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Geriatric Depression Screening and Chief Complaint: What is the Risk for 30- and 90-day Readmission?

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ABSTRACT

Introduction	Readmission to the hospital within 30-days has a high cost and represents a gap in care for older adults. Older adults are at significant risk for depression, particularly given their medical comorbidities and social factors such as isolation due to SARS-CoV-2. Many patients who screen positive for depression may have no known history of depression. This investigation examines the relationship between a positive geriatric depression screen and chief complaint as a function of 30- and 90-day readmission risk.
Methods	We examined the electronic medical record of 329 older adults aged 65 and older from February 1, 2020, to January 31, 2021, with a positive depression screen during an emergency department visit at a Midwest Geriatric Emergency Department. Their admission and final ICD-10 diagnosis coding groups (used as a surrogate to standardize chief complaint), social factors such as marital status, living environment, Orientation-Memory-Concentration Test score, and level of independence, were analyzed and considered as potential contributory factors.
Results	In total, this group of patients was found to have readmission rates reaching 42.6% within 30-days, 61.7% within 90 days, and 22.2% with readmission within both 30- and 90-days. Two diagnosis groups were associated with an increased risk for readmission: (1) endocrine, nutritional, and metabolic diseases had a 1.72-fold increase in odds of 90-day readmission (OR: 1.72, $p=0.03$), and (2) circulatory system diseases had 2.45-fold increased odds for both 30- and 90-day readmission (OR: 2.45, $p=0.02$). Two diagnosis groups were associated with a decreased risk for readmission: (1) mental, behavioral, or neurocognitive disorders had a 57.0% lower odds of 30-day readmission (OR: 0.43, $p=0.01$), and 51.1% for 90-day readmission (OR: 0.49, $p=0.02$) and (2) factors influencing health status or contact with health services had an 88.2% lower odds of 90-day readmission (OR: 0.12, $p=0.02$).
Conclusion	Our results suggest an interplay between a positive depression finding and specific concurrent diagnosis groups increased the risk for 30- and 90-day readmission. These findings support further investigation into the importance of depression identification followed by actions to address social determinants of health that could lower the odds of readmission, specifically with endocrine, nutritional, and metabolic diseases. Emergency providers can better meet the needs of this population by assessing for depression followed by referral protocols.

INTRODUCTION

The incidence of depression in the older adult population continues to increase, as well as the risk for suicide, particularly in men 75 years of age and older (39.9 per 100,000).¹ The Emergency Department (ED) is uniquely positioned to evaluate older adults for depression and suicidal ideation since this population's ED encounters, hospital admissions, and utilization of healthcare resources continue to rise.² National trends show over 38% of older adults utilize emergency medical services resulting in transfer to an ED.³ Given the frequency of an index ED visit or a "bounce back" shortly

after discharge, depression and suicide risk identification using validated tools in the ED with subsequent referrals ensure essential access to appropriate treatment.⁴⁻⁷

Geriatric depression assessment in the ED has value in improving outcomes and identifying previously undiagnosed depression. In one study by Hustey and Smith, 80% of patients screened positive had no previous history of depression.⁸ Moreover, Betz and colleagues discuss a further benefit of mental health evaluation for older adults— identifying those with a positive depression screening who are at risk of self-harm (5.5%).⁹ In another analysis by Schumette et al. (2019), the strongest predictor of admission for patients with suicidal ideation or self-harm were other medical comorbidities.¹⁰ Notably, a study by MacNeil-Vroomen et al. (2019) found significant ED return visits for those with osteo or rheumatoid arthritis and cognitive impairment.¹¹ The authors suggest both may be tied to the neurologic pain network, and the assignment of that pain may have different presentations.¹¹ These studies suggest an association between depression screening, the absence of depression history, and association with other comorbid conditions, underscores the need to investigate their relationship further, particularly given the risk for self-harm.

These relationships are critical to a greater degree given the problems around the mental health of the aging adult population in the SARS-CoV-2 pandemic, which led to in-person gathering limitations, thus increasing rates of anxiety and depression.^{12,13} Powell et al. found that there is an independent association between loneliness and symptom presentation of fatigue, pain, and depression that supported previous relationships between loneliness, cardiovascular disease, and dementia.¹⁴ Loneliness has increased among older adults and contributed to the prevalence of depression, which is not easily remedied or supplemented by many technological methods adopted for social interaction.¹⁵ One study found that increased technological socialization in older adults was associated with increased levels of depression in those with pain. However, this method did improve depressive symptoms in older adults without a chronic pain condition.¹⁶

Given such complexities in the care of older adults, many studies have examined factors to identify prognostic factors of readmission.¹⁷ Some investigations showed significance in 30-day readmission risk due to comorbidities, depression, and hospitalization in the previous three months.¹⁷ However, a prospective study did not find depressive symptoms to be prognostic; age, Charlson comorbidity index, and the number of previous hospitalizations were.¹⁸ These efforts have not reached a consensus on the most prognostic factors for readmission, likely because of the multifactorial nature and complexities in the care of older adults.

