

# Characteristics of psychiatric comorbidities in emergency medicine setting and impact on length of hospitalization: A retrospective study

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## Abstract

This study aims to evaluate clinical correlates of psychiatric comorbidity and length of hospitalization in patients admitted in a general hospital emergency medicine setting. Overall, 160 patients hospitalized for different acute medical pathologies were selected consecutively over 12 months. All subjects were evaluated with proper forms to collect data on medical and psychiatric diagnoses. Levels of C-reactive protein were also measured in all patients. Statistical analyses were conducted with univariate, logistic, and multiple linear regressions. Patients with psychiatric comorbidity

had significantly longer hospitalization than did patients with no psychiatric diagnoses (days 10.9±9.5 vs. 6.9±4.5,  $p<0.005$ ). Agitation and delirium were more frequent in the psychiatry comorbidity study group ( $p<0.05$ ), as was cognitive impairment ( $p=0.001$ ). These variables predicted longer hospitalisation (respectively:  $t=-3.27$ ,  $p=0.002$ ;  $t=-2.64$ ,  $p=0.009$ ;  $t=-2.85$ ,  $p=0.006$ ). Psychiatric comorbidity acts as an adjunct factor in determining clinical severity and predicting a more difficult recovery in patients hospitalized in an emergency medicine setting.

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## Introduction

In recent years, the interaction of mental health issues with the overall health of the individual has been explored from several points of view. In particular, the role of psychiatric disorders has been extensively studied as modifying and risk factors in organic pathologies. For instance, occurrence of depressive symptomatology in the wake of acute myocardial infarction<sup>1</sup> or the impact of pre-existing depressive morbidity on prognosis after acute myocardial infarction represent classical areas of research.<sup>2</sup> On a broader scale than correlations to single organic pathologies, psychiatric disorders in general have been found to influence clinical course and outcome of inpatients admitted to medical wards.<sup>3</sup> In addition, the paucity of a dedicated emergency care service for psychiatric acuties in many general hospitals has been increasingly felt by professionals in the field all over the world.<sup>4</sup> Psychiatric disorders are common in General Hospital Emergency Medicine Setting (EMS): in a recent study, 10% of EMS visits were reported to have a mental disorder diagnostic code, of which 61% related to stress, anxiety, or depression. Therefore, these cases represent an important source of all EMS inpatient admissions.<sup>5</sup> Research using validated measures to screen adults presenting to the EMS with nonpsychiatric complaints reveals depressive symptoms in 32% to 34%, mania in 4%, passive suicidal ideation in 7% to 12%, and active suicidal ideation in about 2%.<sup>5</sup>

With regard to specific psychiatric conditions, the epidemiology of anxiety in emergency medicine settings has not been extensively studied but its association with chronic medical comorbidity has been noted to be common<sup>6</sup> and to affect negatively medical outcome.<sup>7</sup> Depression is one of the most common chronic illnesses in general medical practice, second only to hypertension.<sup>8</sup> Depression in EMS can be difficult to be recognized due to the physician's attention being called to more visible and immediate threats to survival and also because of frequent masking comorbidities and varied manifestations.<sup>9</sup> Depression negatively influences the outcome of other medical issues and chronic comorbidities,<sup>10</sup> is associated with a higher prevalence of chronic medical conditions<sup>11</sup> and, conversely, medical comorbidities raise the risk

of developing a depressive disorder.<sup>12</sup> Last but not least, suicidal ideation and attempts are relevantly associated with physical illnesses, greatly increasing the burden of illness in EMS.<sup>13</sup> Suicidal attempts account for 0,4% of EMS admissions, with a tenfold rate of hospital admission than general population presenting to the ED in a 2001 survey,<sup>14</sup> with more recent data reporting increase in these occurrences.<sup>13</sup> Data on the phenomenology of suicidality in EMS are scanty in literature. Suicidal patients are frequently admitted to EMS in relation to the physical consequences of an individual's anticonservative act. In addition, clinical experience suggests that in some cases suicidal ideation is a request of psychiatric consultation by EMS as a psychopathological complication arising during hospitalization.

