


Psychiatric comorbidity in emergency general surgery patients: a prospective observational study

Timothy J Geier ,¹ Natasha Simske,¹ Sarah Melin ,¹ Colleen Trevino,¹ Patrick Murphy,¹ Mary Elizabeth Schroeder,¹ Amber Brandolino,² Terri deRoon-Cassini,^{1,2} Andrew T Schramm¹

¹Surgery, Medical College of Wisconsin, Milwaukee, Wisconsin, USA

²Comprehensive Injury Center, Medical College of Wisconsin, Milwaukee, Wisconsin, USA

Correspondence to

Dr Timothy J Geier; tgeier@mcw.edu

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ABSTRACT

Objectives Annually, approximately 27 million individuals in the United States are admitted to hospitals for emergency general surgery (EGS). Approximately 50% develop postoperative complications and 22% require unplanned readmission within 90 days, highlighting a need to understand factors impacting well-being and recovery. Psychiatric comorbidity can impact medical treatment adherence, cost, and premature mortality risk. Despite the severity of illness in EGS, there is limited research on psychiatric comorbidity in EGS patients. Thus, the purpose of the current study was to characterize EGS patient mental health and to assess its relationship with pain, social support, and healthcare utilization (ie, length of stay, readmission).

Methods Adult EGS patients were screened for participation during hospitalization. Inclusion criteria included: (1) 18 years or older, (2) communicate fluently in English, and (3) assessed within 7 days of admission. Participants (n=95) completed assessment, which included a structured clinical diagnostic interview. Record review captured medical variables, including length of stay, discharge disposition, narcotic prescription, and 90-day readmission rates.

Results Ninety-five patients completed the assessment, and 31.6% met criteria for at least one current psychiatric diagnosis; 21.3% with a major depressive episode, 9.6% with a substance use disorder, and 7.5% with post-traumatic stress disorder (PTSD). Lower perceived social support and greater pain severity and interference were significantly related to more severe depression and anxiety. Depression was associated with longer length of stay, and those with PTSD were more likely to be re-admitted.

Conclusion The EGS patient sample exhibited psychiatric disorder rates greater than the general public, particularly regarding depression and anxiety. Screening protocols and incorporation of psychological and social interventions may assist in recovery following EGS.

Level of evidence Level II, prognostic.

INTRODUCTION

Annually, >27 million individuals are admitted to US hospitals for emergency general surgery (EGS) with these admissions and costs expected to rise 45% to >\$41 billion annually by 2060.¹ EGS patients, compared with elective general surgery patients, carry more severe pre-existing illnesses, require more prolonged postoperative mechanical ventilation, require longer intensive care unit (ICU)

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Although researchers have identified a robust co-occurrence of psychiatric disorders with medical illness in general, knowledge of psychiatric comorbidity specific to emergency general surgery (EGS) patients is limited to provider-based anecdotal evidence, medical record review, and self-report measures.

WHAT THIS STUDY ADDS

⇒ This study offers an in-depth evaluation of mental health diagnoses in an EGS patient population via use of the gold-standard clinical interview, which provides more reliable and novel insight into what EGS patients experience from a mental health standpoint.
⇒ The current EGS convenience sample exhibited psychiatric disorder rates greater than the general public and, in some cases, other patient populations (eg, general hospital adult inpatient).

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ As leaders in the field determine how to implement a coordinated system of care for the EGS patient, this investigation highlights the need for assessing psychiatric needs and effectively engaging EGS patients with mental health services to optimize outcomes.
⇒ Results of this investigation can inform future projects related to psychological and pain management interventions as well as promotion of social support systems to more effectively modulate quality of life and to buffer the development and/or exacerbation of psychopathology.

stays, and have higher rates of mortality.² Furthermore, approximately half of EGS patients develop postoperative complications, with 22% requiring unplanned readmission within 90 days postsurgery.^{3–5} Increased risk for poor outcomes remains in this population even after adjusting for preoperative comorbidity and physiological status.⁵ Together, these findings underline the public health burden of disease in EGS patients as well as the need to better understand and improve factors related to effective management of this population.