Indeed, readmission rates are critical quality-of-care markers as defined by the Centers for Medicare and Medicaid Services. A reduced rate of avoidable readmissions can result from improved communication and care coordination.¹⁹ Given many of the diagnoses associated with the Hospital Readmission Reduction Program (HRRP), and the known association between chronic disease and depression in older adults, consideration of a compounding depression with a chronic condition may assist in determining readmission risk.^{18,20} Furthermore, regardless of reimbursement implications, readmission is expensive.²¹ An analysis of one-year Medicare spending was \$35,465 per patient not readmitted, while a 30-day readmission led to an average yearly cost of \$56,856 per patient.²¹

The primary purpose of this study was to examine which, if any, chief complaints using International Classification of Disease, Tenth Revision (ICD-10) diagnosis codes separated into standardized groups, were predictive of 30- and 90-day readmission to the ED in those screened positive for possible depression using the GDS-5.²² Secondly, the effect of other social factors on readmission were considered to disclose any relationship that could lead to better allocation of discharge planning and care management resources.

METHODS

Study Design and Setting

The study design was a retrospective observational cohort analysis of 329 older adult patients who screened positive for possible depression in the geriatric emergency department (GED) at St. Mary Mercy Hospital in Livonia, MI (SMML), using data from the electronic medical record (EMR).

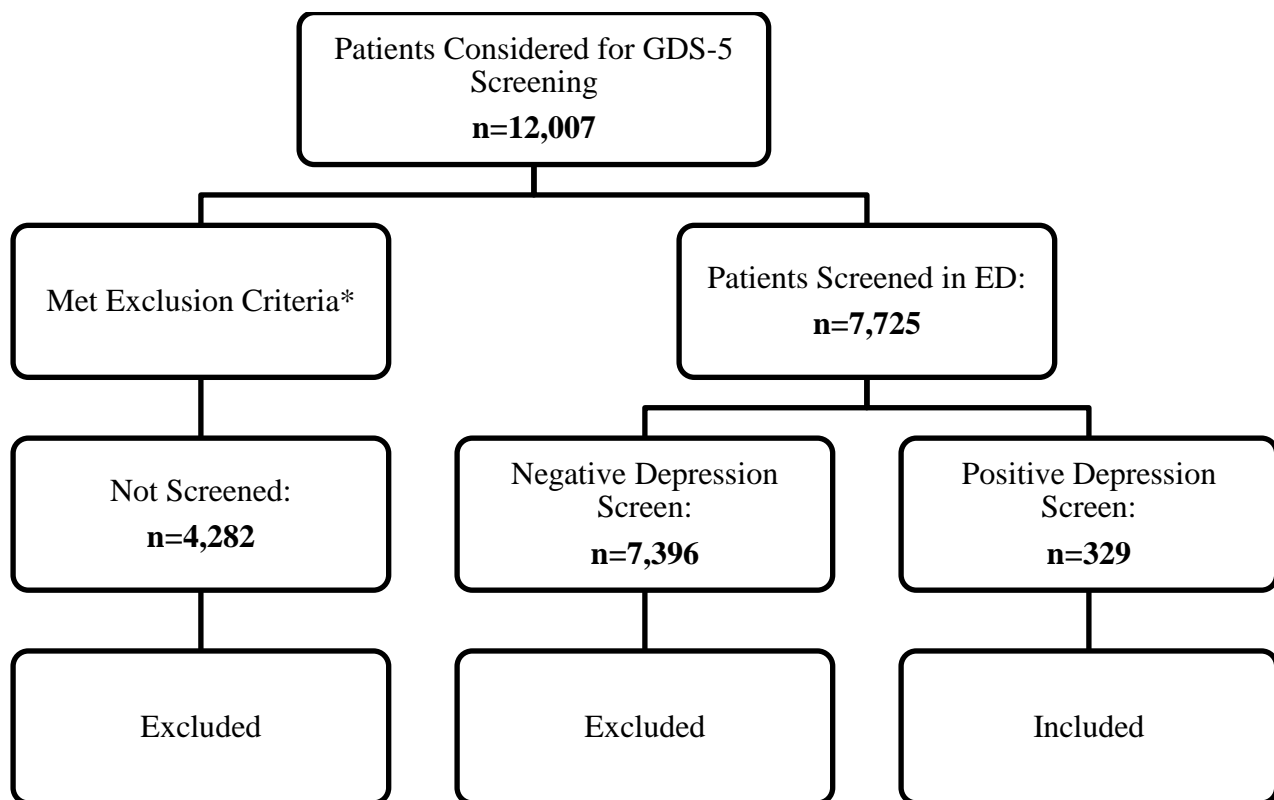
Evaluation for depression is one of the geriatric assessments the emergency nurse performs upon room placement. SMML is a 304-bed hospital with a 53-bed Level 1 ACEP-accredited GED and an annual volume of 57,000 patients, one-third of whom are 65 or older.

Selection of Participants

Inclusion Criteria

We included 329 older adults with a positive depression screen using the GDS-5 between 02/01/2020 to 01/31/2021 (Figure 1).⁵ One year selected to reduce the risk of seasonal changes in patient distribution and disease.

