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Personality Traits Predict Emergency Department Utilization Over 3 Years in Older Patients

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Abstract

Background—Emergency department (ED) utilization by older patients has major implications for morbidity, mortality, and health costs, yet its behavioral determinants remain poorly understood. Powerfully tied to health in older adults, the “Big Five” personality traits of neuroticism, extroversion, openness to experience, agreeableness, and conscientiousness may predict ED use.

Objectives—Investigate the role of personality in prospective ED use among older patients.

Research Design—Prospective cohort.

Subjects—Adults aged 65 and older.

Measures—Participants completed the NEO Five Factor Inventory of personality at baseline, and interviewers administered the Cornell Services Index assessing ED use at baseline and 3 yearly follow-ups.

Results—Controlling for income, education, gender, age, physician-assessed medical burden and physical functioning, and interviewer-assessed impairments in basic activities of daily living and physical self-maintenance, and depression, lower agreeableness and higher extroversion were each associated with increased odds of an ED visit over the follow-up period. A 1 sample deviation (SD) increase in extroversion (i.e., 50th versus 83rd population percentile) increased the odds of ED use by 51% (adjusted odds ratio [AOR] [95% CI] = 1.51 [1.03-2.21], $z = 2.12$, $N = 923$, $p = 0.034$). A 1-SD decrease in agreeableness (i.e., 50th versus 17th population percentile) increased odds of ED use by 54% (AOR [95% CI] = 1.54 [1.05-2.22], $z = -2.25$, $N = 923$, $p = 0.034$).

Conclusion—The greater assertiveness and social confidence signified by lower agreeableness and higher extroversion may help older adults overcome potential barriers to the ED. Overly introverted and agreeable older adults may require special encouragement to access the ED—particularly for time-sensitive conditions—to reduce morbidity and mortality.

Keywords

Emergency department use; older adults; personality traits; Andersen behavioral model

Emergency department (ED) utilization is a major issue in elderly populations. We focus here on medical, as opposed to psychiatric ED use, although mental health service use by older adults is also a major public health issue.^{1,2} Appropriate use of the ED can reduce morbidity, mortality, and healthcare costs associated with untreated emergent conditions, whereas misuse may lead to healthcare system burden and unnecessary costs. Despite the fact that older adults represent a large proportion of ED visits, often have longer ED stays, and higher rates of hospital admission than younger patients,³ widespread attention to determinants of ED use in the elderly is relatively recent,^{4,5} and has only begun to address psychosocial or behavioral factors influencing ED utilization in this population. The Anderson behavioral model of health service use⁶ has been used as a conceptual framework for studying ED use among older adults,^{4,5} and considers utilization to be driven by 1) need, involving health conditions, which require medical attention; 2) enabling factors, such as sufficient insurance, geographic access, and financial means; and 3) predisposing factors, including demographic factors such as age and gender, as well as individual differences in psychological characteristics, behaviors, and other psychosocial factors.

Reviews⁴ and large-scale analyses of Medicare beneficiary data⁵ indicate that medical need is the primary factor accounting for ED usage among elders but have noted that existing studies and surveillance databases often do not assess psychological and behavioral factors, which may affect older adults' success at accessing ED services. Among other things, these might include dispositional tendencies such as the ability to remain calm under stress, assert one's need for care, reliably follow-through on the intention to visit the ED, and interact with caregivers and medical staff. A large range of psychological factors potentially affecting ED use can be parsimoniously captured by the so-called "Big Five" personality traits, which reflect the five major axes of dispositional cognitive, emotional, and behavioral variation in humans.^{7,8} Empirically derived and representing roughly equal portions of genetic and environmental variance,⁹ the Big-five taxonomy includes the dimensions of neuroticism or the tendency to experience negative emotions and emotional instability; extroversion, or a disposition toward sociability, positive emotions, dominance, and high-activity level; openness to experience, or interest in new things, ideas, and courses of action; agreeableness, or deference, acquiescence, amiability, and trust; and conscientiousness, reflecting diligence, reliability, organization, and goal striving. These traits are associated with several aspects of health in older adults,¹⁰ including health behaviors,^{11,12} subjective and objective medical burden,^{13,14} and all-cause mortality,^{15,16} and predict utilization of other health services in the general populations.¹⁷⁻²⁰ We hypothesized that the following Big Five Big personality traits would be associated with ED use in a prospective cohort study of older adults drawn from primary care, controlling for a range of other factors in the Andersen model reflecting healthcare need, enabling, and predisposing factors:

