

## 30-Day Emergency Department Revisit Rates among Older Adults with Documented Dementia

Tyler Kent, BS,\* Adriane Lesser, MS,\* Juhi Israni, MS,\* Ula Hwang, MD, MPH,<sup>†</sup>  
Christopher Carpenter, MD, MS,<sup>‡</sup> and Kelly J. Ko, PhD\*

**OBJECTIVES:** Published literature on national emergency department (ED) revisit rates among older adults with dementia is sparse, despite anecdotal evidence of higher ED utilization. Thus we evaluated the odds ratio (OR) of 30-day ED revisits among older adults with dementia using a nationally representative sample.

**DESIGN:** We assessed the frequency of claims associated with a 30-day ED revisit among Medicare beneficiaries with and without a dementia diagnosis before or at index ED visit. We used a logistic regression model controlling for dementia, age, sex, race, region, Medicaid status, transfer to a skilled nursing facility after ED, primary care physician use 12 months before index, and comorbidity.

**SETTING:** A nationally representative sample of claims data for Medicare beneficiaries aged 65 and older who maintained continuous fee-for-service enrollment during 2015 and 2016. Only outpatient claims associated with an ED visit between January 2016 and November 2016 were included as a qualifying index encounter.

**PARTICIPANTS:** We identified 240 249 patients without dementia and 54 622 patients for whom a dementia code was recorded in the year before the index encounter in 2016.

**RESULTS:** Our results indicate a significant difference in unadjusted 30-day ED revisit rates among those with an ED dementia diagnoses (22.0%) compared with those without (13.9%). Our adjusted results indicated that dementia is a significant predictor of 30-day ED revisits ( $P < .0001$ ). Those with a dementia diagnosis at or before the index ED visit were

more likely to have experienced an ED revisit within 30 days (OR = 1.27; 95% confidence interval = 1.24-1.31).

**CONCLUSION:** Dementia diagnoses were a significant predictor of 30-day ED revisits. Further research should assess potential reasons why dementia is associated with markedly higher revisit rates, as well as opportunities to manage and transition dementia patients from the ED back to the community more effectively. *J Am Geriatr Soc* 00:1-6, 2019.

**Key words:** dementia; emergency; revisits; geriatric

Dementia is a progressive condition that includes a number of possible diagnoses, with Alzheimer's disease (AD) the most common (estimated 60%-80% of cases).<sup>1</sup> Most AD cases in the United States occur in older adults; 5.3 of the 5.5 million people living with AD in 2017 were 65 years or older, accounting for roughly 10% of all older adults 65 years and older.<sup>1</sup> As the nation's older adult population grows, the number of those living with AD is projected to increase markedly, to an estimated 7.1 million in 2021 and 13.8 million in 2050, assuming no major breakthroughs in curing AD.<sup>1</sup>

Such a dramatic increase would impact many facets of the healthcare system including the emergency department (ED). Specifically, older adults with dementia visit the ED at a higher rate than older adults without dementia,<sup>2,3</sup> and some studies suggested dementia is independently associated with a higher rate of potentially avoidable ED visits and admissions.<sup>4,5</sup> According to one study that surveyed caregivers, 30% of community-dwelling dementia patients had experienced at least one ED visit in the past 3 months, most of which were reportedly avoidable including urinary tract infections and injuries related to falls.<sup>6</sup> Another study determined that 47% of people with dementia living long term at nursing facilities had one or more ED visits in the past year.<sup>7</sup> In this study, comorbidities, age, race, do-not-resuscitate status, and prior hospital admissions were all positively associated with earlier time to first ED visit.

From the \*The Gary and Mary West Health Institute, La Jolla, California; <sup>†</sup>Department of Emergency Medicine, Icahn School of Medicine at Mount Sinai, New York, New York; and the <sup>‡</sup>Washington University Division of Emergency Medicine, Washington University School of Medicine in St. Louis, St. Louis, Missouri.