One factor likely impacting EGS outcomes is psychological health. Generally, researchers have

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identified a robust co-occurrence of psychiatric disorders with medical illness and injury.^{6,7} Concomitant mental illness among medical patients (eg, diabetes) has been shown to impact medical treatment adherence and cost as well as premature mortality risk.^{8,9} Despite complexities of the EGS population, there is limited empirical work detailing emotional functioning of these patients. That said, provider-based anecdotal evidence of psychological concerns is described in EGS management guidelines; for example, postoperative enterocutaneous fistula guidelines highlight ‘the psychological sequelae, which include depressive illness, anxiety, guilt, and institutionalization’.¹⁰ There is also empirical evidence of psychiatric needs in patients with medical stressors often treated through EGS. For example, a qualitative study examining patient experiences with cholecystitis and cholecystectomy found pain associated with cholecystitis ‘can create stress...even more so in those who are vulnerable to psychological stress’ and ‘patients expressed feelings of vulnerability with “no control” over their illness’.¹¹ Currently, assessment of psychological functioning is limited to self-report measures, and these data are often sourced through outpatient, elective encounters and do not speak to the conditions unique to emergency medical interventions. For example, in a meta-analysis examining impact of psychological factors on surgical recovery, most studies did not incorporate the gold standard of psychological evaluation (ie, clinical interview), and most participants underwent only elective procedures.¹² These methodological limitations thwart generalizability of conclusions regarding EGS patients.

These gaps in clinical knowledge and practice contrast, for example, with significant advances in the multidisciplinary and holistic care of patients with cancer. Born from specific research efforts identifying the effects of cancer on psychopathology, pain, and fatigue, the American College of Surgeon’s (ACS) Commission on Cancer recognized the psychosocial impact of cancer, leading to a requirement for mental health screening and referral as part of the accreditation process.¹³ As a result, both research funding and philanthropic efforts have been devoted to identifying effective strategies for improving comprehensive patient care in oncology, leading to improved integrated care to treat patients with cancer.

Altogether, developing a greater, empirical understanding of EGS patients’ psychological presentation within the context of their physical health may help identify patients at risk for adjustment and coping difficulties during hospitalization and recovery. Identifying these at-risk patients early in their hospital course may allow providers to initiate more integrative treatments to mitigate and/or circumvent psychological distress and increase access to psychiatric care; this in turn can potentially reduce physical complaints and recovery complications. To this end, the present study has three aims. First, to identify psychiatric diagnostic rates and symptom severity in a convenience sample of EGS patients; it was hypothesized these rates would be analogous to other hospital-based surgical samples (eg, traumatic injury). Second, to examine how social support and pain experience are related to these psychological sequelae; it was hypothesized social support would be related to less psychiatric distress and that pain would be related to more psychiatric distress. Third, to explore the impact of psychopathology and other characteristics on length of hospitalization as well as on likelihood of 90-day readmission; it was hypothesized more psychiatric distress, more pain, and less social support would increase risk for readmission.

METHODS

Participants

EGS patients admitted by the Trauma and Acute Care Surgery service at a single Midwest level I trauma center were recruited to participate in the current study. The ability to approach patients was limited by personnel availability and patient availability, and therefore only a limited subset was available for inclusion. From April 2018 to November 2021, a convenience sample of eligible participants was identified using a real-time list of all patients admitted to the EGS service. Inclusion criteria included: (1) 18 years of age or older, (2) ability to communicate fluently in English (due to lack of trained bilingual staff members and questionnaires available in other languages), and (3) assessment within 7 days of admission. In total, 1157 patients were assessed for study eligibility; of these, 274 patients did not meet inclusion criteria, including 30 non-English-speaking patients, resulting in 883 patients eligible for study participation. Among these, 589 (66.7%) were not directly approached given lack of patient availability (eg, surgery, engagement with cares, sleeping) and subsequent discharge prior to being approached. Of the remaining 294 individuals approached for enrollment, 194 (66%) declined participation.