- Higher neuroticism may increase ED use because this trait is associated with health worry,²¹ somatic sensitivity,²² and chronic emotional distress.²³
- Higher extroversion involves vigor, social confidence,^{24,25} hope for future health,¹⁴ and sense of health control,^{11,26} which may enhance the odds of accessing ED services.
- Lower agreeableness involves assertiveness, a self-serving attitude, and potential manipulativeness,^{24,25} factors which may help older adults navigate administrative, bureaucratic, and logistical barriers to accessing the ED.
- Although conscientiousness is associated with protective behaviors¹² and might therefore be associated with greater ED use, the better health management of more conscientious individuals may also obviate the need for ED services. Similarly, openness might be associated with willingness to pursue ED services, but also receptivity to alternative routes to care, such as waiting for the next available urgent

primary care appointment. We therefore offered no a priori hypotheses about these traits but explored their association ED use.

METHODS

Participants and Procedure

Participants were adults aged 65 years and older who took part in a prospective cohort study on the health of older adults in primary care. Of 1,500 older adults approached in primary care clinics in the Rochester, NY area, 749 consented and underwent primary care chart reviews and interviews with trained research assistants in their homes or at the University of Rochester Medical Center. All individuals had Medicare insurance. The study funding was for 5 years, allowing for 1–4 years of follow-up given that intakes were staggered over the first 4 years of the funding period. The present study focuses on the first 3 yearly follow-ups. The follow-up period for each participant was dependent on entry into the study, and ranged from baseline only (i.e., no follow-up) to 3 years of follow-up after baseline (i.e., a total observation period of 4 years). Because only a very small number of 4-year follow-ups were conducted, they were not included in these analyses; however, analyses including them yielded comparable results. The study was duly approved by the institutional review board.

Measures

NEO-Five Factor Inventory—The NEO-Five Factor Inventory (NEO-FFI)²² is a 60-item personality inventory designed to assess the Big five personality dimensions of neuroticism, extroversion, openness to experience, agreeableness, and conscientiousness and is commonly used in research on personality and health in older adults.^{13,27,28} At the baseline interview, participants were left with the NEO-FFI to complete and return via mail. The NEO-FFI was scored using *T* scores (mean 50, sample deviation [SD] 10) according to national norms²⁵ and scaled by normative SD units to provide meaningful interpretation. Thus, a 1-SD unit increase in each trait corresponded to the difference between the 50th population percentile to the 83rd, whereas a 1-SD decrease corresponded to the difference between the 50th population percentile to the 17th, shifts representing average to “high” and “low” levels, respectively, of a trait.²⁵ Note that the sample standard deviations were comparable with those of the national norms (e.g., 10 *T* score points). The 50th percentile in the sample was half a SD lower than the national 50th percentile for neuroticism (e.g., *T* score of 45 rather than 50) and half a SD higher for Agreeableness (e.g., *T* score of 55 rather than 50).

Cornell Services Index—The Cornell Services Index (CSI)²⁹ assesses the use of several different types of health services, including outpatient and ED visits. Items ask whether a particular form of health service has been used, and if so, how much (i.e., how many primary care visits). The CSI was administered by interviewers with respect to the 3-month period immediately preceding the interview, consistent with its standard instructions, to minimize recall bias. Prior findings suggest that self-reports on the CSI closely correspond to actual records of service use,²⁹ and that interviewer assistance in self-reports of service use improves accuracy among older adults.³⁰ In addition to ED use, we included number of primary care visit in the last 3 months as a covariate, given prior reports of an association between primary care and ED use.⁴