Cognitive impairment is a predictor of longer hospitalization and worse outcome,<sup>15</sup> with prevalence among patients in EMS reported between 20%<sup>16</sup> and 25%.<sup>17</sup> Neurocognitive dysfunction is correlated with advancing age, multiple comorbidities, and occurrence of delirium.<sup>18</sup> Delirium is acute and in most cases transitory<sup>19</sup> confusional state, a disturbance of attention or awareness with alterations of baseline cognition, accompanied by reduced orientation to environment and self and involves memory, language, and perceptual distortions; it arises acutely (hours-days) and tends to fluctuate during the course of the day, often worsening at night when external orienting stimuli decrease.<sup>20</sup> Delirium occurs frequently in EMS either in relation to medical illness or in the context of an underlying Neurocognitive Disorder (NCD). The impaired brain function of individuals with mild and major NCD renders them more vulnerable to delirium, and a similar vulnerability is seen in 10 to 60% of the older hospitalized population and in 60 to 80% of patients in the intensive care units and EMS. Delirium is an important independent prognostic determinant of hospital outcomes, including duration of mechanical ventilation, nursing home placement, functional decline, long-term cognitive impairment, and death.<sup>20,21</sup>

Dementia is subsumed under the new diagnostic entity Major Neurocognitive Disorder, and it is a condition of permanent and progressive cognitive impairment, which correlates with aging and which is estimated to rise in prevalence due to longer life expectancy and lack of curative therapeutic options for most dementia disorders.<sup>22</sup>

The term dementia is retained in DSM-5 for continuity and may be used in settings where physicians and patients are accustomed to this term.<sup>23</sup>

Aggression, agitation, and rejection of care are common behavioral symptoms that affect the quality of care for the patient and that represent a difficulty for the staff as well as a predictor of poor outcome.<sup>24</sup> Behavioural symptoms add a further layer of complexity in the diagnosis and treatment of delirium superimposed on dementia.<sup>25</sup>

Psychomotor Agitation is a behavioral symptom defined as "excessive motor activity associated with a feeling of inner tension. The activity is usually non-productive and repetitious and consists of behaviors such as pacing, fidgeting, wringing of the hands, pulling of clothes, and inability to sit still".<sup>23</sup> It is a common feature of depressive,<sup>26</sup> bipolar,<sup>27</sup> and neurocognitive disorders,<sup>28</sup> as well as schizophrenia.<sup>29</sup> Similarly to delirium, which can be an expression of the lowered cognitive reserve without permanent neurocognitive damage, sporadic or "isolated" agitation can also be found in patients who have lost consciousness due to trauma, who have been given psychoactive drugs like opioids and sedatives, or who are simply disorientated by their ailment and the unknown environment they find themselves in.<sup>30</sup>

The aims of this study were: i) to evaluate the characteristics

of patients admitted in a general hospital emergency medicine setting over a 12-month period of time and for whom a psychiatric consultation was requested; ii) to investigate the impact of psychopathology on physical illness in terms of Length of Hospitalization (LoS) and overall clinical improvement in comparison with a matched group of patients who did not have psychiatric problems at the time of hospital admission; iii) to evaluate levels of a biological marker of inflammation (e.g. C-Reactive Protein) in patients with psychiatric comorbidity as compared to a matched group without current psychiatric disorders.

## Materials and Methods

### Subjects and Setting

This retrospective study was conducted in a one-year time-frame (between September 2017 and August 2018) in two Emergency Medicine Care Units at the Azienda Ospedaliera Universitaria Pisana (AOUP) within the framework of a hospital-wide computerized patient's record system providing a comprehensive database. Overall, 160 subjects were included in the study. Of these, 80 subjects were enrolled based on a formal request for a psychiatric consultation (PD group). The study group subjects are 39 males (48,8%), 41 females (51,2%), ages between 18 and 94 (mean 67,5), admitted with primary medical diagnoses classified as Cardiovascular, Gastrointestinal, Pulmonary, Neurological, Traumatic, Psychiatric or Other. Upon request of the treating physician, they were evaluated by an expert psychiatrist who assigned psychiatric diagnoses (when not already known from anamnesis) according to DSM-5 criteria and grouped as: Depressive disorders, Substance-related Disorders, Bipolar Disorders, Anxiety Disorders, Neurocognitive Disorder, Suicidality, and Other. The remaining 80 subjects were enrolled as a control group from the same wards, matching them by age and sex to the study subjects, excluding patients who had received requests for psychiatric consultation during their stay or previous psychiatric care (non-PD group). In-hospital mortality during our time-frame of interest in the sample population was comparable with ward-wide mortality (respectively 4,4% and 5,1%).

