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Major Depression and Emergency Medical Services Utilization in Community-Dwelling Elderly Persons with Disabilities

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Abstract

Objective—To examine the association between major depression and emergency medical services (EMS) use by community-dwelling older adults with disabilities.

Methods—A prospective observational.study including 1,444 participants age 65+ in 19 counties in three U.S. states that participated in the Medicare Primary and Consumer-Directed Care Demonstration. Eligibility criteria included needing or receiving help with either 2+ activities of daily living (ADLs) or 3+ instrumental ADLs, and having received recent significant healthcare services use. The presence of major depression was measured at baseline by the MINI Major Depressive Episode module. EMS utilization data for the following 2 years were obtained from a daily journal concurrently completed by each subject or a caregiver.

Results—More persons with major depression (43%) than without (35%) reported EMS use. When other factors were controlled in a logistic regression model, this effect was no longer statistically significant. However, of those with at least one episode of EMS transport, the depressed reported significantly (25%) more episodes (mean=2.10) than the non-depressed (mean=1.68). Major depression was significantly associated with more EMS episodes in both Poisson (Z=1.99; p=0.047) and ordinary least squares (t=2.08; p=0.038) regression models.

Conclusions—Depressed disabled older adults who utilize EMS have more EMS episodes than those without depression. This higher use may be driven in part by affective illness. Research is needed to determine whether more EMS episodes are necessary to address symptoms of major depression, especially suicidal ideation, or whether they are due to other illnesses that are exacerbated by symptoms of major depression.

Keywords

Depression; emergency medical services; ambulance; community dwelling; aged; disabilities

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INTRODUCTION

Depression causes significant suffering as well as impairments in physical, mental, and social functioning, and is a common problem among older (age 65 years and over) adults (Alexopoulos, 2005). Use of emergency medical services (EMS) (ambulance services) by older adults is quite high. Nationally representative U.S. data for 1997-2000 indicated that persons age 65+ had an EMS use rate more than four times higher than for younger people, 167 versus 39 per 1000 population per year (Shah, et al., 2007).

Importantly, there appear to be no studies on EMS use by community-dwelling (i.e., not residing in a nursing home or other institution) older persons with disabilities, and none that have investigated the association between depression and EMS use. Two studies of EMS use by older adults examined the influence of mental health status but did not find a significant (Shah, et al., 2003) or large (Wofford, et al., 1995) effect. However, several studies on emergency department (ED) use have found that depressed rather than non-depressed older persons are more likely to have had at least one ED visit (Callahan, et al., 1994; Himmelhoch, et al., 2004), more ED visits (Unutzer, et al., 1997), and higher costs due to ED visits (Katon, et al., 2003).

There are several compelling reasons for research on EMS utilization by community-dwelling persons age 65+ with disabilities. This population is large (National Center for Health Statistics, 2006) and at high risk for accidents (Nawar, et al., 2007) and medical illness. Being older and disabled may mean that they have greater difficulty obtaining access to transportation (Sweeney, 2004) or to medical care than other population groups. Thus, older persons with disabilities may be more likely to need EMS because they are not able to visit their physician on a regular basis or when needed.

The Medicare Primary and Consumer-Directed Care (PCDC) Demonstration (Meng, et al, 2005) offered the opportunity to examine the association between major depression and EMS use by older adults with disabilities and recent significant healthcare services use. However, our study must be considered preliminary because it uses data collected for a randomized controlled trial rather than from an epidemiologically defined sample.

We hypothesized that subjects with major depression will have a higher probability of EMS utilization than those that do not have depression. Further, we expected that among persons who had at least one episode of EMS care and transport, major depression would be associated with a higher number of EMS episodes than those without major depression.

METHODS

Sample Enrollment

The subjects in the present study were the 1,444 participants age 65+ in the Medicare PCDC Demonstration (1998-2002). They resided in 19 counties in New York State, West Virginia, and Ohio, were required to need or receive help with either at least two Activities of Daily Living (ADLs) or at least three Instumental ADLs (IADLs), and must have received recent significant healthcare services use (hospitalization, nursing home admission, or Medicare home healthcare services within the previous twelve months, or 2+ ED visits within the past six months). The enrollment process and criteria are described in detail elsewhere (Meng, et al, 2005). The purpose of the Demonstration was to test the acceptability and effectiveness of three interventions: a health promotion nurse, a consumer-directed voucher, and the combination of the nurse and voucher. Following provision of written informed consent, each subject was randomly assigned to the nurse, voucher, nurse plus voucher, or control (care as usual) groups (Meng, et al, 2005). The Demonstration, its consent process and form,

and the present study were approved by the University of Rochester Research Subjects Review Board.