Cumulative Illness Rating Scale—The Cumulative Illness Rating Scale (CIRS)³¹ quantifies the level of overall medical burden through ratings of disease severity (0 = no burden, 1 = mild burden, 2 = moderate burden, 3 = major burden, 4 = severe burden) across the following major organ systems: cardiovascular/respiratory (combining cardiac, vascular, upper respiratory, and eyes, ears, nose, and throat items), genitourinary, musculoskeletal, neurological, gastrointestinal (combining upper and lower gastrointestinal and hepatic items),

and endocrine/metabolic. CIRS ratings made on the basis of chart review highly correlate with ratings made by a pathologist at autopsy,³² and in the present study, ratings were made by a physician who was blind to the data on personality. These ratings were based on information taken from the participants' primary care charts including history, physical examinations, laboratory tests, and other health-relevant information.

Instrumental Activities of Daily Living and Physical Self-Maintenance Scales—

The Instrumental Activities of Daily Living and Physical Self-Maintenance Scales (IADL/PSMS)³³ are complementary indexes, which measure the extent of impairment in eight essential instrumental activities of daily living (IADLs) such as cooking, shopping, and housekeeping, and in six basic physical self-maintenance activities such as feeding, dressing, and grooming. Each item refers to a separate activity in which there may be no, mild, moderate, or severe impairment. Total scores indicate the degree of impairment, with higher scores meaning greater impairment. Interviewers completed these measures at baseline and yearly home visits.

Karnofsky Performance Status Scale—The Karnofsky Performance Status Scale (KPSS)³⁴ is a rating scale reflecting the general level of physical functioning and disability due to physical illness; higher scores on the 0–100 scale indicate higher levels of functioning. The KPSS was completed by a physician investigator (JML) blind to personality data and based on the subject interview and chart review.

Hamilton Depression Rating Scale—The 24-item version of the Hamilton Depression Rating Scale (HDRS)³⁵ is a reliable and validated interviewer-administered measure of depressive symptom severity within the previous week that has been used with older adults in primary care. It was included to control for any effect of depression on ED utilization.³⁶

Socioeconomic Status—Years of education, rarely affected by later health problems, and census tract median income were used to adjust for socioeconomic status, consistent with recommendations that both individual-level and area-based indices of socioeconomic resources be taken into account in health research.^{37,38}

Statistical Analysis

We used Generalized Linear Mixed Models (GLMMs)³⁹ to estimate the association between baseline personality and odds of ED visits over the study period. GLMMs account for the longitudinal nesting of repeated observations within individuals, use all available data, and provide valid inference even when missing data can be predicted from prior observed covariates. All p values are based on z tests with 1° of freedom.

First, a set of bivariate models examined unadjusted associations between each predictor/covariate and the odds of ED use prospectively. We then fit a multivariate model with personality traits as primary independent variables and covariates conceptualized according to domains of the Andersen⁶ model domains: “health need” factors included CIRS (illness burden), and the KPSS, IADL, and PSMS (physical functioning and disability) at each year; “Enabling” factors including socioeconomic indicators education and census tract median income; and other “predisposing” factors, including gender, age, primary care visits in the prior 3 months, and depression. We also adjusted for study wave, to account for any systematic shifts in ED utilization patterns over the course of the study. Finally, to gain a practical appreciation of personality effect sizes, we compared the effect of a 1 SD change in personality traits to that of a three-point change on the CIRS, or the equivalent of moving from “no burden” to “major burden” in an organ system. Analyses were conducted in Stata 10.0 (Stata Corporation, College Station, TX).

RESULTS

Longitudinal Sample Characterization

Table 1 presents descriptive statistics for the sample arranged according to domains of the Anderson model, which ranged in age at baseline from 65 to 97 years (mean = 75.02, SD = 6.54), and were predominantly white (92%) and women (64%). Data were unavailable on illness burden in two individuals at baseline, for an effective baseline sample of 747. Excluding deaths (N = 28) and withdrawals (N = 85) over the course of the 4-year period, 1-year follow-up interviews were completed on 484 of 699 (69%) eligible given their study entry date. The 2-year follow-up interviews were completed on 398 of 578 (69%) eligible given entry date and 3-year follow-up interviews were completed on 313 of 418 eligible (75%) eligible given entry date. Individuals not completing interviews at the prior time point, but not deceased, withdrawn, or ineligible due to study end date were considered eligible at each wave. Preliminary logistic regression models indicated that younger age and lower education were associated with withdrawal, whereas greater illness burden was associated with death and missed interviews over the follow-up.