Address correspondence to T. Kent, BS, The Gary and Mary West Health Institute, West Health Institute, 10350 N. Torrey Pines Rd., La Jolla, CA 92037. E-mail: tkent@westhealth.org

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In 2013, the US Department of Health and Human Services (HHS) launched the National Plan to Address Alzheimer's Disease, with reducing potentially avoidable ED visits as a top priority.<sup>8</sup> The 2013 report commissioned by HHS leveraged Medicare claims to examine ED use among those living with AD and related disorders, finding more than 950 000 ED visits that "may have been prevented with better primary care in community settings or treatment in a nursing home (for nursing home residents)."<sup>9</sup>

ED visits among dementia patients are of concern for several reasons. First, the ED can be a disorienting and distressing environment, especially for older adults with dementia.<sup>8</sup> Second, patients with dementia are also more likely to be admitted compared with older adults without dementia,<sup>2</sup> have a lower survival rate following an ED visit,<sup>2</sup> and are more likely to experience negative outcomes tied to ED visits and hospital utilization (eg, falls, clinical complications, discharge to skilled nursing facilities [SNFs]).<sup>9-11</sup> Third, ED revisits are often costly for patients and their families, the health system, and the federal government. In fact, prior research demonstrated that ED visits and hospitalizations for community-dwelling dementia patients are also more expensive on average<sup>12</sup> because potentially avoidable ED use and hospitalization constitute a sizable proportion (eg, hospitalization accounted for 54% of costs) of higher Medicare expenditures among dementia patients.<sup>5</sup>

Although prior research has extensively examined ED visit rates among older adults,<sup>13-18</sup> far less is known about ED revisit rates among older adults with dementia. One of the few studies on the topic<sup>2</sup> found dementia patients were more than twice as likely to revisit the ED within 30 days of a prior visit compared with older adults without dementia, before adjusting for several covariates.<sup>2</sup> However, this study was done within a specific geographic region in a single health system. ED revisit rates among dementia patients on a national level have not been examined. To address this gap, we evaluated odds ratios (ORs) of 30-day ED revisits among a nationally representative sample of fee-for-service Medicare beneficiaries aged 65 years and older with a dementia diagnosis at or before index ED visit, compared with beneficiaries without a dementia diagnosis.

## METHODS

### Study Design and Data Source

Our study was a retrospective analysis of a sample of all available national claims-level data from 2015 to 2016. We analyzed data from the Centers for Medicare & Medicaid Services (CMS) Research Data Assistance Center's (ResDAC) 5% sample limited data set that includes claims from older adults enrolled in traditional Medicare plans (ie, Plans A and B). CMS data are one of the richest sources of national utilization information with sizable samples, documented procedures and diagnoses, verified deaths, beneficiary demographic information, and revenue center details.

This study adheres to the Reporting of Studies Conducted Using Observational Routinely Collected Health Data (RECORD) statement that provides guidelines for conducting studies using existing health data (Supplementary Table S1 shows a RECORD checklist). We had full access to the database population used to create the study population.

### Conceptual Model

We identified independent variables for inclusion in our regression equation through developing a conceptual model that draws on Andersen's behavioral model of health services use<sup>19-21</sup> and additional frameworks on both dementia and health services use in the Medicare claims data literature.<sup>22-25</sup> This hybrid approach incorporates the traditional categories that are hallmarks of Andersen's model (ie, predisposing characteristics, enabling characteristics, and need characteristics) while leveraging proxy indicators to reconcile with the limitations of Medicare claims data that lack a full range of detailed information on socioeconomic, behavioral, and environmental factors.

Based on this approach, predisposing characteristics therefore included race, age, sex, and geographic region. Enabling characteristics included Medicaid dual eligibility and having a claim associated with a visit to a primary care provider in the past 12 months. Need characteristics included a modified Charlson Comorbidity Score, discharge to an SNF from initial index ED encounter, and dementia diagnosis between January 2015 and a patient's first ED encounter in 2016.

