients experienced ventricular fibrillation, ventricular tachycardia >30 seconds, sinus pause >3 seconds, Mobitz type II atrioventricular heart block, or pacemaker or implantable cardiac defibrillator malfunction.