The return rate for personality questionnaires at baseline was 69%. Personality trait means were within ± 0.5 SD of the national mean for extroversion, openness, and conscientiousness, and approximately 0.5 SD below and above national means for neuroticism and agreeableness, respectively. Logistic regression models suggested that individuals with data for all variables of interest did not differ with respect to age, gender, education, or illness burden from those without complete data. The final analysis sample thus included 298 individuals at baseline, 169 at 1-year follow-up, 217 at 2-year follow-up, and 239 at 3-year follow-up, for a total of 923 observations across the study period. One individual had a very large numbers of primary care visits (64, 63, and 61 at baseline, 1 year, and 3-year follow-up), so analyses were repeated both with and without this individual.

Factors Influencing Prospective ED Use

First, GLMMs examined bivariate associations between each predictor/covariate and ED use over the study period. These results, presented in the middle column of Table 2, suggested that higher neuroticism, lower conscientiousness, and lower agreeableness were associated with greater odds of an ED visit in past 3 months at each assessment point. These bivariate analyses also indicated that likelihood of ED use was associated with more primary care visits, higher CIRS and KPSS scores, and higher impairment scores on the IADL and PSMS.

The multivariate model adjusting for all factors simultaneously, presented in the right hand column of Table 2, revealed that a 1-SD increase in extroversion increased the odds of ED use by 51% (adjusted odds ratio [AOR] [95% CI] = 1.51 [1.03–2.21], $z = 2.12$, $N = 923$, $p = 0.034$), and a 1-SD increase in agreeableness decreased the odds of ED use by 35% (AOR [95% CI] = 0.65 [0.45–0.95], $z = -2.25$, $N = 923$, $p = 0.025$) or equivalently, a 1-SD decrease in agreeableness increased the odds of ED use by 54% (AOR [95% CI] = 1.54 [1.05–2.24], $z = 2.25$, $N = 923$, $p = 0.025$). By comparison, a 3-point increase in the CIRS, or the equivalent of moving from “no burden” to “major burden” in an organ system, was associated with a 64% increase in the odds of ED use (AOR [95% CI] = 1.64 [1.12–2.35], $z = 2.70$, $N = 923$, $p = 0.007$; this AOR can be obtained by taking the natural log of the odds ratio for a one-point CIRS increase in Table 2, multiplying it by 3, and taking the antilog of this product). High extroversion therefore exerted roughly $(1.51/1.64 = 0.92)$ 92% and low agreeableness exerted $(1.54/1.64 = 0.94)$ 94% as much effect on likelihood of ED use as major medical burden in a given organ system. The other significant predictors of utilization in adjusted models were higher HDRS scores and primary care visits, and odds of ED use decreased with each follow-up period. Table 1 reports the odds ratio for a 1 pt. increase in HDRS scores; the odds ratio

from the multivariate model for a 10 point increase in HDRS scores (i.e., the difference between 0 and 10, a cutoff often used for subsyndromal depression) was 2.16 (95% CI: 1.34–3.71; $z = 2.93$, $N = 923$, $p = 0.003$). Results were virtually identical when the outlier with a large number of primary care visits was excluded.

CONCLUSION

Motivated by the dearth of literature on behavioral and psychosocial determinants of ED use in older adults, we examined whether personality traits predicted ED use prospectively in a cohort of older adults drawn from primary care. Our hypotheses that higher extroversion and lower agreeableness would be associated with greater odds of ED use prospectively in a cohort of older adults were supported in analyses fully adjusted for Andersen⁶ model domain factors representing healthcare need, enabling, and predisposing factors. The magnitude of effect for high extroversion and low agreeableness approached that of major medical burden in a given organ system. Our hypothesis that greater neuroticism would increase likelihood of ED visits found only partial support; however, bivariate associations between baseline neuroticism and prospective ED use disappeared after adjustment, suggesting the effects of neuroticism may be mediated by other determinants, such as depressive symptom severity. Three aspects of these findings warrant comment.