Figure 1. Patient Selection Flow Diagram



*Exclusion Criteria from Screening include: (1) a deficit in their primary survey requiring immediate interventions to correct airway, breathing, circulation, and/or neurological deficits thus limiting their response to screening (Emergency Severity Index score of 1), (2) an ED visit less than 1-hour, (3) positive delirium screen, (4) chief complaint of suicidal ideation, (5) history of cognitive impairment, or (6) alcohol intoxication.

Exclusion Criteria

Only those participants who met GDS-5 screening exclusion criteria or those screened negative were excluded (Figure 1).

Measurements

Several different variables were analyzed using a combination of manual data abstraction and report generation through the EMR. Primary variables collected included: GDS-5 score, Columbia Suicide Severity Risk Score (CSSRS), whether the patient had a 30- or 90-day readmission, the number of days between discharge and readmission when applicable, ICD-10 admission diagnoses during the primary ED encounter, and final ICD-10 diagnosis codes of the admission. The diagnostic categories were sorted into ICD-10 groupings.²² For comparison, admission diagnosis ICD-10 codes were used as a surrogate to standardized chief complaints. Final ICD-10 diagnostic codes were considered risk factors, as clinical information discovered during the encounter could have confounding effects, such as a neoplasm finding, despite an initial chief complaint of fatigue. The analysis also included demographic characteristics and social factors: gender, living environments such as living alone and caregiver availability, ethnicity, marital status, and race. Additionally, the Orientation-Memory-Concentration Test (OMCT), part of the geriatric assessment, results were included due to the association between depression and cognitive impairment.²³

Analysis

Diagnosis ICD-10 code groups are reported as counts and percent frequencies. Continuous variables are reported as means and standard deviations. Univariate, unadjusted logistic regression was used to identify predictors of 30- and 90-day readmissions. Odds ratios for readmission were calculated by comparing the patients who had and did not have a diagnosis in the ICD-10 grouping. Odds ratios (OR), 95% confidence intervals (95% CI), and p-values (p) are presented. Firth's correction for small sample sizes was used in categories with sufficiently low sample size bias. Analyses were performed using SAS 9.4.

Ethics Considerations

This research was submitted and determined to be exempt by the Saint Joseph Mercy Health System Institutional Review Board via expedited review and a reliance agreement with Oakland University.

RESULTS

The average participant (n=329) was 77.2 (SD=8.4) years old. Descriptive demographic data were also collected from the EMR (Table 1). The most frequent admission diagnoses included mental, behavioral, and neurodevelopmental disorders (19.2%, n=63) and symptoms, signs, and abnormal clinical and laboratory findings not elsewhere classified (39.2%, n=129). The frequency of final diagnoses was highest in diseases of the circulatory system (85.1%, n=280) and endocrine, nutritional, and metabolic diseases (72.0%, n=237). In total, rates of 30-day readmission were 42.6% (n=140) and 90-day readmission at 61.7% (n=203). Nearly one-quarter (22.2%, n=73) of patients had both a 30- and 90-day readmission (Table 2).

Category		N	%
Gender	Male	129	39.2
	Female	200	60.8
Race/Ethnicity	White/Caucasian	286	88.3
	Black/African American	35	10.6
	Asian	3	0.9
	Declined/Unknown	5	1.5
Marital Status	Married	107	32.5

	Single	48	14.6
	Widowed	98	29.8
	Divorced	69	21.0
	Unknown	7	2.1

Diagnostic Group	Admission Diagnosis		Final Diagnosis	
	n	%	n	%
1. Infectious and Parasitic Diseases	4	1.2	21	6.4
2. Neoplasms	4	1.2	25	7.6
3. Diseases of the Blood and Blood Forming Organs and Certain disorders involving the immune mechanism	7	2.1	60	18.2
4. Endocrine, Nutritional, and Metabolic Diseases	15	4.6	237	72.0
5. Mental, Behavioral, and Neurodevelopmental disorders	63	19.2	188	57.1
6. Diseases of the Nervous System	4	1.2	88	26.8
7. Diseases of the Eye and Adnexa	1	0.3	10	3.0
8. Diseases of the ear and mastoid process		0.0	5	1.5
9. Diseases of the circulatory system	31	9.4	280	85.1
10. Diseases of the Respiratory System	8	2.4	105	31.9
11. Diseases of the Digestive System	15	4.6	109	33.1
12. Diseases of the Skin and Subcutaneous Tissue	7	2.1	31	9.4
13. Diseases of the Musculoskeletal System and Connective Tissue	39	11.9	101	30.7
14. Diseases of the Genitourinary System	11	3.3	138	42.0
15. Symptoms, Signs, and abnormal clinical and laboratory findings, not elsewhere classified	129	39.2	185	56.2
16. Injury, Poisoning, and certain other consequences of external causes	36	10.9	66	20.1
17. Codes for Special Purposes	4	1.2	6	1.8
18. External Causes of Morbidity	0	0.0	3	0.9
19. Factors influencing health status and contact with health services	8	2.4	184	55.9

