

**Acute care utilization risk among older adults living undiagnosed or unaware of dementia
Supplementary Information**

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Supplementary Table S1. ICD-9 and ICD-10 codes used to identify dementia

ICD-9 code	Diagnosis
331.00	Alzheimer's disease
331.11	Pick's disease
331.19	Other frontotemporal dementia
331.2	Senile degeneration of brain
331.7	Cerebral degeneration in diseases classified elsewhere
290	Senile dementia, uncomplicated
290.1	Presenile dementia, uncomplicated
290.11	Presenile dementia with delirium
290.12	Presenile dementia with delusional features
290.13	Presenile dementia with depressive features
290.2	Senile dementia with delusional features
290.21	Senile dementia with depressive features
290.3	Senile dementia with delirium
290.4	Vascular dementia, uncomplicated
290.41	Vascular dementia, with delirium
290.42	Vascular dementia, with delusions
290.43	Vascular dementia, with depressed mood
294	Amnesic disorder in conditions classified elsewhere
294.1	Dementia in conditions classified elsewhere without behavioral disturbance
294.11	Dementia in conditions classified elsewhere with behavioral disturbance
294.2	Dementia, unspecified, without behavioral disturbance
294.21	Dementia, unspecified, with behavioral disturbance
294.8	Other persistent mental disorders due to conditions classified elsewhere
797	Senility without mention of psychosis
331.82	Lewy body dementia
331.89	Cerebral degeneration
331.9	Cerebral degeneration
ICD-10 code	
G30.0	Alzheimer's disease with early onset
G30.1	Alzheimer's disease with late onset
G30.8	Other Alzheimer's disease
G30.9	Alzheimer's disease, unspecified
G31.1	Senile degeneration of brain, not elsewhere classified
G31.01	Pick's disease
G31.09	Other frontotemporal dementia
R41.81	Age-related cognitive decline
F01.50	Vascular dementia without behavioral disturbance
F01.51	Vascular dementia with behavioral disturbance
F04	Amnesic disorder due to known physiological condition
F02.80	Dementia in conditions classified elsewhere without behavioral disturbance
F02.81	Dementia in conditions classified elsewhere with behavioral disturbance

F03.90	Dementia, unspecified, without behavioral disturbance
F03.91	Dementia, unspecified, with behavioral disturbance
G94	Other disorders of brain in diseases classified elsewhere
G31.2	Degeneration of nervous system due to alcohol
G13.8	Systemic atrophy primarily affecting central nervous system in other diseases classified elsewhere
F06.8	Other specified mental disorders due to known physiological condition
G31.83	Dementia with Lewy bodies

Supplementary Table S2. Prevention quality indicator conditions examined as potentially preventable hospitalizations

Condition/Quality Indicator
Diabetes short-term complications
Diabetes long-term complications
Chronic obstructive pulmonary disease (COPD) or asthma
Hypertension
Heart failure
Dehydration
Bacterial pneumonia
Urinary tract infection
Uncontrolled diabetes
Lower-extremity amputation among patients with diabetes

ICD-9 codes and details are available at

https://www.qualityindicators.ahrq.gov/Archive/PQI_TechSpec_ICD09_v60.aspx

ICD-10 codes and details are available at

https://www.qualityindicators.ahrq.gov/Archive/PQI_TechSpec_ICD09_v60.aspx

Supplementary Table S3. Risk of acute care utilization among different dementia diagnosis and awareness status groups compared to individuals *without dementia* applying two claim requirement