First, extroversion may enhance the odds that older persons would visit the ED because the physical energy and vigor, coupled with social confidence indexed by this trait,^{24,25} enable decisive action in the face of urgent health problems. Prior findings have also linked extroversion to greater sense of control over health^{11,26} and to hope for future health among older adults.¹³ These tendencies may index expectations of positive healthcare experiences, and more favorable attitudes toward health services have been associated with ED use among elders in prior work.⁴⁰

Second, lower agreeableness was also associated with greater odds of ED use among older adults. Low levels of this trait reflect assertiveness, manipulateness, and self-interest and can result in resistance to others' directions, authority, or efforts to control.^{24,25} Often socially unpleasant, the potential adaptive value of these tendencies may lie in their ability to assert one's need for urgent care stridently enough or cleverly enough to circumvent potential obstacles to ED access faced by older adults. For instance, consider an older adult with an incipient health crisis who is told on Friday by a primary care physician without weekend office hours to return on Monday for further evaluation. An assertive older patient may be more capable of resisting this advice and instead reporting to the ED. In contrast, an overly agreeable older patient may comply out of concern for potential conflict with or for inconveniencing outpatient office staff, ED personnel, the primary care doctor, or others in their support system who must transport them to and provide supervision during the ED visit. Other barriers to ED access for older adults, such as convincing emergency services or triage personnel to attend to one quickly, obtaining transportation, and instrumental assistance, or alerting caretakers to emergent problems may also be surmounted by the combination of social confidence, vigor, assertiveness, and insistence encapsulated by high extroversion and lower agreeableness.

Third, although higher neuroticism seemed associated with higher odds of ED use in unadjusted models, we did not observe hypothesized effects after multivariate adjustment. One reason may be that neuroticism is a longstanding predisposition toward distress and negative emotion, which greatly increases risk for depressive episodes.^{28,41} In this cohort, current depression symptoms were prominently associated with higher likelihood of ED use, suggesting that current depressive symptoms represent a more proximal correlate of ED use in older patients than neuroticism. Higher conscientiousness was also associated with lower odds of ED use in unadjusted but not adjusted analyses. However, higher conscientiousness is associated with

less illness burden,¹² which in turn was a significant determinant of ED use (consistent with prior findings^{4,5}), so a mediating relationship may prevail among these factors. More primary care visits were also associated with greater likelihood of an ED visit, contrary to prior findings,⁴ perhaps reflecting a sample-specific pattern wherein outpatient services promote ED access. Finally, ED use tended to decline over the study period, probably reflecting selective survivorship and retention of more medically stable participants over the course of the study.

These findings suggest several implications. First, considerable heterogeneity exists in ED use even among older adults of comparable sociodemographics, medical burden, and functional status. Linking this heterogeneity to personality dispositions can systematically describe the complex array of psychological and behavioral tendencies driving the decision to seek care. This aids in the identification of who or which kind of older patients are more or less likely to use emergency medicine services. Although our findings indicate that more extraverted and less agreeable older patients are more likely, whereas introverted and highly agreeable patients less likely to seek ED care, we make no claims about “over” or “under” utilization. Rather, given that patients are often advised to seek care when in doubt—particularly for time-sensitive conditions such as strokes and myocardial infarctions—a cautious interpretation is simply that more introverted and agreeable older adults may constitute a specific risk-segment of the geriatric population less likely to access ED services.

Introverted and overly agreeable older patients may require particular encouragement from primary care providers to seek ED services, particularly for time-sensitive conditions, for which waiting for the next outpatient appointment may result in a hospitalization that was avoidable or increase fatality risk. Whether through informal clinical advice or formal behavioral intervention, potentially helpful prophylaxis may range from simple reassurances—such as that it is always safer to be evaluated than not—to more elaborate training in assertiveness and proactive coping specific to the steps necessary to obtain ED care. Meta-analytic findings that personality continues to evolve across the life course³⁸⁻⁴⁰ suggest that interventions to reduce dispositional risk for ED underuse or misuse in elders would be theoretically and empirically well grounded. Just as depression and anxiety are commonly screened in primary care, future work may wish to evaluate the feasibility and utility of brief personality measures⁴² for screening, as well as the accuracy with which physicians and caretakers of older patients can judge their patients’ dispositional tendencies,⁴³ obviating the need for formal screening.