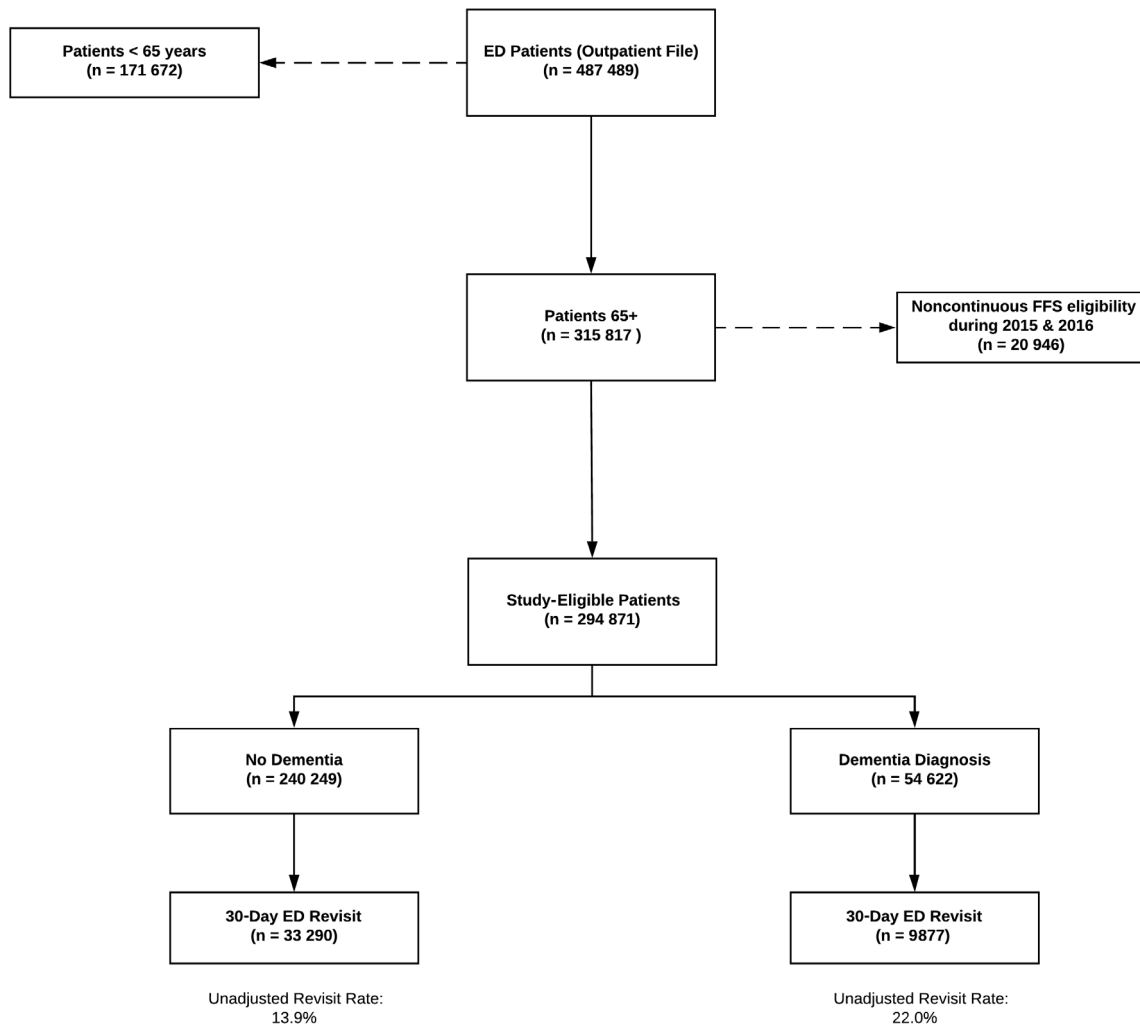
### Inclusion Criteria

To be considered for inclusion in our study, we looked at all claims for patients 65 years of age and older with continuous fee-for-service Medicare enrollment throughout the entirety of 2015 and 2016. Only outpatient claims associated with an ED visit based on revenue center codes (0450-0459, 0981, 0760, 0761, 0762)<sup>26</sup> were included as qualifying encounters. Once inclusion criteria were applied, we had a total of 294 871 patients for our analyses. Figure 1 shows the inclusion and exclusion criteria.