### Evaluation

#### Clinical Global Impression

All patients were evaluated using the Clinical Global Impression Scale (27), an instrument that takes under consideration the clinician's experience of patients with the same diagnosis. Though modified since its original design to fit specific illnesses and reflect the changing reality of psychiatric consensus,<sup>26</sup> the CGI is composed of three main items: Item 1: Severity Scale (CGI-S), Item 2: Improvement Scale (CGI-I), Item 3: Efficacy Index. For the purposes of our study we made use of items 1 and 2, both 7-point scales ranging respectively from 1= "not ill" to 7= "among the most extremely ill", and 1= "very much improved" to 7= "very much worse".

Item 3, which consists of a cross-evaluation of therapeutic efficacy and adverse drug effects, was not applied in our study due to the complexity of confounding factors within the single groups (psychiatric illnesses and/or acute psychiatric episodes in acutely medically ill patients) and between the two groups (ample diversity of main cause for hospitalization and comorbidities), requiring in our judgment a larger sample to adequately interpret.

Patients were assigned their scores based on the clinical expe-

rience of the attending physician and psychiatrist, corroborated by narrative data compiled by the staff throughout the hospitalization period. The scales were used both on study and control subjects, accounting for mental as well as medical severity and improvement despite the main scope of the CGI being mental health, to render the two groups uniformly evaluated and comparable.

### Other clinical parameters

Proper forms were used to collect data concerning different variables.

Sex and age, matched in the non-PD group to those recorded for the PD group; medical diagnosis reason for admission and psychiatric diagnosis; presence/absence of agitation, delirium, and cognitive impairment; psychopharmacological therapy, opioid, and corticosteroids use in the study patients; previous psychiatric anamnesis; Length of Stay (LoS); C-Reactive Protein as a biological marker. Although "normal" CRP levels vary from lab to lab, it is generally accepted that a value of 0.8-1.0 mg/dL (or 8-10 mg/L) or lower is normal. Most healthy adults have CRP levels lower than 0.3 mg/dL.

### Statistical analysis

Statistical analysis was performed using SPSS software version 24.0.<sup>28</sup> Frequency analysis was computed to describe and characterize each group as well as the whole sample population. The significance level was set to  $p=0.05$ .

The groups were then confronted against each other by frequency of each item of the database; we compared Gaussian variables such as LoS between groups or Los by presence/absence of cognitive impairment with Student's T-Test for independent samples, which tests the hypothesis that the two groups of variables are independent but identically distributed; ordinal and non-gaussian variables like CRP were studied with Mann-Whitney U Test for non-parametric variables, which does not require the assumption of normal distribution and can be used to determine whether two independent samples were selected from populations with the same distribution (mean rank reported between parentheses); categorical variables such as expected versus observed frequencies of agitation, delirium and medical diagnoses between groups were studied with Pearson's Chi-Squared Test.

We conducted Analyses Of Variance (ANOVA) confronting LoS between psychiatric diagnostic groups after a variance homogeneity test; a Logistic Regression with Hosmer-Lemeshow Test (which assesses whether or not the observed event rates match expected event rates in subgroups of the model population) to retro-engineer a prediction model that would apply to our group distribution between PD and non-PD patients, which in turn is indicative of which variables characterised our sample and how by calculating the contribution of individual predictors. Lastly, we performed a multiple linear regression with analysis of variance to explore contribution to the determination of LoS.