Variables of Interest

Major depression was identified using the Mini-International Neuropsychiatric Interview (MINI) Major Depressive Episode (MDE) module (Sheehan, et al., 1998) administered as part of the baseline interview.

EMS utilization data were obtained from a Health Care Journal completed on a daily basis by each subject (or a caregiver if the subject was unable to do so). The journal listed each of 30 health care services and was completed for however long the person was in the Demonstration, up to 730 days. Journal data were available for 99.4% of the person-weeks the study participants were in the Demonstration.

One of the services in the Journal was the "number of ambulance trips (each way)." Only ambulance trips that resulted in an ED visit the same day, a hospital admission that same day, or a hospital admission the next day were included in the present study. For the remainder of this paper, the term "EMS episode" is defined as including only those ambulance trips as described in the previous sentence. Thus, they are episodes of EMS care and transport.

Control Variables

Variables having potential influence on EMS utilization were used as control variables in the regression models we tested. They include demographic factors, social supports, health insurance status, and measures of health and disability (Gerson and Shvarch, 1982; Wofford, et al., 1995; McConnel and Wilson, 1998; Strange and Chen, 1998; Svenson, 2000; Shah, et al., 2003). We also included the number of days each person participated in the Demonstration. As this was an intervention study, we included in our models control variables for the three interventions (nurse, voucher, and nurse plus voucher).

Statistical Analysis

Our statistical analysis employed Pearson chi-square tests, t-tests, and logistic, Poisson, and ordinary least squares (OLS) regression analysis. STATA 8.0 was used to perform the statistical analyses.

RESULTS

Sample Description

The 1,444 subjects had a mean age of 80.5 years (SD=7.63), 70% were female, and 3% were non-white. The mean number of ADL and IADL dependencies was 2.37 (SD=1.83) and 3.56 (SD=1.79), respectively. About one in six subjects (n=226 or 16%) were identified as having major depression (see Table 1).

Probability of EMS Use

Over one-third (n=528 or 36.6%) of the study sample reported at least one episode of EMS care and transport during the two years after entering the Demonstration. Of the 526 for whom there were data on major depression at study entry, 97 (18.4%) had major depression. Among those with no EMS use (n=910), 14.2% (n=129) had major depression.

Bivariate results—Significantly more subjects with major depression (42.9%) reported EMS utilization than did those without major depression (35.4%) (Pearson Chi Square Test = 4.57; 1 df; n=1,436; p=0.032).

Logistic regression results—Major depression was not independently associated with probability of EMS utilization (coefficient = .179; Robust SE = .157; Z=1.14; p=0.258; OR=1.20; 95% OR CI = 0.87-1.63). Several control variables confounded the effect of depression. Specifically, age 85+, number of chronic conditions, the voucher intervention, and the nurse plus voucher intervention were associated with greater probability of EMS use, while the number of study days had a negative relationship (see Table 2).

Number of EMS Episodes

Among the 526 subjects who had at least one EMS episode, 329 (62.6%) had one episode, 108 (20.5%) had two episodes, and 89 (16.9%) had three to 13 episodes. The mean was 1.76 episodes (SD=1.45). Since we found that major depression did not have a statistically significant effect on probability of any EMS use, we included only these 526 subjects in our Poisson and OLS regression models. We felt that it would be more meaningful to investigate the effect of major depression among those subjects who had some EMS use rather than for the entire sample.

Bivariate results—The 97 subjects with major depression experienced significantly more EMS episodes (mean=2.10; SD=1.87) than did the 429 persons without major depression (mean=1.68; SD=1.32) (ANOVA F=6.90; n=526; p=0.009). Because the number of EMS episodes is so skewed (skewness = 3.44), we also logged the number of episodes and compared them. The number of logged episodes was significantly higher for those with major depression (mean=0.51; SD=0.63) than for those without (mean=0.35; SD=0.52) (ANOVA F=6.99; n=526; p=0.008).

Poisson and OLS regression results—Among the 526 subjects who utilized EMS, major depression was significantly associated with more EMS episodes in both a Poisson regression model (coefficient = .201; Robust SE = .101; Z=1.99; p=0.047; 95% CI = .003-.399) and in an OLS regression model with logged number of EMS episodes as the dependent variable (coefficient = .144; Robust SE = .069; t=2.08; p=0.038; 95% CI = .008-.281) (see Table 3).