### Cohort Selection

For our study, we compared two cohorts: a dementia cohort and a comparison group of beneficiaries without dementia (ie, no-dementia group). The groups were constructed as follows:

**Dementia Cohort.** Only outpatient claims associated with an ED visit between January and November 2016 were included as a qualifying index encounter. Of the 294 871 eligible patients, dementia was identified across the entire claim history based on the presence of any claim during 2015 up until the index encounter in 2016 that included *International Classification of Diseases* (ICD)-9 or ICD-10 diagnosis codes as outlined in the chronic conditions warehouse list of dementia codes (331.0, 331.11, 331.19, 331.2, 331.7, 290.0, 290.10, 290.11, 290.12, 290.13, 290.20, 290.21, 290.3, 290.40, 290.41, 290.42, 290.43, 294.0, 294.10, 294.11, 294.20, 294.21, 294.8, 797, F01.50, F01.51, F02.80, F02.81, F03.90, F03.91, F04, G13.8, F05, F06.1, F06.8, G30.0, G30.1, G30.8, G30.9, G31.1, G31.2, G31.01, G31.09, G94, R41.81, R54).<sup>27</sup> We limited dementia diagnoses to claims where at least one of these codes was documented at least once, at which point the patient was flagged for inclusion to the dementia cohort. Index visit was defined as the first outpatient ED claim in 2016. Using these methods, we identified a total of 54 622 qualifying patients with a dementia diagnosis and index ED claim.



**Figure 1.** Inclusion criteria. ED, emergency department; FFS, fee for service.

**No-Dementia Cohort.** The no-dementia group consisted of patients with no dementia diagnosis (via the ICD-9 or ICD-10 diagnoses codes previously outlined) present during all of 2015 and 2016. The index encounter for this group was also determined by including the first eligible outpatient ED visit during 2016. Of the eligible 294 871 patients, a total of 240 249 patients without dementia were selected for our no-dementia group.

### ED Revisits

We classified an ED revisit as a subsequent ED visit for any reason within 30 days following the index encounter. If an index visit had at least one additional ED visit within 30 days for any reason, it was classified as a revisit.

The unit of analysis for the study was at the patient level. Once ED revisit criteria were applied, the dementia cohort included a total of 9877 patients who had a 30-day ED revisit following the index encounter, and our no-dementia group included 33 290 patients with 30-day ED revisits for inclusion in the final analysis.

### Outcome Measures

Our primary outcome measure was 30-day all-cause ED revisits. Using this outcome measure, we then compared the

proportion of 30-day all-cause ED revisits between those that did, and did not, have a dementia diagnosis between 2015 and first ED visit in 2016 (ie, the index encounter).

### Secondary Measures

Once the index encounter was determined in both cohorts, we calculated utilization metrics for the 12 months before the index visit to gain insight into annual utilization patterns. We looked at the average number of ED visits and the average number of primary care physician (PCP) visits. ED visits were identified using the same methodology mentioned earlier, using the same revenue center codes. PCP visits were determined by using the Provider Specialty code found on institutional carrier file (Medicare Part B) claims (codes 11, 08, 01, 38, 50, 35, 97, 25), as determined by a practicing physician.