A total of 100 participants consented and completed the study protocol during hospitalization; 5 participants discharged prior to administration of psychiatric diagnostic interview, resulting in 95 participants in the analytic sample.

Procedure

A trained research team member approached eligible participants and explained the study purpose, risks and benefits, and procedures. Once enrolled, participants provided demographic information, and a standardized psychiatric diagnostic interview was conducted by a trained research team member. All measures were administered verbally.

Measures

Demographics

Demographic information was obtained, including age, gender, race, and ethnicity, education level, relationship status, as well as psychiatric treatment history. The following information was captured from the participant’s electronic medical record: chief admission complaint, baseline hospitalization length, and dates of readmissions within 90 days postdischarge.

Psychiatric diagnoses

The Mini International Neuropsychiatric Interview (MINI) standard V.7.0.2 is a brief, structured clinical diagnostic interview for Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition and International Classification of Diseases, Tenth Edition psychiatric disorders.¹⁴ MINI is the most widely used psychiatric structured diagnostic interview in the world and serves as the ‘gold standard’ for identification of various psychological disorders (eg, major depression) in other empirical studies.¹⁵ MINI yielded adequate to strong sensitivity (ie, 0.63–0.94) and moderate to strong specificity (ie, 0.72–0.97) when compared with the Composite International Diagnostic Interview.¹⁶ It requires minimal training and takes approximately 15 min to administer, making it simple and effective. It is, therefore, suitable for patient populations who cannot endure a longer interview, such as those requiring emergency surgical intervention. Dichotomous scoring was used to identify individuals meeting diagnostic threshold for the following current disorders: major depressive episode (MDE), manic episode,

hypomanic episode, panic disorder, social anxiety disorder, generalized anxiety disorder (GAD), obsessive compulsive disorder, post-traumatic stress disorder (PTSD; the index event was not necessarily specific to EGS admission, rather the most distressing lifetime traumatic event), alcohol use disorder, illicit drug use disorder, anorexia nervosa, bulimia nervosa, and binge eating disorder. MINI was administered and scored by trained graduate and postdoctoral-level professionals. In a random subsample of approximately 10% of the current study's interviews, there was an inter-rater reliability Cohen's kappa of 0.991 at the level of diagnosis, indicating almost perfect agreement.

Depression symptom severity

The Center for Epidemiologic Studies of Depression Scale-Revised (CESD-R) is a 20-item measure assessing symptoms of depression.¹⁷ Scores are derived from an average of all items, where higher mean scores indicate higher depression levels; per developer scoring instructions, values for the top two responses were coded with the same value. The CESD-R has demonstrated excellent internal reliability with a Cronbach's $\alpha=0.93$ in the general population.¹⁸

Anxiety symptom severity

The Beck Anxiety Inventory (BAI) is a 21-item self-report instrument measuring the severity of anxiety with a focus on somatic symptoms and is adept at discriminating between anxiety and depression.¹⁹ Scores are derived from an average of all items, with higher scores indicating higher anxiety levels. The BAI has exhibited excellent internal consistency with high Cronbach's α ranging from 0.90 to 0.94 in large samples of psychiatric patients, community-dwelling adults, and college students as well as good test-retest reliability with coefficients in the reasonable 0.62 to excellent 0.93 range.²⁰

Pain

The Brief Pain Inventory (BPI) is an 11-item self-administered general pain questionnaire assessing pain across two domains: pain severity (four items) and pain interference (seven items).²¹ Pain severity is defined as the individual's perception of pain intensity, including its worst, least, average, and current value. Pain interference is defined as the impact pain has on life activities (eg, walking, work) and affect (eg, mood, relationships, enjoyment). It has demonstrated good psychometric properties regarding reliability, validity, and responsiveness among surgical patient populations.^{22–24} Furthermore, evidence-based practice guidelines state the BPI can be used for pain assessment in surgery patients with acute pain.²⁵