We qualify our findings appropriately by study limitations. First, utilization data were self-reported, albeit with a validated instrument, which correlates highly with documented utilization,²⁹ and in the context of an interview, which facilitates accuracy of service use reports in the elderly.³⁰ Second, we were unable to examine specific reasons for ED visits. This makes it difficult to disentangle high rates of use due to legitimate medical emergencies from personality-driven use. Third, our sample reported levels of neuroticism and agreeableness slightly below and above the population mean. Although response rate was in line with expectations, given the intensive nature of participation, future studies might wish to oversample highly neurotic and disagreeable populations. Fourth, although we controlled extensively for numerous other covariates, the possibility of additional, unmeasured influences can never be ruled out. For instance, we did not measure supplementary insurance or income at the individual level; however, prior reports suggest minimal impact of both upon ED use in older adults with Medicare.⁵ Other factors may drive both depression and ED use, or they may reciprocally influence one another over time. Fifth, our prospective cohort design provides less basis for causal conclusions than randomized clinical trials, but it is impossible to randomize individuals to personalities, rendering prospective cohort designs the most feasible for investigating this area. As causality cannot be strongly inferred, however, we restrain our conclusions to rigorously controlled prospective prediction. Sixth, three conceptual or theoretical hypotheses were tested in this study—one each for neuroticism, extroversion, and

agreeableness. Some might use a Bonferroni correction or reduce the p value from the customary value of 0.05–0.01 or another value. However, as we were examining this question for the first time, we favor the use of the conventional value of 0.05 in order to err on the side of falsely accepting a hypothesis rather than conclude potentially important factors are nonsignificant and exclude them from further study. Results should be interpreted in this light. A related consideration is that 32 p values appear in Table 2. The left-hand column presents bivariate associations, primarily for descriptive purposes. We draw no inference or scientific conclusions from these unadjusted estimates. Additionally, the p values of covariates, either unadjusted or from the multivariate model presented in the right-hand column of Table 2, are of little interest because these variables were included simply to adjust personality estimates for potential confounders. From one perspective, some of these p values may represent Type I errors. Thus, we caution against drawing inferences about the statistical significance of unadjusted or covariate effects, which were not the factors of interest in this study.

In conclusion, our results indicate that personality traits represent a potentially illuminating set of predisposing factors that may be useful in identifying older adults more or less likely to access ED care. Further research might explore whether dispositional and behavioral risk profiling can be effectively used to reduce morbidity, mortality, quality of life burden, and healthcare costs arising from failure to seek timely treatment for emergent health problems. Future work may also examine whether personality can assist in the identification and characterization of patients who have difficulty navigating the healthcare system in general, and/or those who misuse or overuse it. A better understanding of psychological and behavioral factors associated with ED and other health service use in the elderly may hold promise for the construction and tailoring of prevention and intervention programs encouraging optimal health service use.

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TABLE 1
Sample Descriptives, Organized by Anderson Model Domains Graphics

Domain/Variable	M/N	SD/%	Range
Personality traits			
Neuroticism	44.4	10.1	25-75
Extraversion	51.5	10.5	25-75
Openness	49.3	9.9	25-75
Agreeableness	54.5	9.9	25-75
Conscientiousness	49.5	9.7	25-75
Predisposing factors			
Gender, female	190/298	19,679.8%	—
Age (years)			
Year 1	75.2	6.6	65-94
Year 2	75.2	6.5	65-95
Year 3	75.0	6.5	65-95
Year 4	74.3	6.4	65-95
Depression (HRDS)			
Year 1	8.9	6.2	0-35
Year 2	8.8	6.0	0-28
Year 3	8.5	6.0	0-31
Year 4	8.6	6.2	0-29
Enabling factors			
Education (years)	14.0	2.3	6-17
Census Tract Median Income (dollars)	55,690	19,679	11,485-114,787
Health care need factors			
Cumulative Illness Rating Scale (CIRS)			
Year 1	7.4	2.8	0-18
Year 2	8.5	3.0	2-21
Year 3	9.5	3.0	3-22
Year 4	9.9	3.2	2-21
Karnofsky Performance Scale (KPSS)			
Year 1	79.9	11.5	40-94
Year 2	78.5	12.1	19-94