### Statistical Methods

All statistical analyses were conducted with SAS Studio, v.3.71. We examined unadjusted and adjusted differences in proportion of patients experiencing an ED revisit within 30 days of the index visit. For our unadjusted results, we used the Pearson  $\chi^2$  test to compare revisits for both groups. Our adjusted analysis used a logistic regression model to control for potential

covariates such as beneficiary age, sex, race, region, Medicaid status (as a proxy for economic status), transfer to an SNF after ED, PCP use 12 months before index, and comorbidity. Model fit statistics including R-squared and Akaike information criterion were used in establishing the model.

To address comorbidity, we calculated a Charlson Comorbidity Index score for each beneficiary with a qualifying index claim. The Charlson score is constructed by assessing whether certain high-acuity conditions appear as a diagnosis within the patient's record during a given historical period (often 1 year prior). Several variations of the score exist based on varying definitions and applications. For this analysis, we calculated a weighted Charlson score based on the Deyo scale.<sup>28</sup> For each claim, the Charlson score was calculated based on information from any claims that occurred within the 12 months before the index visit. Because the Charlson score takes dementia diagnosis into consideration, we removed it from our calculation so we would not bias the dementia cohort with higher Charlson scores. Variables were chosen based on the conceptual model as described earlier. A total of eight patients had missing data for the elements specified in the model and thus were excluded from the model.

## RESULTS

### Demographics and Unadjusted Results

Of the identified 294 871 patients who met the inclusion criteria, 240 249 (81.5%) were patients *without* documented dementia, and 54 622 (18.5%) were patients for whom a dementia code was recorded at the index ED encounter.

Overall unadjusted 30-day ED revisits for those without an ED dementia diagnosis was 33 290 (13.9%); the 30-day ED revisit rate for those with dementia was 9877 (22.0%). A  $\chi^2$  analysis of our unadjusted results demonstrate a significant difference in revisit rates between the dementia and nondementia cohort at 30 days ( $P < .0001$ ).

The mean age of those with a dementia diagnosis was older (81.7 y) compared with the no-dementia group (75.6 y). Most patients in both groups were women (58.5% in the no-dementia group and 64.0% in the dementia group). Those without dementia had an average Charlson score of 3.52 compared with 2.66 in the dementia cohort, indicating a higher prevalence of comorbid conditions in those with documented dementia.

### Adjusted Results

The results of our logistic regression model are presented in Table 1. Even after controlling for beneficiary age, sex, race, region, Medicaid status (as a proxy for economic status), transfer to an SNF after ED, PCP use 12 months before index, and comorbidity, having a diagnosis of dementia before or during the index visit was associated with a significantly higher likelihood of an all-cause ED revisit within 30 days (OR = 1.27; 95% confidence interval = 1.24-1.31;  $P < .0001$ ) compared with those patients who did not receive a dementia diagnosis.

For region, the reference category was the Midwest (to be consistent with prior research on ED revisit rates and dementia patients). For race, the reference category was white. Each incremental increase in Charlson score and age

**Table 1. 30-Day Emergency Department Revisit Adjusted Results**

	Estimate	Odds ratio (95% CI)	P value
(Intercept)	-2.54		<.0001
Dementia diagnosis before or at index	.24	1.27 (1.23-1.30)	<.0001
Discharge to SNF from ED	-.25	.77 (.71-.85)	<.0001
Primary care utilization 12 mo before Index	.02	1.02 (.98-1.06)	.181
Comorbidity	.05	1.06 (1.05-1.06)	<.0001
Medicaid dual eligible	.23	1.26 (1.22-1.29)	<.0001
Age	.00	1.00 (1.00-1.00)	<.0001
Sex: male	.09	1.09 (1.07-1.11)	<.0001
Region (Reference level: Midwest)			
Northeast	-.12	.87 (.85-.90)	<.0001
Southeast	-.09	.90 (.88-.93)	<.0001
Southwest	.04	.95 (.92-.99)	.021
West	.00	1.0 (.96-1.03)	.928
American Samoa	.75	2.13 (.59-7.68)	.247
Guam	.40	1.50 (.72-3.12)	.276
Race (Reference level: white)			
Asian	-.29	.74 (.67-.82)	<.0001
Black	-.09	.90 (.87-.94)	<.0001
Hispanic	-.21	.80 (.73-.88)	<.0001
North American Native	.134	1.14 (1.00-1.30)	.049
Other	-.189	.82 (.74-.91)	.000
Unknown	-.207	.81 (.71-.92)	.001