Outcome	Unadjusted		Adjusted model without dementia severity ¹		Adjusted model with dementia severity ¹	
	Hazard ratio (95% CI)	p-value	Hazard ratio (95% CI)	p-value	Hazard ratio (95% CI)	p-value
Undiagnosed dementia						
All-cause hospitalization	1.40 (1.11, 1.75)	<0.01	1.03 (0.81,1.30)	0.84	0.87 (0.67, 1.11)	0.26
Potentially preventable hospitalization	1.99 (1.35, 2.93)	<0.01	1.15 (0.75, 1.77)	0.52	0.93 (0.60, 1.43)	0.74
ED visit	1.31 (1.05, 1.62)	0.02	1.00 (0.79,1.26)	1.00	1.04 (0.81, 1.32)	0.77
Diagnosed but unaware of dementia						
All-cause hospitalization	2.12 (1.81, 2.47)	<0.01	1.46 (1.24,1.73)	<0.001	1.35 (1.14, 1.60)	<0.01
Potentially preventable hospitalization	2.82 (2.17, 3.67)	<0.01	1.62 (1.22, 2.15)	0.001	1.43 (1.08, 1.89)	0.01
ED visit	1.95 (1.67, 2.28)	<0.01	1.47 (1.24,1.74)	<0.001	1.46 (1.23, 1.73)	<0.01
Diagnosed and aware of dementia						
All-cause hospitalization	2.56 (2.17, 3.03)	<0.01	1.79 (1.48, 2.15)	<0.001	1.43 (1.14, 1.78)	<0.01
Potentially preventable hospitalization	3.20 (2.39, 4.28)	<0.01	1.88 (1.35, 2.60)	<0.01	1.44 (1.02, 2.03)	0.04
ED visit	1.95 (1.62, 2.33)	<0.01	1.43 (1.17,1.75)	<0.001	1.56 (1.23, 1.97)	<0.01

¹. Covariates in adjusted model included age, gender, race, education, baseline Charlson index score, depression, history of seeing regular doctor in year prior, history of hospitalization in year before baseline. Dementia severity covariates included IADL and ADL functional impairment severity and proxy respondent. Adjusted models excluded 163 of 10,260 total observations due to missing covariate data.

Supplementary Table S4. Risk of acute care utilization among older adults undiagnosed or unaware of dementia compared to the *diagnosed and aware* applying two claim requirement

Outcome	Unadjusted		Adjusted model without dementia severity ¹		Adjusted model with dementia severity ¹	
	Hazard ratio (95% CI)	p-value	Hazard ratio (95% CI)	p-value	Hazard ratio (95% CI)	p-value
Undiagnosed dementia						
All-cause hospitalization	0.54 (0.42, 0.71)	<0.01	0.57 (0.43, 0.76)	<0.01	0.61 (0.46, 0.81)	<0.01
Potentially preventable hospitalization	0.62 (0.39, 0.98)	0.04	0.61 (0.38, 0.98)	0.04	0.65 (0.40, 1.04)	0.07
ED visit	0.67 (0.51, 0.88)	<0.01	0.70 (0.53, 0.93)	0.01	0.67 (0.50, 0.89)	0.01
Diagnosed but unaware of dementia						
All-cause hospitalization	0.83 (0.67, 1.03)	0.08	0.82 (0.65, 1.03)	0.08	0.95 (0.74, 1.21)	0.66
Potentially preventable hospitalization	0.88 (0.62, 1.26)	0.49	0.86 (0.59, 1.26)	0.44	0.99 (0.67, 1.46)	0.97
ED visit	1.00 (0.80, 1.26)	0.97	1.03 (0.81, 1.30)	0.82	0.94 (0.72, 1.22)	0.62

¹: Covariates in adjusted model included age, gender, race, education, baseline Charlson index score, depression, history of seeing regular doctor in year prior, history of hospitalization in year before baseline. Dementia severity covariates included IADL and ADL functional impairment severity and proxy respondent. Adjusted models excluded 163 of 10,260 total observations due to missing covariate data.