## Results

### Descriptive analysis

Out of 160 subjects 48,8% were male and 51,2% female, ages between 18 and 94 (mean  $67.5\pm 21.1$ ). Overview of admission diagnoses in patients admitted to two Emergency Medicine Departments over a 12-month period of time ( $n=160$ ): Cardiovascular 16.25%, Gastrointestinal 10%, Pulmonary 10%, Neurological 12.5%, Traumatic 8.75%, Psychiatric 30% or Other

12.5% in PD patients; Cardiovascular 8,8%, Gastrointestinal 25%, Pulmonary 18.8%, Neurological 11.3%, Traumatic 15%, Psychiatric 0%, and Other 21.3% (e.g. Acute Kidney Injury, Anaemia, General Functional Decline) in non-PD patients. Length of Stay was between 1 and 56 days overall (mean  $8.9\pm 7.7$ ),  $10.9\pm 9.5$  in PD group and  $6.9\pm 4.5$  in non-PD group; in-hospital death was 4.4% overall, 5% in PD patients and 3.8% in non-PD patients. 70% of PD patients had a medical comorbidity (30% had psychiatric admission diagnosis) versus 100% in non-PD patients. C-Reactive Protein was between 0,00 mg/dL and 33.77 mg/dL (mean  $3,45\pm 5.51$ ). At least one episode of Psychomotor Agitation was recorded in 22,5% of subjects in total: 5% of control subjects and 40% of study subjects. Delirium was experienced by 19.4% of subjects in total: 5% of control subjects and 33.8% of study subjects. Mild cognitive impairment was present in 3.8% of subjects, moderate cognitive impairment in 12.5% and severe cognitive impairment in 11.3%.

### Psychiatric comorbidity

Psychiatric diagnoses in the study group were: Neurocognitive Dysfunction 21.3%, Depressive Disorder 17.5%, Substance-related Disorder 12.5%, Bipolar Disorder 5%, Anxiety Disorders 8.8%, Suicidality 18.8%, and Other 11.3% (e.g. isolated agitation).

### Psychotropic treatments

Psychopharmacological therapy in the psychiatric study group was not undertaken in only 4% of subjects; therapy with a single psychoactive medication was undertaken in 30%, two psychoactive medications in 31.25%, three in 16.25%, four in 7.5%, five in 6.25%, six in 3.75% and seven psychoactive drugs in 1.25% of patients. Overall, 16.3% of the study group population was prescribed corticosteroid therapy, and 16.3% received opioid medications.

### Comparative analysis

The comparison of Length of Stay between the two groups was found to be statistically significant using Student's T Test ( $p=0.001$ ), and the result was confirmed conducting an independent samples Mann-Whitney's U Test (mean rank 90.89 in the study group, 70.11 in the control group;  $Z=2,8$ ;  $p<0.005$ ). This shows that patients with any Psychiatric Disorder (PD group) had a significantly longer hospitalization than did patients with no Psychiatric Disorder (non-PD group). LoS in depressed patients confronted with both the rest of the study subjects and the whole sample did not show significant differences; exploring the effect of psychiatric disorders on LoS with a Variance Homogeneity Test revealed that no single psychiatric disorder had relevance with the exception of patients admitted for suicidal behavior who tended to have a shorter stay (mean  $12.6\pm 9.8$  days in non-suicidal patients,  $3.9\pm 2.2$  in suicidal patients;  $t=6.5$ ;  $p<0.005$ ).

Psychomotor agitation and delirium were significantly more frequent in the PD group (Chi-Squared Test:  $p<0.05$ ). Cognitive impairment was statistically different in the two groups as seen with Mann-Whitney's U Test ( $p=0.001$ ), with the frequency being higher in the PD group (mean rank 90.25) than in the non-PD group (mean rank 70.75;  $Z=3.4$ ;  $p=0.001$ ).

LoS was found to be significantly longer in patients who had episodes of psychomotor agitation ( $t=-3,27$ ;  $p=0.002$ ), delirium ( $t=-2,64$ ;  $p=0.009$ ) and who suffered from cognitive impairment ( $t=-2,85$ ;  $p=0.006$ ).

The difference in primary diagnosis distribution was statistically significant between the two groups (Chi-Squared Test:  $p<0.05$ ).