Abbreviations: CI, confidence interval; ED, emergency department; SNF, skilled nursing facility.

was associated with increased odds of an ED revisit. Being male or Medicaid dual eligible also increased these odds. Being transferred to an SNF after the index ED visit was associated with a lower likelihood of an ED revisit, as well as living in the Northeast, Southeast, or Southwest (when compared with the Midwest). Having a race designation of Asian, Black, Hispanic, other, or unknown was associated with a lower likelihood of an ED revisit, whereas being North American Native was associated with a higher likelihood (when compared with being white).

### Annual Utilization

The mean utilization of ED visits and PCP visits during the year before index for a patient in the dementia cohort was also higher in comparison with the nondementia cohort (ED = 2.26 vs 1.09; PCP = 15.33 vs 9.48, respectively) (Table 2).

## DISCUSSION

Our findings from an analysis of national claims data indicate that patients with a diagnosis of dementia in the ED are associated with an increase in likelihood of ED revisits within 30 days of the initial encounter. In particular, a dementia diagnosis in the ED was associated with a higher likelihood of an ED revisit even after controlling for known factors associated with increased ED revisits such as comorbidity, age, and sex. These results are consistent with prior

**Table 2. 30-Day Emergency Department Revisits: Unadjusted Results**

Characteristics	No dementia	Dementia
Total	240 249 (100)	54 622 (100)
All-cause ED revisits		
30 d	33 290 (13.9)	9877 (22.0)
Mean count of revisits among those with at least one	1.31	1.32
Age, y		
65-74	123 014 (51.2)	11 478 (21.0)
75-84	83 258 (34.7)	21 446 (39.3)
≥85	33 977 (14.1)	21 698 (39.7)
Mean age, y	75.6	81.7
Sex		
Female	140 603 (58.5)	34 983 (64.0)
Male	99 646 (41.5)	19 639 (36.0)
Race		
White	207 593 (86.4)	46 648 (85.4)
Asian	2918 (1.2)	678 (1.2)
Black	19 969 (8.3)	5304 (9.7)
Hispanic	3278 (1.4)	985 (1.8)
North American Native	1244 (.5)	246 (.5)
Other	2937 (1.2)	572 (1.1)
Unknown	2310 (1.0)	189 (.4)
Modified CCI scores (no dementia)		
None (0)	53 763 (22.4)	6685 (12.2)
1	47 977 (20.0)	8743 (16.0)
2	38 708 (16.1)	8375 (15.3)
3	30 635 (12.8)	7513 (13.8)
4	20 576 (8.6)	6185 (11.3)
≥5	48 590 (20.2)	17 121 (31.3)
Mean CCI score	2.66	3.52
Dual enrollment status		
Medicaid	32 754 (13.6)	13 625 (24.9)
Utilization during 12 mo before index encounter		
Mean ED visits	1.09	2.26
Mean PCP visits	9.48	15.33
Post ED utilization		
Discharged to SNF from index ED visit	1072 (.5)	2969 (5.4)

Abbreviations: CCI, Charlson Comorbidity Index; ED, emergency department; PCP, primary care physician; SNF, skilled nursing facility.

studies that documented increased use of hospital and acute care services among patients with dementia.