Supplementary Table S5. Risk of acute care utilization among different dementia diagnosis and awareness status groups compared to individuals *without* dementia based on objective NHATS criteria for dementia

Outcome	Unadjusted		Adjusted model without dementia severity ¹		Adjusted model with dementia severity ¹	
	Hazard ratio (95% CI)	p-value	Hazard ratio (95% CI)	p-value	Hazard ratio (95% CI)	p-value
Undiagnosed dementia						
All-cause hospitalization	1.29 (1.02, 1.64)	0.03	0.98 (0.76, 1.27)	0.88	0.84 (0.64, 1.10)	0.20
Potentially preventable hospitalization	1.81 (1.21, 2.71)	<0.01	1.08 (0.69, 1.69)	0.73	0.89 (0.57, 1.40)	0.62
ED visit	1.15 (0.92, 1.45)	0.23	0.88 (0.69, 1.12)	0.30	0.88 (0.67, 1.14)	0.32
Diagnosed but unaware of dementia						
All-cause hospitalization	2.25 (1.70, 2.97)	<0.01	1.57 (1.17, 2.11)	0.003	1.41 (1.04, 1.91)	0.03
Potentially preventable hospitalization	2.81 (1.83, 4.32)	<0.01	1.45 (0.90, 2.32)	0.13	1.21 (0.75, 1.97)	0.44
ED visit	2.12 (1.62, 2.76)	<0.01	1.49 (1.12, 1.98)	0.006	1.47 (1.10, 1.97)	0.01
Diagnosed and aware of dementia						
All-cause hospitalization	2.56 (2.12, 3.08)	<0.01	1.82 (1.48, 2.24)	<0.001	1.45 (1.11, 1.91)	0.01
Potentially preventable hospitalization	3.02 (2.20, 4.15)	<0.01	1.80 (1.25, 2.59)	0.001	1.41 (0.92, 2.15)	0.12
ED visit	1.60 (1.29, 1.98)	<0.01	1.15 (0.91, 1.45)	0.25	1.19 (0.89, 1.58)	0.24

¹ Covariates in adjusted model included age, gender, race, education, baseline Charlson index score, depression, history of seeing regular doctor in year prior, history of hospitalization in year before baseline. Dementia severity covariates included IADL and ADL functional impairment severity and proxy respondent. Adjusted models excluded 163 of 10,260 total observations due to missing covariate data.

Supplementary Table S6. Risk of acute care utilization among older adults undiagnosed or unaware of dementia compared to the *diagnosed and aware* based on objective NHATS criteria for dementia

Outcome	Unadjusted		Adjusted model without dementia severity ¹		Adjusted model with dementia severity ¹	
	Hazard ratio (95% CI)	p-value	Hazard ratio (95% CI)	p-value	Hazard ratio (95% CI)	p-value
Undiagnosed dementia						
All-cause hospitalization	0.51 (0.38, 0.68)	<0.01	0.54 (0.40, 0.73)	<0.001	0.58 (0.42, 0.80)	<0.01
Potentially preventable hospitalization	0.60 (0.37, 0.98)	0.04	0.60 (0.36, 0.99)	0.05	0.63 (0.37, 1.08)	0.09
ED visit	0.72 (0.53, 0.98)	0.04	0.77 (0.56, 1.05)	0.10	0.74 (0.53, 1.02)	0.07
Diagnosed but unaware of dementia						
All-cause hospitalization	0.88 (0.63, 1.22)	0.45	0.86 (0.61, 1.21)	0.39	0.97 (0.68, 1.38)	0.86
Potentially preventable hospitalization	0.93 (0.56, 1.56)	0.78	0.80 (0.47, 1.37)	0.42	0.86 (0.50, 1.50)	0.60
ED visit	1.32 (0.95, 1.85)	0.10	1.30 (0.92, 1.84)	0.14	1.24 (0.86, 1.80)	0.25

¹ Covariates in adjusted model included age, gender, race, education, baseline Charlson index score, depression, history of seeing regular doctor in year prior, history of hospitalization in year before baseline. Dementia severity covariates included IADL and ADL functional impairment severity and proxy respondent. Adjusted models excluded 163 of 10,260 total observations due to missing covariate data.