Social support satisfaction

The Social Support Questionnaire-Shortened Version (SSQ-6) is a 6-item self-administered questionnaire measuring the qualitative and quantitative network of relationships accessible in adverse circumstances.²⁶ Participants indicate the number of people available to provide support in six areas, and then rate overall level of satisfaction with said support. Higher scores indicate greater level of satisfaction with the available support system. The SSQ-6 has exhibited excellent internal reliability with a Cronbach's $\alpha=0.93$.²⁶

Statistical approach

Means and standard deviations (SD) were computed for all dimensional variables; frequencies and percentages were computed for all categorical variables.

Given the sample size, determining the distribution of dimensional study variables was important in identifying appropriate statistical methodology. Subsequently, Shapiro-Wilk tests were completed to determine if study variables were normally distributed. Shapiro-Wilk tests showed BAI total ($W=0.92$, $p<0.01$), CESD-R total ($W=0.93$, $p<0.01$), SSQ-6 ($W=0.61$, $p<0.01$), BPI—severity ($W=0.97$, $p<0.01$), BPI—interference ($W=0.96$, $p<0.01$), and length of baseline admission ($W=0.48$, $p<0.01$) were not normally distributed; only age was normally distributed ($W=0.98$, $p=0.13$). Based on these outcomes, non-parametric statistics were used, including Spearman's rank correlation coefficients to assess the relationship between quantitative variables (eg, the relationship between BAI total and BPI—severity) and Mann-Whitney U tests to the significance of mean differences (eg, length of baseline admission) across categorical groups (eg, presence vs absence of MINI MDE). The χ^2 tests of independence were used to determine whether categorical variables were likely to be significantly related to each other.

Simple logistic regression was conducted to measure the degree to which psychosocial variables were associated with subsequent 90-day hospital re-admissions after discharge; corresponding classification rates were detailed.

RESULTS

To determine differences between the enrolled convenience sample and those not enrolled in the study, descriptive analyses comparing characteristics were conducted. Although age did not significantly differ between groups ($U=53\,505.5$, $z=0.117$, $p=0.91$), race was significantly different ($\chi^2(1, n=1152)=6.89$, $p=0.01$), where 74% of those enrolled identified as Caucasian vs 60% of those not enrolled identifying as Caucasian. Principal diagnosis differed significantly by enrollment status ($\chi^2(1, n=1152)=61.70$, $p<0.001$), where those not enrolled were more likely to have a principal diagnosis of appendicitis (12% vs 4.2%) or biliary disease (26% vs 9.5%) compared with those not enrolled; furthermore, those not enrolled were less likely to have a principal diagnosis of diverticulitis (6.8% vs 18.9%). Length of stay for those enrolled ($n=95$; median (Mdn)=8.26) was significantly longer than those not enrolled ($n=1057$; Mdn=5.84; $U=68\,548.0$, $z=5.20$, $p<0.001$).

Characteristics of enrolled patients including demographics, principal admission problem, discharge characteristics, and MINI diagnoses are reported in [table 1](#). The most common principal problems for admission were diverticulitis/colon (19%) and bowel obstruction/small bowel (16.8%); principal EGS problem was not significantly related to length of stay, narcotic prescription at discharge, 90-day readmission status, CESD-R severity, BAI severity or any MINI diagnosis ($p>0.05$).

Descriptive statistics for dimensional study measures are detailed in [table 2](#). Length of stay for those with a surgery ($n=74$; Mdn=5) was significantly longer than for those without a surgery ($n=21$; Mdn=3.1; $U=606$, $z=-3.62$, $p<0.001$). Undergoing surgery was also significantly related to narcotic prescription at discharge, where 64.9% of those with surgery were discharged with narcotics vs 28.6% of those without surgery ($\chi^2(1, n=95)=8.78$, $p=0.003$). Undergoing surgery was not significantly related to 90-day readmission status, CESD-R severity, BAI severity, or any MINI diagnosis ($p>0.05$).