DISCUSSION

Our first hypothesis, that the probability of EMS use would be higher among persons with major depression, was not verified. This finding differs from those of two studies on ED use that found that depressed rather than non-depressed older persons are more likely to have had at least one ED visit (Callahan, et al., 1994; Himmelhoch, et al., 2004). However, the subjects in those two studies differed considerably from those in our sample. Those two studies also defined depression differently than we did. The one previous study that used logistic regression to examine factors associated with any EMS use among older adults reported a finding similar to ours: that having worsened mental health was not significantly associated with probability of any EMS use (Shah, et al., 2003).

We were able to confirm our second hypothesis, that, for older adults with disabilities and at least one EMS episode, the number of EMS episodes would be greater among persons with major depression than for those without depression. This finding is similar to those for ED visits (Unutzer, et al., 1997) and for costs due to ED visits (Katon, et al., 2003). The extent of the increase in EMS episodes by depressed persons in our study is 25%, a little under a

half (0.42) episode per person over a mean of 18.4 months (an average of 2.10 episodes for persons with major depression as compared to 1.68 episodes for those with no depression). Cohen's d (Cohen, 1988) is 0.262. While it is difficult to tell whether a difference of 0.42 episode is clinically significant, a Cohen's d of 0.262 is considered to be a small effect. However, an increase of 25% is certainly substantial in terms of service use and costs.

There are a number of possible reasons for more episodes of EMS care and transport by depressed EMS users. First, this may be directly related to the nature and symptoms of depressive illness and their impact on behavior. For example, some depressive symptoms undermine motivation and initiative, so that people with depression are more likely to delay help seeking until the problem becomes an emergency. Second, it may be that persons with major depression are less compliant with their medication regimens than non-depressed people, and that their relatively less compliance leads to more illness requiring EMS assistance. A third reason is that the depressed person receives positive behavioral reinforcement from using EMS: the more EMS episodes they get, the more attention they receive. Another possibility is that there is a subgroup of EMS users that is directly self-destructive through suicidality.

The prevalence of major depression in our sample, 16%, is considerably higher than the 1-4% cited for the community-dwelling older adult population and the 6-9% reported for the primary care setting (Alexopoulos, 2005). Our higher prevalence is probably due to the greater prevalence of major depression found in populations with considerable medical comorbidity (Alexopoulos, 2005) such as ours. In the present study the mean number of chronic conditions is high, about 4.5.

Our study has a number of potential limitations. First, generalizability is limited by the specialized subset of subjects that were enrolled in the Medicare PCDC demonstration. Thus, it may be generalizable only to older adults with disabilities who have had recent significant healthcare services use. Second, it is possible that because this is an intervention study, the interventions affected both EMS use and major depression. However, we controlled for the interventions in our regression models, and preliminary analysis indicates that the interventions had no effect on major depression. A third limitation is that the possibility of self-report bias error exists. Each subject (or the subject's caregiver when the subject was cognitively impaired) was required to report his or her own EMS utilization. However, the definition of “ambulance trips” was open to little question of ambiguity, and each subject and/or caregiver had the ongoing assistance of a Field Data Collector to help them with the completion of the Health Care Journal. Fourth, our outcome measure, EMS episode, may be considered by some to be not well defined or validated. We attempted to address this issue by limiting EMS use to ambulance trips that resulted in an ED visit the same day, a hospital admission that same day, or a hospital admission the next day. By doing so we have excluded ambulance rides for clinic visits. It is not possible to validate our outcome measure against EMS records, ambulance bills to Medicare, or 911 records since we do not have access to any of these data. While we do have Medicare claims files for most of the time our study subjects were in the Demonstration, in each of the three states there are volunteer EMS organizations that do not bill Medicare. Because of this the Medicare claims files will not include all of the ambulance visits for our study subjects. Fifth, the EMS use data were not collected in a manner that would allow for a cost analysis. Study of the relationship between major depression and EMS costs would be useful and, indeed, important, and should be carried out. Finally, we examined the association of major depression with EMS use rather than its relationship with total burden of psychiatric disease. We are precluded from creating a measure of the latter by the absence of measures for psychotic disorders and psychiatric disorders other than depression and anxiety.

CONCLUSION

In conclusion, it is unknown whether the additional episodes of EMS care and transport among depressed older users of EMS are necessary to address symptoms of major depression, especially suicidal ideation, or whether they are “unnecessary” in the sense that they could be eliminated by ensuring proper depression treatment. It is also unknown whether these additional EMS episodes are due to other chronic or acute illnesses that are exacerbated by the symptoms of major depression, for example, by the failure of depressed persons to properly follow medication and other treatment regimens for these other illnesses. Research is needed to determine the appropriateness of more EMS episodes by older persons with disabilities who have major depression, and their potential implications for healthcare costs.