Table 2: Frequency of Admission and Final ICD-10 Diagnostic Groups (n=329)

Regarding the primary goal of this investigation, determining 30- and 90-day readmission risk, several specific categories had statistically significant findings. (1) An older adult with an admission diagnosis including mental, behavioral, & neurodevelopmental disorders had 57% lower odds of 30-day readmission (OR: 0.43, p=0.01), and (2) 51.1% lower odds of 90-day readmission (OR 0.49, p=0.01). (3) older adults with an admission diagnosis, including a factor influencing health status and contact with health services, had an 88.2% lower chance of 90-day readmission (OR 0.12, p=0.03). (4) The only condition grouping that increased rates of 90-day readmission was an endocrine, nutritional, or metabolic disease, with a 1.72-fold increase in odds (OR 1.72, p=0.028). (5) Finally, older adult patients with an admission diagnosis of a disease of the circulatory system had 2.45-fold greater odds of both a 30- and 90-day readmission (OR 2.45, p=0.02) (Table 3 and 4).

Table 3. Admission Diagnosis Risk of Readmission Odds Ratios

Diagnostic Group	30-Day Readmission		90-Day Readmission		30- and 90-Day Readmission	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
Infectious and Parasitic Diseases	1.36 (0.19-9.87)	0.76	1.87 (0.19-18.48)	0.59	1.50 (0.17-12.93) [†]	0.71
Neoplasms	1.36 (0.19-9.87)	0.76	1.87 (0.19-18.48)	0.59	0.38 (0.01-10.12) [†]	0.56
Diseases of the Blood and Blood Forming Organs and Certain disorders involving the immune mechanism	0.53 (0.10-2.82)	0.46	0.82 (0.18-3.78)	0.80	0.80 (0.12-5.42) [†]	0.82
Endocrine, Nutritional, and Metabolic Diseases	2.83 (0.94-8.54)	0.06	4.24 (0.93-19.30)	0.06	0.87 (0.24-3.20)	0.84
Mental, Behavioral, and Neurodevelopmental disorders	0.43 (0.23-0.79)	0.01*	0.49 (0.28-0.85)	0.01*	0.61 (0.29-1.27)	0.18
Diseases of the Nervous System	1.36 (0.19-9.87)	0.76	0.62 (0.09-4.50)	0.63	1.17 (0.12-11.61) [†]	0.89
Diseases of the Eye and Adnexa	0.45 (0.01-41.58) [†]	0.73	0.20 (0.00-19.14) [†]	0.49	1.18 (0.01-107.70) [†]	0.94
Diseases of the circulatory system	2.00 (0.94-4.25)	0.07	2.28 (0.95-5.49)	0.07	2.45 (1.12-5.36)	0.02*
Diseases of the Respiratory System	0.26 (0.04-1.70) [†]	0.16	0.20 (0.04-1.01)	0.05	0.20 (0.01-4.14) [†]	0.30
Diseases of the Digestive System	0.90 (0.31-2.60)	0.84	1.75 (0.54-5.65)	0.35	1.29 (0.40-4.22)	0.67
Diseases of the Skin and Subcutaneous Tissue	1.01 (0.22-4.65)	0.99	1.57 (0.30-8.28)	0.60	0.80 (0.12-5.42) [†]	0.82
Diseases of the Musculoskeletal System and Connective Tissue	1.68 (0.85-3.30)	0.13	1.28 (0.63-2.60)	0.50	1.24 (0.57-2.70)	0.58
Diseases of the Genitourinary System	1.13 (0.34-3.81)	0.84	1.09 (0.31-3.83)	0.90	1.33 (0.34-5.19)	0.68
Symptoms, Signs, and abnormal clinical and laboratory findings, not elsewhere classified	1.37 (0.88-2.16)	0.17	1.08 (0.68-1.71)	0.75	1.48 (0.87-2.51)	0.15
Injury, Poisoning, and certain other consequences of external causes	0.74 (0.36-1.52)	0.41	0.97 (0.48-1.99)	0.94	0.53 (0.20-1.44)	0.21
Codes for Special Purposes	1.36 (0.19-9.87)	0.76	0.62 (0.09-4.50)	0.63	0.38 (0.01-10.12) [†]	0.56
Factors influencing health status and contact with health services	0.26 (0.04-1.70) [†]	0.16	0.12 (0.02-0.77)[†]	0.03*	0.69 (0.11-4.50) [†]	0.70

Table 3: Risk of Readmission by Admission Diagnostic Grouping (N=329) including: Odds Ratios (OR), 95% Confidence Intervals (CI), and p-values (p). *p<0.05, [†]Firth's correction for small sample sizes used.