The relationship between psychological distress and social support levels was assessed. Regarding social support satisfaction in the sample, the mean SSQ-6 score was 5.4 (SD=1.1). Spearman's rank correlation coefficients for key study variables are displayed in [table 3](#). Of note, BAI severity was significantly,

Table 1 Descriptive statistics of categorical study measures (n=95)

	N (%)
Gender	
Female	34 (35.8)
Male	61 (64.2)
Race	
Caucasian	70 (73.7)
Black	18 (19.0)
American Indian	3 (3.2)
Asian	1 (1.1)
Other	3 (3.2)
Ethnicity	
Hispanic	3 (3.2)
Non-Hispanic	92 (96.8)
Education	
Less than college degree	48 (50.5)
At least college degree	47 (49.5)
Relationship status	
Single	33 (34.7)
In relationship	62 (65.3)
Principal admission problem	
Diverticulitis/Colon	18 (19.0)
Bowel obstruction/Small bowel	16 (16.8)
Soft tissue infection/Hematoma	11 (11.6)
Other	11 (11.6)
Hernia	10 (10.5)
Biliary tract disease	9 (9.5)
Pancreatitis	8 (8.4)
Appendicitis	4 (4.2)
Ulcer disease	4 (4.2)
Enteric fistula	3 (3.2)
Other intra-abdominal infection	1 (1.1)
Surgery during admission	
Yes	74 (77.9)
No	21 (22.1)
Discharge disposition	
Home	87 (91.6)
Care facility	8 (8.4)
Discharge with narcotics	
Yes	54 (56.8)
No	41 (43.2)
Readmission within 90 days	
Yes	20 (21.1)
No	75 (78.9)
Psychiatric treatment history	
Yes	25 (26.3)
No	70 (73.7)
Current MINI diagnosis	
Any diagnosis	30 (31.6)
Major depressive episode	20 (21.3)
Post-traumatic stress disorder	7 (7.5)
Substance use disorder	9 (9.6)
Alcohol use disorder	5 (5.3)
Illicit drug use disorder	5 (5.3)
General anxiety disorder	4 (4.4)
Manic episode	3 (3.2)
Hypomanic episode	1 (1.1)
Binge eating	2 (2.2)
Agoraphobia	3 (3.2)
Panic disorder	1 (1.1)
On MINI, no patients met diagnostic criteria for the following disorders: social anxiety disorder, hypomania, obsessive compulsive disorder, anorexia nervosa, or bulimia nervosa.	
MINI, Mini International Neuropsychiatric Interview.	

Table 2 Descriptive statistics of dimensional study measures (n=95)

	M	SD	Mdn
Age, years	54.0	16.9	55
Length of admission, days	8.3	13.0	4.0
BPI—severity	4.1	2.2	4.4
BPI—interference	4.9	2.8	4.9
BAI total	14.0	11.8	11.0
CESD-R total	18.5	14.8	14.0
SSQ satisfaction total	5.4	1.1	6.0
BAI, Beck Anxiety Inventory; BPI, Brief Pain Inventory; CESD-R, Center for Epidemiologic Studies of Depression Scale-Revised; Mdn, median; MINI, Mini International Neuropsychiatric Interview.			

negatively correlated with social support satisfaction, such that those with greater anxiety symptoms described less satisfaction with social support than those with lower levels of anxiety ($r(95) = -0.37$, $p < 0.001$). Supporting this, group differences between psychiatric diagnoses across dimensional factors are presented in [table 4](#). Specifically, social support satisfaction for those with GAD ($n=4$; $Mdn=2.7$) was lower than for those without GAD ($n=88$; $Mdn=6$); a Mann-Whitney U test indicated this difference was statistically significant ($U=31$, $z=-3.27$, $p < 0.01$). CESD-R severity was also significantly, negatively correlated with social support satisfaction, such that those with greater depression symptoms described less social support satisfaction than those with lower levels of depression ($r(95) = -0.28$, $p = 0.01$). This is mirrored in MINI, where social support satisfaction for those with an MDE ($n=20$; $Mdn=5.41$) was lower than those without an MDE ($n=74$; $Mdn=6$); a Mann-Whitney U test indicated this difference was statistically significant ($U=720$, $z=-2.34$, $p=0.02$).