Conflicts of Interest

No potential conflicts of interest exist. Potential conflicts were not disclosed to study participants since none existed and the present study is a secondary analysis of existing data. The study sponsors did not play any role in study design, in the collection, analysis and interpretation of data, in the writing of the report or in the decision to submit the report for publication.

Original Publication

There are no submissions or previous reports that might be regarded as redundant or duplicate publication of the same or very similar work.

Key Points

- Among community-dwelling older persons with disabilities, major depression was not independently associated with probability of emergency medical services (EMS) (ambulance services) use.
- For those subjects with at least one episode of EMS transport, the depressed reported 25% more utilization of EMS services (mean=2.10 episodes of use) than the non-depressed (mean=1.68).
- For subjects with at least one episode of EMS transport, major depression was significantly associated with more EMS episodes in both Poisson and linear regression models.

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Table 1

Sample Description (N=1444)

	n	%		n	%
DEMOGRAPHIC FACTORS			**SOCIAL SUPPORT**		
Age			Marital Status		
65-74	346	23.96	Married	587	40.65
75-84	633	43.84	Widowed	729	50.48
85+	465	32.20	Separated or Divorced	80	5.54
Male Gender	432	29.92	Never married	48	3.32
Non-White Race	44	3.05	Number of Friends Feels Close To (n=1435)		
Education			0-1	468	32.61
Did not finish High School	594	41.14	2-5	659	45.92
High School Graduate	451	31.23	6 or more	308	21.46
At least some College	399	27.63	Number of Relatives Feels Close To (n=1435)		
Annual Household Income			0-1	267	18.61
< $10,000	459	31.79	2-5	687	47.87
$10,000-19,999	524	36.29	6 or more	481	33.52
$20,000 +	461	31.93	Lives Alone	555	38.43
Rural Residence	412	28.53	**HEALTH INSURANCE**		
West Virginia/Ohio	455	31.51	Medicare Supplemental (Medigap) Insurance	1054	72.99
HEALTH AND DISABILITY MEASURES			Medicare HMO	172	11.91
Major Depression (n=1436)	226	15.74	Medicaid	121	8.38
Self-Rated Health Status			**MEDICARE PCDC DEMONSTRATION**		
Excellent - very good	185	12.81	Intervention Groups		
Good	450	31.16	Control	344	23.82
Fair	559	38.71	Nurse	344	23.82
Poor	250	17.31	Voucher	373	25.83
Number of Chronic Conditions			Nurse and Voucher	383	26.52

Note: HMO = Health Maintenance Organization; Medicare PCDC Demonstration = Medicare Primary and Consumer-Directed Care Demonstration; ADL = Activities of Daily Living; IADL = Instrumental Activities of Daily Living; Source for Cognitive Performance Scale (CPS) = Morris, et al., 1994.

	n	%		n	%
DEMOGRAPHIC FACTORS			**SOCIAL SUPPORT**		
0	24	1.66	**CONTINUOUS VARIABLES**	**Mean**	**Standard Deviation**
1-2	242	16.76	Age	80.47	7.63
3-4	484	33.52	Number of chronic conditions	4.52	2.20
5+	694	48.06	Cognitive Performance Scale (CPS) Score	1.30	1.42
Cognitive Performance Scale (CPS) Score			Number of ADL dependencies	2.37	1.83
0	442	30.61	Number of IADL dependencies	3.56	1.79
1	606	41.97	Number of study days	557.99	233.39
2-6	396	27.42			
Bodily Pain (n=1435)					
None-mild	564	39.30			
Moderate	503	35.05			
Severe-very severe	368	25.64			
Number of ADL Dependencies					
0	275	19.04			
1-2	541	37.47			
3-4	398	27.56			
5-6	230	15.93			
Number of IADL Dependencies					
0	76	5.26			
1-2	369	25.55			
3-4	477	33.03			
5-6	522	36.15			

Note: HMO = Health Maintenance Organization; Medicare PCDC Demonstration = Medicare Primary and Consumer-Directed Care Demonstration; ADL = Activities of Daily Living; IADL = Instrumental Activities of Daily Living; Source for Cognitive Performance Scale (CPS) = Morris, et al., 1994.