Table 4. Final Diagnosis Risk of Readmission Odds Ratios

Diagnostic Group	30 Day Readmission		90 Day Readmission		30- and 90-Day Readmission	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
Infectious and Parasitic Diseases	1.01 (0.41-2.49)	0.98	1.01 (0.40-2.52)	0.98	0.57 (0.16-2.00)	0.38
Neoplasms	1.80 (0.79-4.11)	0.16	1.65 (0.67-4.10)	0.28	1.40 (0.56-3.52)	0.47
Diseases of the Blood and Blood Forming Organs and Certain disorders involving the immune mechanism	1.45 (0.82-2.54)	0.20	1.72 (0.93-3.19)	0.08	1.08 (0.56-2.11)	0.81
Endocrine, Nutritional, and Metabolic Diseases	0.95 (0.58-1.55)	0.83	1.73 (1.06-2.83)	0.03*	1.13 (0.63-2.05)	0.68

Mental, Behavioral, and Neurodevelopmental disorders	0.70 (0.45-1.09)	0.12	0.73 (0.46-1.15)	0.17	0.82 (0.49-1.39)	0.47
Diseases of the Nervous System	0.80 (0.49-1.33)	0.39	0.81 (0.49-1.33)	0.40	0.87 (0.48-1.59)	0.65
Diseases of the Eye and Adnexa	0.57 (0.14-2.26)	0.42	0.93 (0.26-3.39)	0.91	0.54 (0.09-3.34) [†]	0.51
Diseases of the ear and mastoid process	0.90 (0.15-5.52)	0.91	0.41 (0.07-2.51)	0.33	2.38 (0.39-14.67)	0.35
Diseases of the circulatory system	1.09 (0.58-2.02)	0.79	1.52 (0.82-2.81)	0.18	1.13 (0.53-2.41)	0.75
Diseases of the Respiratory System	1.14 (0.71-1.83)	0.58	1.08 (0.66-1.74)	0.77	0.70 (0.39-1.25)	0.22
Diseases of the Digestive System	0.83 (0.52-1.32)	0.43	0.93 (0.58-1.49)	0.76	0.71 (0.40-1.26)	0.24
Diseases of the Skin and Subcutaneous Tissue	1.50 (0.71-3.16)	0.29	1.88 (0.81-4.38)	0.14	1.78 (0.79-3.99)	0.16
Diseases of the Musculoskeletal System and Connective Tissue	0.94 (0.59-1.52)	0.81	0.77 (0.48-1.25)	0.29	1.05 (0.60-1.85)	0.87
Diseases of the Genitourinary System	0.96 (0.62-1.51)	0.87	1.52 (0.96-2.41)	0.07	1.19 (0.70-2.01)	0.52
Symptoms, Signs, and abnormal clinical and laboratory findings, not elsewhere classified	1.07 (0.68-1.66)	0.78	1.16 (0.74-1.82)	0.52	0.93 (0.55-1.57)	0.78
Injury, Poisoning, and certain other consequences of external causes	0.85 (0.49-1.48)	0.56	0.94 (0.54-1.65)	0.84	0.49 (0.23-1.05)	0.07
Codes for Special Purposes	2.75 (0.49-15.41)	0.25	1.25 (0.22-6.99)	0.80	0.95 (0.13-6.77) [†]	0.96
External Causes of Morbidity	0.81 (0.08-8.43) [†]	0.86	1.24 (0.11-14.09)	0.86	2.11 (0.20-22.14) [†]	0.53
Factors influencing health status and contact with health services	0.77 (0.49-1.19)	0.24	0.71 (0.45-1.12)	0.14	1.09 (0.64-1.85)	0.76

Table 4: Risk of Readmission by Final Diagnostic Grouping (N=329) including: Odds Ratios (OR), 95% Confidence Intervals (CI), and p-values (p). *p<0.05, † Firth's correction for small sample sizes used.

Demographic characteristics and social factors were also considered part of the multifactorial nature of readmission risk. However, there were no statistically significant social variables predictive of readmission in this sample of patients, including age, gender, OMCT scores, marital status, and living environment. Similarly, no significant associations were discovered based on either the final GDS-5 score or the CSSRS.⁷

DISCUSSION

In this retrospective cohort study, we found our older adult population (n=329), the 30-day readmission rate was 42.6% (n=140), and the 90-day readmission rate was 61.7% (n=203). Notably, there was significant overlap, with 22.2% (n=73) of patients having both a 30- and 90-day readmission. In an analysis of Medicare data from 2013 to 2014, readmission within 30-days for non-HHRP conditions was 13.1%, and HHRP conditions were 17.8%.²⁴ Medicare data from 2020 to 2021 showed our institution did not deviate from the national all-cause readmission average.²⁵ A primary finding of this study was the notable difference between the readmission of our patient population with a positive depression screening compared to the Medicare population. Given the difference between our sample and the previous Medicare data, a positive GDS-5 may be a potential predictor of readmission but would need a further comparison to a population with a negative finding. Similarly, the groups with the most significant final diagnosis frequency may underpin an underlying physiologic process of depression that could be distinct from non-depressed patients, with 72.0% (n=237) of patients having a final diagnosis including an endocrine, nutritional, or metabolic disease.