Specifically, LaMantia et al<sup>2</sup> linked claims to electronic medical records to track ED revisit rates among more than 10 000 dementia patients with an index ED visit across 11 centers within a single hospital system in the Midwest. They found that dementia patients were 37% more likely to revisit the ED within 30 days of the index ED visit compared with patients without dementia after adjusting for covariates (OR = 1.37). In our national analyses, we found similar results. Even after adjusting for age, sex, race, region, Medicaid status, transfer to an SNF after the ED, PCP use 12 months before index, and comorbidity, dementia patients were 27% more likely to experience an ED revisit within 30 days (OR = 1.27). In terms of risk differences, this means there were 8.1 excess patients with 30-day ED revisits per

100 patients in the group with a diagnosis of dementia compared with the group without such a diagnosis. Our findings are consistent with the only other known study to address the topic of dementia and ED revisit rates.

Overall, the higher rate of ED revisits among patients with dementia points to the impact of dementia on our nation's healthcare system, specifically the ED. Given the complexity of managing dementia patients coupled with the growing older adult population, proactive identification and management of dementia has broad implications, and it has rightfully received national attention. For example, presence of dementia can impede routine treatment for other comorbid conditions such as coronary artery disease, stroke, kidney disease, chronic obstructive pulmonary disease, cancer, or diabetes because these patients have higher utilization patterns and experience higher costs compared with patients with these conditions but without dementia. However, prior research showed that coordination of medical and community-based services has the potential to improve the quality of care as well as the clinical outcomes associated with people with dementia.<sup>29,30</sup> In this regard, the ED is in a unique position to connect clinical as well as social resources including discussions around goals of care to ensure that management of dementia reflects the patient's wishes.

One area where the ED may play an increased role is the opportunity to place increased emphasis on care transitions for dementia patients. A recent review of the literature found providing enabling resources such as coordination of care improved disease management and reduced ED use among advanced dementia patients.<sup>3</sup> The opportunity for all clinicians, from ED staff to primary care providers, to be engaged partners in care transitions is also in line with national initiatives to improve care coordination for dementia patients such as the National Plan to Address Alzheimer's disease<sup>31</sup> and the Veterans Affairs' "Partners in Dementia Care." Both of these programs demonstrated success in improving the outcomes of dementia patients<sup>32</sup> and caregivers,<sup>33</sup> as well as reducing ED and hospital utilization.<sup>9</sup> Beyond the patient, ED visits for dementia patients are often distressing for their caregivers as well.<sup>34</sup> Thus the ED is also able to serve as a source of information for family caregivers, particularly with regard to educating caregivers on preventable ED visits and community-based resources such as adult day centers and support groups to help manage caregiver strain.<sup>6</sup>

## Limitations

Although we identified a significant association between dementia diagnosis in the ED and ED revisits, our study had several limitations. One key limitation is that dementia is typically underdiagnosed,<sup>35,36</sup> which also means it is likely to be under-coded in claims diagnoses. Given our reliance on claims data only, our results likely underestimate the true burden of dementia among fee-for-service beneficiaries. Furthermore, we were also unable to account for severity of dementia in our analyses,<sup>37</sup> although we know increased symptoms and disability associated with dementia is linked to higher ED visit rates.<sup>3</sup> Additionally, we were unable to determine any causal relationships between a diagnosis of dementia and reason for ED revisit; thus our results only point to the association between dementia and ED revisit rates.

In conclusion, given the growing older adult population and the increase in the number of people living with

dementia, the number of patients presenting with dementia to the ED is likely to increase. Our results using a national data set indicate that dementia patients experience an increased risk of all-cause ED revisits within 30 days following the initial visit. Our research highlights the magnitude of the potential role that EDs can play in connecting patients and caregivers to appropriate medical and social resources for the management of dementia.

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**Conflict of Interest:** The authors have declared no conflicts of interest for this article.

**Author Contributions:** All the authors contributed to the design of the study. Tyler Kent led the data analysis and drafted the methods, results, and limitations sections of the manuscript. Adriane Lesser researched and drafted the introduction and discussion sections of the manuscript. All authors reviewed, revised, and approved the final manuscript.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article.

**Supplementary Table S1.** The RECORD statement – checklist of items, extended from the STROBE statement, that should be reported in observational studies using routinely collected health data.