The whole-sample CGI-S score assigned at time of admission was distributed as follows: 1 = “not ill”, 0%; 2 = “borderline”, 5%; 3 = “mildly ill”, 15%; 4 = “moderately ill”, 35%; 5 = “markedly ill”, 30%; 6 = “severely ill”, 11.3%; “among the most extremely ill”, 3.8%.

The whole-sample CGI-I score at time of discharge from the hospital was distributed as follows: 1 = “very much improved”, 20.6%; 2 = “much improved”, 33.1%; 3 = “minimally improved”, 30%; 4 = “no change”, 6.9%; 5 = “minimally worse”, 3.8%; 6 = “much worse”, 1.3%; 7 = “very much worse”, 4.4%.

The CGI scores were confronted between groups with Mann-Whitney’s U test for independent samples. While clinical improvement expressed on the CGI-I scale did not relevantly differ between groups, clinical severity of illness in the form of CGI-S was significantly higher in the non-PD group (mean rank 91,84) than in the PD group (mean rank 69.16;  $Z=-3,2$ ;  $p=0.001$ ).

CRP studied with Mann-Whitney’s U test was significantly higher in PD group (mean rank 88,33) than in the non-PD group (mean rank 72.67;  $Z=2.17$ ;  $p<0.05$ ). Furthermore, higher values were found when cross-referencing for presence of agitation ( $p<0.001$ ), delirium ( $p=0.005$ ) and cognitive impairment ( $p<0.001$ ; Table 1).

### Regression analysis

To better understand the characterization of study group patients, with a psychiatric diagnosis, a group prediction model was made using logistic regression with a Hosmer-Lemeshow test (Cox-Snell’s R-Squared = 0.535; Nagelkerke’s R-Squared = 0.714) using as predictive variables CGI-S, LoS, CRP, agitation, delirium and cognitive impairment (Table 2). The model correctly predicts which subjects belong to which group in 88.1% of cases with 90% accuracy for control group subjects and 86.3% for study subjects.

CGI-S is significant to the prediction, and growing severity correlates with the lessened probability of psychiatric diagnosis; LoS directly relates to the probability of psychiatric diagnosis, 18% more per day; CRP does not adequately contribute to the prediction. Delirium and agitation correlate with a probable psychiatric diagnosis, increasing its likelihood respectively by a seven- and fourteen-fold factor (see odd ratios in Table 2).

In order to more thoroughly investigate the factors influencing LoS we ran a multiple linear regression with ANOVA, using group, CGI-S, cognitive impairment, agitation and delirium as independent variables (Table 3). Psychomotor agitation and cognitive impairment are the best predictors, the former predicting a 4,5 days mean increase and the latter 3 days increase in LoS.

**Table 1. Distribution of baseline clinical variables scores in patients admitted to Emergency Medicine Setting over a 12-months period.**

Variables *	Psychiatric Disorders		P value**
	Yes (n=80, %)	No (n=80, %)	
CGI-S <sup>a</sup>	4.1±0.9	4.6±1.2	$Z=-3.22$ ; $p=0.001$
CGI-I <sup>b</sup>	2.7±1.5	2.5±1.4	$p=0.337$
Agitation	32 (40)	4 (5)	$p<0.001$
Delirium	27 (33.8)	4 (5)	$p<0.001$
Cognitive Impairment	31 (38.8)	13 (16.3)	$Z=3.40$ ; $p=0.001$

\*Expressed as mean ± standard deviation or percentage; \*\*Chi-Squared or Mann-Whitney p-values; <sup>a</sup>Clinical Global Impression-Severity; <sup>b</sup>Clinical Global Impression-Improvement.