Table 2

Logistic Regression for Any Emergency Medical Services Use (N=1436)

Variable	Coefficient	Coefficient 95% CI	Std Error	z	Odds Ratio	Odds Ratio (OR) 95% CI	P Value
Major Depression	0.179	−0.13 - 0.49	0.157	1.14	1.20	0.87 - 1.63	0.258
Age 75-84	−0.031	−0.32 - 0.26	0.146	−0.21	0.97	0.72 - 1.29	0.833
Age 85+	0.140	0.01 - 0.72	0.158	2.58	1.51	1.11 - 2.06	0.010
Non-white race	−0.524	−1.25 - 0.20	0.370	−1.42	0.59	0.28 - 1.23	0.162
Good self rated health	−0.021	−.040 - 0.35	0.191	−0.11	0.98	0.67 - 1.43	0.912
Fair self rated health	0.276	−0.09 - 0.64	0.188	1.47	1.32	0.91 - 1.91	0.145
Poor self rated health	−0.069	−0.50 - 0.37	0.222	−0.31	0.93	0.61 - 1.44	0.757
Number of chronic conditions	0.127	0.07 - 0.18	0.027	4.68	1.13	1.08 - 1.20	<0.001
Cognitive Performance Scale (CPS) score	−0.003	−0.10 - 0.09	0.050	−0.07	1.00	0.90 - 1.10	0.944
Number of ADL dependencies	0.062	−0.01 - 0.14	0.039	1.60	1.06	0.99 - 1.15	0.111
Number of ADL dependencies	0.046	−0.04 - 0.13	0.044	1.05	1.05	0.96 - 1.14	0.286
Nurse intervention	−0.053	−0.39 - 0.28	0.171	−0.31	0.95	0.68 - 1.32	0.753
Voucher intervention	0.299	−0.01 - 0.61	0.160	1.87	1.35	0.98 - 1.85	0.062
Nurse plus Voucher intervention	0.398	0.08 - 0.71	0.161	2.47	1.49	1.08 - 2.03	0.013
Number of study days	−0.001	−0.001 - 0.000	0.000	−1.83	0.99	0.99-1.00	0.067
Constant	−1.591	−2.227 - −0.954	0.325	−4.90	--	--	<0.001

Log likelihood = −902.077; Wald Chi2 = 75.72; Prob. > Chi2 < .001; Pseudo R-squared = 0.044. This regression model included only those independent variables that had bivariate associations with major depression of p=0.15 or less. Source for Cognitive Performance Scale (CPS) = Morris, et al., 1994. ADL = Activities of Daily Living; IADL = Instrumental Activities of Daily Living.

Table 3

Poisson and Ordinary Least Squares Regression Models for Number of Emergency Medical Services (EMS) Episodes among Those That Had at Least One EMS Episode (N=526)

Variable	Poisson Regression					Ordinary Least Squares Regression				
	Coefficient	Robust Std Error	z	P Value	95% CI	Coefficient	Robust Std Error	t	P Value	95% CI
Major Depression	.201	.101	1.99	.047	.003 - .399	.144	.069	2.08	.038	.008 - .281
West Virginia/Ohio	.144	.079	1.84	.066	−.010 - .299	.120	.053	2.26	.024	.016 - .225
Rural	−.131	.069	−1.91	.056	−.266 - .003	−.071	.048	−1.49	.138	−.165 -.023
Feels Close to 0-1 Relatives	−.151	.122	−1.24	.216	−.389 - .088	−.137	.072	−1.89	.059	−.279 - .005
Feels Close to 2-5 Relatives	−.212	.076	−2.77	.006	−.362 - −.062	−.130	.056	−2.33	.020	−.239 - −.020
Medicare Supplemental (Medigap) Insurance	.106	.078	1.37	.172	−.046 - .259	.070	.053	1.32	.188	−.034 -.176
Cognitive Performance Scale (CPS) score	.056	.023	2.40	.017	.010 -.102	.046	.016	2.89	.004	.015 - .078
Nurse intervention	−.239	.117	−2.03	.042	−.469 - −.009	−.125	.076	−1.64	.101	−.274 - .024
Voucher intervention	−.195	.100	−1.96	.050	−.390 - −.000	−.086	.071	−1.21	.225	−.226 - .054
Combination of Nurse and Voucher	−.104	.105	−0.99	.322	−.310 -.102	−.033	.072	−0.46	.645	−.176 -.109
Number of study days	.000444	.000125	3.55	<.001	.000 - .001	.000281	.000089	3.16	.002	.000106 - .000045
Constant	.364	.137	2.66	.008	.095 - .632	.210	.097	2.16	.031	.019 - .401

Poisson Regression: Log pseudolikelihood = −804.365; Wald Chi2 = 45.81; Prob. > Chi2 < .001; Pseudo R-squared = 0.026. OLS Regression: F(11, 514) = 3.75; Prob > F < 0.001; R-squared = 0.073; Root MSE = .533. Each regression model included only those independent variables that had bivariate associations with major depression of p=0.20 or less. Source for Cognitive Performance Scale (CPS) = Morris, et al., 1994.