Regarding biological pathways of geriatric depression, three specific theories are offered by existing literature: (1) a vascular hypothesis relating to white matter changes in the brain, supported by our results showing 85.1% (n=280) of participants had a disease of the circulatory system in their final diagnoses, (2) an inflammatory hypothesis associating increased age with inflammation, and (3) a

degenerative hypothesis that geriatric depression is an initial symptom in early cognitive impairment and dementia.²⁶ These theories provide a basis for a pathophysiologic etiology of depression in older adults, with interruption of sleep rhythms, gastrointestinal symptomatology, and chronic pain often accompanied and manifested in depressed patients. However, our results did not specifically show such a pattern.²⁷ There are also specific conditions that may be associated with depression, such as diabetes, kidney disease, and dementia in this population, which was observed in the increased frequency of endocrine-related conditions.²⁷ One goal of this investigation was to identify chief complaint categories most significantly linked to hospital readmission because physical symptoms of depression may distract an underlying, untreated diagnosis of depression.²⁷ Conversely, depression is a known consequence of chronic illness in older adults and could show greater manifestation with a more specific diagnosis or sequelae of a chronic disease process.²⁰

Older adults with an inclusion diagnosis in the mental, behavioral, and neurocognitive disorder group had a reduced chance of 30- and 90-day readmission intervals (OR: 0.43, $p=0.01$) and (OR 0.49, $p=0.01$), respectively. This finding supports the vital role of ED clinicians' early recognition of depression, followed by referral to a health care professional to establish a formal diagnosis and treatment plan. This group of patients expressly may warrant further investigation to identify their use of follow-up resources to determine if such interventions were responsible for the observed admission reduction. Albrecht et al. determined depressive symptoms correlated prognostically with poorer outcomes, specifically morbidity.¹⁸ Our findings suggest that there may also not only be a correlation with poorer outcomes but that identification and treatment can reduce visits to the ED. That premise is supported by another study which found the greatest 30-day readmission predictor was the identification and treatment of a mental illness compared with hospitalizations and medical comorbidities.²⁷

From our analysis, the lower odds of 90-day readmission (88.2%) with an admission diagnosis with factors influencing health status and contact with health services suggests identifying social determinants of health may be an effective method of readmission reduction (OR: 0.12, $p=0.03$). Social determinants of health are known indicators to impact older adults and influence their hospitalization rate.^{28–30} This analysis further supports the value of social work and care management to one population that may particularly benefit from their assistance to mitigate potential readmission.³¹

A group that showed an increased rate of readmission was endocrine, nutritional, and metabolic diseases, with a 1.73-fold increase in odds of 90-day readmission (OR 1.73, $p=0.03$). This is not necessarily surprising given the interplay between endocrine and nutritional components of mental health, which compliments the previously discussed importance of care management. It may be beneficial to attempt further interventions for these patients to evaluate and mitigate nutritional risk or malnutrition by connecting them to community resources, especially given the increased rates of food insecurity in older adults.²⁹ In one study, 5.7% of older adults reported food insecurity and found many populations where the rate was 10.0% or greater, such as those with less than a high school education, Medicaid insurance, extreme obesity, poor health status, and depression or anxiety.³²

Another data point that highlights a particularly high-risk group is a diagnosis of a circulatory disease which showed a 2.45-fold greater odds of both a 30- and 90-day readmission (OR 2.45, $p=0.02$). This association also represents a potential overlap between circulatory disorders and those who screen positive for depression, a combination that leads to frequent readmission. Given the Medicare services reimbursement implications of readmission in patients with heart failure and coronary artery bypass grafting procedures, this subgroup has the potential for a more significant benefit with the use of geriatric specific resources.^{19,33–35}

While the data did not support a relationship between readmission and social factors such as marital status, living environment, age, independence, or level of cognitive function measured by OMCT, these factors may still be important in determining readmission. In future investigations, consideration for the community composition may be critical and necessary in distinguishing such features. The

community surrounding SMML is mainly composed of older adults, with limited racial diversity that may mitigate or distort the effect of those factors.

This study has some inherent limitations. First, due to the SARS-CoV-2 pandemic, there may have been readmissions that were the result of the community spread of the virus, especially given the increased severity in older adults. Additionally, the SARS-CoV-2 pandemic serves as a confounding variable that may have led to increased levels of depression secondary to the isolation associated with social distancing and morbidity among older adults. Further, there are limits to the methodology, as there are likely additional confounding and contributing variables that could not be considered, such as specific comorbidities not encapsulated in the final diagnostic codes utilized for analysis. Additionally, readmissions to other hospitals during this period were not identified in this study, which would alter our interpretation and analysis. Finally, since the data were collected from a single GED, the results may not be generalizable to all older adults with depression, which could be explored in a larger, multicenter sample.