Beyond social support, the relationship between psychological distress and pain experience was analyzed. Specifically, BAI severity was significantly, positively correlated with both pain severity and interference, where those with greater anxiety symptoms endorsed greater pain severity and interference compared with those with lower levels of anxiety (BPI—severity: $r(95)=0.36$, $p < 0.001$; BPI—interference: $r(95)=0.49$, $p < 0.001$). CESD-R severity was also significantly, positively correlated with pain severity and interference, where those with greater depression symptoms reported greater pain severity and interference compared with those with lower levels of depression (BPI—severity: $r(95)=0.41$, $p < 0.001$; BPI—interference: $r(95)=0.55$, $p < 0.001$). This is mirrored in MINI, where pain severity and interference for those with an MDE ($n=20$; BPI—severity $Mdn=5.5$; BPI—interference $Mdn=7.3$) was higher than those without an MDE ($n=74$; BPI—severity $Mdn=4.3$; BPI—interference $Mdn=4.4$); a Mann-Whitney U test indicated these differences were statistically significant (BPI—severity $U=1211.5$, $z=2.53$, $p=0.01$; BPI—interference $U=1289$, $z=3.40$, $p < 0.01$). In line with this relationship between pain and depression, 80% of those with MDE were discharged with narcotics vs 51.4% of those without MDE ($\chi^2(1, n=95)=5.29$, $p=0.02$). Of note, those with greater pain interference endorsed lower social support compared with those with lower pain interference ($r(95) = -0.29$, $p=0.01$); this relationship was not present for pain severity ($r(95) = -0.14$, $p=0.19$).

Regarding baseline length of hospitalization, CESD-R severity was significantly, positively correlated with length of stay, where those exhibiting more severe depression symptoms had longer baseline admissions ($r(95)=0.24$, $p=0.019$). Paralleling this observation, length of stay for those with a current MINI

Table 3 Spearman’s rank correlation coefficients for key study variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	–											
2. Male sex	0.03	–										
3. Racial minority	–0.28*	0.00	–									
4. In relationship	0.07	0.24†	0.12	–								
5. BAI	–0.10	0.09	0.03	0.03	–							
6. CESD-R	–0.05	0.11	0.04	0.03	.80*	–						
7. Any MINI diagnosis	–0.36*	0.25†	0.11	0.03	0.44*	0.37*	–					
8. Social support	0.03	0.07	0.15	–0.08	–0.37*	–0.28*	–0.17	–				
9. BPI—severity	–0.09	0.17	0.29*	–0.05	0.36*	0.41*	0.19	–0.14	–			
10. BPI—interference	–0.11	0.13	0.10	–0.08	0.49*	0.55*	0.33*	–0.29*	0.60*	–		
11. Length of stay	0.04	0.04	–0.12	–0.07	0.19	0.24†	0.14	–0.05	0.14	0.07	–	
12. Psychiatric treatment	–0.05	0.04	–0.08	0.12	0.30	0.33	0.20†	–0.16	0.15	0.15	–0.01	–
13. Re-admission	0.03	–0.12	0.04	0.17	0.04	–0.02	0.09	–0.03	0.04	–0.05	0.07	0.17

*P<0.01.
†P<0.05.
BAI, Beck Anxiety Inventory; BPI, Brief Pain Inventory; CESD-R, Center for Epidemiologic Studies of Depression Scale-Revised; MINI, Mini International Neuropsychiatric Interview.