Domain/Variable	M/N	SD/%	Range
Year 3	77.4	12.1	37-91
Year 4	76.7	12.8	36-91
Instrumental Activities of Daily Living (IADL)			
Year 1	1.7	3.3	0-18
Year 2	1.6	3.0	0-19
Year 3	2.0	3.6	0-20
Year 4	2.1	3.7	0-19
Physical Self Maintenance Scale (PSMS)			
Year 1	1.3	2.0	0-14
Year 2	1.5	1.6	0-7
Year 3	1.7	2.0	0-15
Year 4	1.8	2.1	0-15
Primary care visits ^a			
Year 1	2.6	1.5	0-13
Year 2	2.5	1.8	0-12
Year 3	2.5	2.2	0-21
Year 4	2.6	2.5	0-33
Emergency room use			
Year 1	39/298	13.1%	—
Year 2	12/169	7.1%	—
Year 3	22/217	10.1%	—
Year 4	19/239	8.0%	—

^aOne outlier had 64, 63, and 61 primary care visits at Years 1, 2, and 4.

TABLE 2
Unadjusted and Adjusted Predictors of ED Use Over Study Period

Personality Traits/Anderson Model Domains	Bivariate Predictors of Emergency Room Visit OR (95% CI)	Multivariate Predictors Emergency Room Visit OR (95% CI)
Personality traits ^a		
Neuroticism	1.54 (1.09-2.18) ^b	0.95 (0.62-1.45)
Extraversion	0.92 (0.65-1.31)	1.51 (1.03-2.21) ^b
Openness	1.13 (0.78-1.64)	1.12 (0.79-1.58)
Agreeableness	0.60 (0.41-0.87) ^c	0.65 (0.45-0.95) ^b
Conscientiousness	0.62 (0.42-0.93) ^c	0.78 (0.53-1.17)
Predisposing factors		
Female	1.18 (0.62-2.28)	1.18 (0.58-2.39)
Age, years	1.00 (0.95-1.05)	0.99 (0.94-1.04)
Hamilton Depression Scale (HDRS)	1.11 (1.07-1.17) ^d	1.08 (1.03-1.14) ^b
Enabling factors		
Census Tract Median Income (10 K units)	1.02 (0.96-1.07)	1.04 (0.88-1.23)
Education, years	0.99 (0.87-1.12)	0.98 (0.83-1.15)
Health need factors		
Cumulative Illness Rating Scale (CIRS)	1.20 (1.09-1.32) ^d	1.18 (1.04-1.33) ^d
Karnofsky Performance Status Scale (KPSS)	0.95 (0.93-0.98) ^d	0.98 (0.94-1.02)
Physical Self Maintenance Scale (PSMS)	1.11 (1.01-1.21) ^c	0.97 (0.79-1.20)
Instrumental Activities of Daily Living Impairment (IADL)	1.27 (1.10-1.49) ^b	0.95 (0.85-1.06)
Primary care visits	1.07 (1.01-1.14) ^b	1.06 (1.01-1.12) ^b
Study wave	0.81 (0.65-1.04)	0.69 (0.54-0.90) ^c

Notes: Results of bivariate and multivariate mixed effects models predicting ED use longitudinally. Odds ratios (confidence intervals).

^aPersonality traits scaled in standard deviation (SD) units according to national norms: 1-SD increase is equivalent to moving from the 50th to 83rd population percentile on the trait, whereas 1-SD decrease is equivalent to moving from the 50th to the 17th population percentile on the trait. Tests are z tests based on 923 observations across the study period.

^bp <0.05.

^cp <0.01.

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$p < 0.001$