To conclude, the care of older adults is a complex and important issue, which is relevant to an even greater degree with the impacts of the SARS-CoV-2 pandemic. Depression and anxiety levels are high and often missed in the older adult population despite their association with worse outcomes. In this study, higher readmission rates underscore the importance of depression screening in the ED. Findings from our study contribute to more knowledge regarding readmission rates in the depressed older adult population and significant associations with diagnostic groupings. Specifically, an identified diagnosis of a mental, behavioral, or neurodevelopmental disorder, as well as a factor influencing health status and contact with health services, were shown to have lower rates of readmission in some timeframes after discharge, while endocrine, nutritional, and metabolic diseases were associated with increased rates of 90-day readmission. There also was a strong association for patients with both a 30- and 90-day readmission and a diagnosis involving the circulatory system. Our findings may also provide a better guide for allocating specific services, such as geriatric-specific units and care teams, with additional follow-up resources or referrals to help reduce readmission rates after ED disposition.^{34,35} Moving forward, expanding these considerations with a larger sample size in multiple GEDs may aid in further refining readmission risk criteria and provide a higher level of care to older adult patients with depression.

KEYWORDS

Depression, Readmission, Emergency Department, Chief Complaint

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

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REFERENCES

1. National Institute of Health. Suicide. National Institute of Mental Health. Published 2019. Accessed March 22, 2020. <https://www.nimh.nih.gov/health/statistics/suicide.shtml>
2. Pines JM, Mullins PM, Cooper JK, Feng LB, Roth KE. National trends in emergency department use, care patterns, and quality of care of older adults in the United States. *J Am Geriatr Soc*. 2013;61(1):12-17. doi:10.1111/jgs.12072
3. Shah MN, Bazarian JJ, Lerner EB, et al. The Epidemiology of Emergency Medical Services Use by Older Adults: An Analysis of the National Hospital Ambulatory Medical Care Survey. *Acad Emerg Med*. 2007;14(5):441-447. doi:10.1197/j.aem.2007.01.019
4. Meldon SW, Emerman CL, Schubert DSP. Recognition of depression in geriatric ED patients by emergency physicians. *Ann Emerg Med*. 1997;30(4):442-447. doi:10.1016/S0196-0644(97)70002-7
5. Hoyl MT, Alessi CA, Harker JO, et al. Development and Testing of a Five-Item Version of the Geriatric Depression Scale. *J Am Geriatr Soc*. 1999;47(7):873-878. doi:10.1111/j.1532-5415.1999.tb03848.x
6. Bessey LJ, Radue RM, Chapman EN, Boyle LL, Shah MN. Behavioral Health Needs of Older Adults in the Emergency Department. *Clin Geriatr Med*. 2018;34(3):469-489. doi:10.1016/j.cger.2018.05.002
7. Posner K, Brown GK, Stanley B, et al. The Columbia–Suicide Severity Rating Scale: Initial Validity and Internal Consistency Findings From Three Multisite Studies With Adolescents and Adults. *Am J Psychiatry*. 2011;168(12):1266-1277. doi:10.1176/appi.ajp.2011.10111704
8. Hustey FM, Smith MD. A depression screen and intervention for older ED patients. *Am J Emerg Med*. 2007;25(2):133-137. doi:10.1016/j.ajem.2006.05.016
9. Betz ME, Arias SA, Segal DL, Miller I, Camargo CA, Boudreaux ED. Screening for Suicidal Thoughts and Behaviors in Older Adults in the Emergency Department. *J Am Geriatr Soc*. 2016;64(10):e72-e77. doi:10.1111/jgs.14529
10. Schmutte T, Olfson M, Xie M, Marcus SC. National study of emergency department disposition for high suicide risk geriatric patients. *Gen Hosp Psychiatry*. 2019;58(March):67-70. doi:10.1016/j.genhosppsych.2019.03.005
11. MacNeil-Vroomen JL, Nagurney JM, Allore HG. Comorbid conditions and emergency department treat and release utilization in multimorbid persons with cognitive impairment. *Am J Emerg Med*. 2019;(xxxx):158353. doi:10.1016/j.ajem.2019.07.023
12. Webb LM, Chen CY. The COVID-19 pandemic's impact on older adults' mental health: Contributing factors, coping strategies, and opportunities for improvement. *Int J Geriatr Psychiatry*. 2022;37(1). doi:10.1002/gps.5647
13. Padala KP, Parkes CM, Padala PR. Neuropsychological and Functional Impact of COVID-19 on Mild Cognitive Impairment. *Am J Alzheimer's Dis Other Dementias*. 2020;35:1-3. doi:10.1177/1533317520960875
14. Powell VD, Kumar N, Galecki AT, et al. Bad company: Loneliness longitudinally predicts the symptom cluster of pain, fatigue, and depression in older adults. *J Am Geriatr Soc*. 2022;70(8):2225-2234. doi:10.1111/jgs.17796
15. Kotwal AA, Holt-Lunstad J, Newmark RL, et al. Social Isolation and Loneliness Among San Francisco Bay Area Older Adults During the COVID-19 Shelter-in-Place Orders. *J Am Geriatr Soc*. 2021;69(1):20-29. doi:10.1111/jgs.16865
16. Yang Y, Grol-Prokopczyk H, Reid MC, Pillemer K. The Relationship Between Pain and Psychological Distress During the COVID-19 Pandemic: Is Social Technology Use Protective? *Pain Med*. 2022;23(2):280-287. doi:10.1093/pm/pnab262