MDE (n=20; Mdn=5) was higher than those without a current MINI MDE (n=74; Mdn=4); a Mann-Whitney U test indicated this difference was statistically significant (U=1160.5, z=1.95, p=0.05). BAI severity along with all other MINI diagnoses were not significant in terms of length of stay (ie, p>0.05).

Regarding readmission, 57.14% (n=4) of those with PTSD were re-admitted, vs 18.39% (n=16) of those without PTSD (χ^2 (1, n=95)=5.81, p=0.02). No other study variables significantly predicted 90-day readmission status (ie, p>0.05).

DISCUSSION

The purpose of this study was to describe rates of psychiatric diagnoses in a convenience sample of EGS patients, to assess the relationship of psychological distress with pain and social support, and to identify how these variables relate to baseline admission length and impact 90-day readmission status. Psychiatric disorder rates in this current EGS sample are greater than the general US population; results of MINI indicate 31.6% of the sample met criteria for at least one current psychiatric disorder, compared with the estimated 21% of US adults meeting criteria for any current psychiatric disorder.²⁷ Specifically, 21.3% of the sample reported symptoms consistent with an MDE diagnosis, compared with 8.4% in the general US adult population²⁷ and 12% in general hospital adult inpatient populations.²⁸

Furthermore, 7.5% of the sample met criteria for current PTSD, compared with 4.7% of US adults in the general population²⁹; however, the PTSD rate in the current sample was lower than other populations of hospitalized patients, including 13.3% after unplanned hospitalization among patients with cancer and 10%–20% in traumatic injury patients.^{6,30} Elevated rates of GAD were also observed, with 4.4% of participants meeting criteria, compared with 2.7% of US adults in the general population.³¹ However, the rate of GAD in the sample was largely analogous with the estimated 5% in general hospital adult inpatient populations.³²

Informing these largely elevated rates of psychiatric difficulties, social support satisfaction in this sample (ie, mean=5.1, SD=1.1) paralleled rates in other populations, including 5.4 (SD=1) for chronic heart failure outpatients, 5.1 (SD=0.9) in depressed undergraduates, and 5.2 (SD=0.7) among patients with traumatic brain injury.^{33–35} Lower satisfaction with social support was significantly associated with greater depression and anxiety severity, highlighting the protective role social support plays in the development of anxiety and depression in medical and surgical populations.^{36,37} Social support is a notable protective factor well-studied in other medical and surgical populations, where greater perceived social support is related to decreased risk for all-cause mortality as well as readmission rates.^{38,39}

As with social support satisfaction, pain severity and interference levels mirrored those in other populations, including 3.9 severity (SD=1.7) and 4.4 interference (SD=1.7) among those with ‘severe disability’ due to lower back pain.⁴⁰ In the current sample, greater levels of pain severity and interference were associated with greater depression and anxiety severity. Among traumatic injury patients, pain is associated with a multitude of adverse outcomes, including physical disability and higher healthcare costs when comorbid with depression.⁴¹ Generally, pain is a documented risk factor for poor quality of life, including mental and physical health outcomes,⁴² which in turn is associated with increased healthcare costs⁴¹ and failure to participate in or complete physical therapy.⁴³ As this relationship between depression and pain is evident in the EGS population, development of cognitive behavioral pain management strategies in this population may buffer deleterious outcomes as it has in other postsurgical populations.⁴⁴

Table 4 Group differences between psychiatric diagnoses across dimensional factors

	Generalized anxiety disorder			Major depressive episode		
	Present (median)	Absent (median)	z	Present (median)	Absent (median)	z
Social support	2.67	6.00	–3.27*	5.42	6.00	–2.34*
Pain severity	5.25	4.25	0.72	5.50	4.25	2.53†
Pain interference	6.79	4.93	0.92	7.29	4.43	3.40†
Length of stay	6.00	4.00	0.45	5.00	4.00	1.95*

No significant differences in social support, pain severity, or pain interference were identified for any of the other psychiatric diagnoses assessed by MINI; significance of between-group differences evaluated by Mann-Whitney U test.