17. Deschodt M, Devriendt E, Sabbe M, et al. Characteristics of older adults admitted to the emergency department (ED) and their risk factors for ED readmission based on comprehensive geriatric assessment: A prospective cohort study. *BMC Geriatr*. 2015;15(1):1-10. doi:10.1186/s12877-015-0055-7
18. Albrecht JS, Gruber-Baldini AL, Hirshon JM, et al. Depressive symptoms and hospital readmission in older adults. *J Am Geriatr Soc*. 2014;62(3):495-499. doi:10.1111/jgs.12686
19. Center for Medicare and Medicaid Services. Hospital Readmissions Reduction Program (HRRP). Published 2021. Accessed February 3, 2021. <https://www.cms.gov/medicare/medicare-fee-for-service-payment/acuteinpatientpps/readmissions-reduction-program>
20. Alexopoulos GS. Depression in the elderly. *Lancet*. 2005;365(9475):1961-1970. doi:10.1016/S0140-6736(05)66665-2
21. Zheng S, Hanchate A, Shwartz M. One-year costs of medical admissions with and without a 30-day readmission and enhanced risk adjustment. *BMC Health Serv Res*. 2019;19(1):1-10. doi:10.1186/s12913-019-3983-7
22. Center for Medicare and Medicaid Services. *ICD-10-CM Tabular List of Diseases and Injuries*.; 2018. <https://www.cms.gov/Medicare/Coding/ICD10/2018-ICD-10-CM-and-GEMs>
23. Zuckerman H, Pan Z, Park C, et al. Recognition and Treatment of Cognitive Dysfunction in Major Depressive Disorder. *Front Psychiatry*. 2018;9(December):1-11. doi:10.3389/fpsy.2018.00655
24. Zuckerman RB, Sheingold SH, Orav EJ, Ruhter J, Epstein AM. Readmissions, Observation, and the Hospital Readmissions Reduction Program. *N Engl J Med*. 2016;374(16):1543-1551. doi:10.1056/NEJMsa1513024
25. Center for Medicare and Medicaid Services. *Unplanned Hospital Visits - Hospital*.; 2023. <https://data.cms.gov/provider-data/dataset/632h-zaca>
26. Haigh EAP, Bogucki OE, Sigmon ST, Blazer DG. Depression Among Older Adults: A 20-Year Update on Five Common Myths and Misconceptions. *Am J Geriatr Psychiatry*. 2018;26(1):107-122. doi:10.1016/j.jagp.2017.06.011
27. Wang J, Jia H, Shang J, Kearney JA. Critical Association Between Mental Health Disorders and Medical Status: Depression Intervention Use Indicates a Two-Fold Risk for Subsequent Medical Events in Older American Home Health Care Patients. *J Gerontol Nurs*. 2016;42(10):42-55. doi:10.3928/00989134-20160701-03
28. Zulman DM, Maciejewski ML, Grubber JM, et al. Patient-Reported Social and Behavioral Determinants of Health and Estimated Risk of Hospitalization in High-Risk Veterans Affairs Patients. *JAMA Netw Open*. 2020;3(10):e2021457. doi:10.1001/jamanetworkopen.2020.21457
29. Tang X, Blewett LA. Food Security Status among U.S. Older Adults: Functional Limitations Matter. *J Nutr Gerontol Geriatr*. 2021;40(2-3):108-124. doi:10.1080/21551197.2021.1924337
30. Zhao L, Wang J, Deng H, Chen J, Ding D. Depressive Symptoms and ADL/IADL Disabilities Among Older Adults from Low-Income Families in Dalian, Liaoning. *Clin Interv Aging*. 2022;Volume 17:733-743. doi:10.2147/CIA.S354654
31. Xiang X, Zuverink A, Rosenberg W, Mahmoudi E. Social work-based transitional care intervention for super utilizers of medical care: a retrospective analysis of the bridge model for super utilizers. *Soc Work Health Care*. 2019;58(1):126-141. doi:10.1080/00981389.2018.1547345
32. Steiner JF, Stenmark SH, Sterrett AT, et al. Food Insecurity in Older Adults in an Integrated Health Care System. *J Am Geriatr Soc*. 2018;66(5):1017-1024. doi:10.1111/jgs.15285
33. Flood KL, MacLennan PA, McGrew D, Green D, Dodd C, Brown CJ. Effects of an Acute Care for Elders Unit on Costs and 30-Day Readmissions. *JAMA Intern Med*. 2013;173(11):981. doi:10.1001/jamainternmed.2013.524
34. Walke LM, Tinetti ME. ACE, MACE, and GRACE: Time to Put the Pieces Together. *JAMA Intern Med*. 2013;173(11):987. doi:10.1001/jamainternmed.2013.493
35. Hung WW, Ross JS, Farber J, Siu AL. Evaluation of the Mobile Acute Care of the Elderly (MACE) Service. *JAMA Intern Med*. 2013;173(11):990. doi:10.1001/jamainternmed.2013.478