*P<0.05.

†P<0.01.

MINI, Mini International Neuropsychiatric Interview.

Furthermore, those with greater pain interference endorsed lower social support satisfaction compared with those with lower pain interference, potentially pointing to the fatiguing impact functional interference has on support systems. The analgesic influence of social support in the experience of pain has been well-documented, where increased social support is related to decreased threat-related and pain-related brain activation in response to painful stimuli.⁴⁵ Social support has also been linked to decreased pain-induced stress and facilitation of effective coping attempts.⁴⁵ Altogether, facilitating access to appropriate social support networks as well as the development of alternate coping strategies may be pivotal in efforts to foster more effective coping in EGS populations.

Depression and anxiety severities were also significantly, positively related to lengthier baseline hospitalization. This relationship between psychological distress and hospitalization length has been documented in other samples, including general medical and neurological services.^{46,47} Although EGS patients appear to frequently experience psychological distress, there are currently no guidelines or requirements in place for psychiatric screenings in EGS populations. This contrasts with other surgical specialties, for example, the ACS' Committee on Trauma recently established a new standard of care for injured patients, requiring level I and level II trauma centers to screen patients at high risk of psychiatric issues following injury and to subsequently refer them to a mental health provider as appropriate.⁴⁸ Given the elevated rates of psychiatric concerns and their potential impact on recovery, development and implementation of screening protocols in the EGS population has the potential to facilitate intervention and ameliorate distress. Although there are questions regarding the practicality of implementing such programs, extensive research demonstrates that hospital-based psychological interventions are feasible and cost-effective, resulting in decreased complication rates as well as shortened length of hospital and ICU stays.⁴⁹

Regarding recovery trajectory, those with PTSD in the sample experienced significantly greater rates of readmission following initial discharge. There exists limited data regarding the relationship between PTSD symptoms and hospital readmission rates. One study among survivors of acute respiratory failure and cardiovascular instability found PTSD symptoms 30 days post-discharge predicted hospital readmission.⁵⁰ That said, another study among hospitalized patients with cancer found greater PTSD symptoms *reduced* risk for readmission, which investigators hypothesized was driven by behaviors inherent to PTSD, including avoiding places (eg, hospitals) triggering reminders of medical stressors.³⁰

Findings in the present study should be considered within the context of its limitations, including a small sample size and use of a convenience sample, which limit the generalizability of the findings. Additionally, apart from readmission rates, many of the relationships assessed were cross-sectional in design, and as such the investigation is not able to make causal inferences outside of the impact on readmission. Future studies would benefit from greater sample sizes, inclusion of non-English-speaking patients, use of probability sampling methodology, and use of a prospective design looking at consecutive patients to evaluate more fully the impact of psychological distress on disease course over time. Furthermore, future studies would be strengthened by examining the etiology of psychological distress (ie, distress induced by medical illness/hospitalization vs premorbid distress) and the role of factors such as surgical complications. Additionally, as readmission status was captured via medical record, it is possible patients were admitted to hospital systems not linked to the

study's hospital record system, potentially underestimating the rates of readmission.

Despite these limitations, this is the first empirical investigation to catalog rates of psychiatric diagnoses in an EGS population using a structured diagnostic interview and validated self-report measures. As leaders in the field continue to determine how to implement a coordinated system of care for the EGS patient,¹ this investigation highlights the need for mental health services within that system. Assessing for psychiatric needs and effectively engaging EGS patients with mental health services has the potential to optimize outcomes. Results of this investigation can inform future projects related to psychological and pain management interventions as well as promotion of social support systems to more effectively modulate quality of life and to buffer the development and/or exacerbation of psychopathology.

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Data availability statement Data are available on reasonable request.

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ORCID iDs

Timothy J Geier <http://orcid.org/0000-0002-8545-4487>

Sarah Melin <http://orcid.org/0000-0002-6554-950X>

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