**Table 2. Logistic Regression Analysis of variables associated to the presence of psychiatric disorders (PD) (dependent variable: PD group) in patients admitted to Emergency Medicine Setting over a 12-months period (n=160).**

	B (S.E.)	O.R.	C.I. 95%	P
CGI-S <sup>a</sup>	-1.45 (0.31)	0.235	0.127 – 0.435	<0.001
LoS <sup>b</sup>	0.17 (0.05)	1.183	1.064 – 1.316	=0.002
Agitation <sup>c</sup>	2.69 (0.77)	14.772	3.254 – 67.059	<0.001
Delirium <sup>c</sup>	1.94 (0.85)	6.980	1.304 – 37.354	=0.023
Cognitive Impairment <sup>c</sup>	0.67 (0.3)	1.954	1.088 – 3.508	=0.025
C-reactive Protein	0.09 (0.06)	1.092	0.964 – 1.236	=1.65
Constant	2.75 (1.04)	15.641		=0.008

B: Regression Coefficient; S.E.: Standard Error; O.R.: Odds Ratio; C.I. 95% confidence interval at 95%; <sup>a</sup>Clinical Global Impression-Severity; <sup>b</sup>Length of Stay; <sup>c</sup>Intensive Care Delirium Screening Checklist (ICDSC).

**Table 3. Linear regression for factors predictive of Length of Stay (LoS) in patients admitted to Emergency Medicine Setting over a 12-month period (n=160).**

	B (S.E.)	T	C.I. 95%	P
Agitation	4.79 (2.65)	2.947	1.581 – 8.009	= .004
Delirium	-0.88 (1.62)	-0.504	-4.369 – 2.592	= .615
Cognitive impairment	3.24 (1.76)	2.226	0.365 – 6.118	= .027
CGI-S	0.14 (1.45)	0.257	-0.955 – 1.241	= .798
Group	1.97 (0.55)	1.428	-0.759 – 4.711	= .155
Constant	5.51 (2.65)	2.080	0.277 – 10.748	= .039

B: Regression Coefficient; S.E.: Standard Error; T: T test value; P: P-value; C.I. 95%: confidence interval at 95%.

## Discussion

Our regression analyses results indicate that the presence of current psychiatric comorbidity correlates with a longer hospital stay in patients admitted in a general hospital emergency medicine setting. The significant role of cognitive impairment and agitation corroborate data from the literature.<sup>29-31</sup> In particular, cognitive impairment, either determined by delirium or agitation or dementia-related decline, is a predictor of longer hospitalization and worse outcome,<sup>15</sup> with prevalence among patients in EMS reported between 20%<sup>16</sup> and 25%. Conversely, in our sample depression was not found to have any role in determining LoS. Literature seems to be divided on this issue with many findings in favour<sup>32-33</sup> and many opposed.<sup>34-35</sup> Nonetheless, impact on LoS remains the major finding of our study having important implications in terms of efficacy of care and costs. In fact, we found an average difference of 6 days of in-ward stay between the group with psychiatric comorbidity as compared to the group without and such a difference was not better accounted for by differences in demographics or type or severity of physical illness. Further studies are warranted to deeply clarify mechanisms by which psychiatric comorbidity affects the course of the individual's medical illness during the hospital stay.

In particular, it would be of paramount importance to explore the biological underpinning by which psychiatric comorbidity has a pathoplastic effect on course and treatment response of main co-occurring medical condition(s). It is noteworthy, in this regard, that we found higher levels of Protein C Reactive in the group with psychiatric comorbidities with respect to the group without, suggesting, as we discuss below, a potential biological interaction between psychopathology and the immune system. In addition, we cannot also exclude that patients with certain psychiatric comorbidities may have lessened ability to comply with physical therapies and difficulties in expressing one's needs and correctly assessing and adapting to a new environment (hospital), all common features of mental illness.

Not surprisingly, in our study, admissions for suicidal behavior were found to correlate with a shorter length of stay. This was probably due to the fact that most of the suicidal patients in our study group were young in age, without important or chronic physical comorbidities. Most of them attempted suicide by overdosing on oral prescription medications and, after receiving a rapid assessment of the clinical situation, were transferred to a psychiatry setting or discharged when the critical window was over. Nevertheless, these patients represent a substantial burden for EMS. In fact in our study, they had a length of stay of 7 days on average with important implications in terms of prevention, health care costs, and rate of occupation of EMS beds.

The similar distribution of CGI-I scores despite varying degrees of sickness and the distinct nature of the two groups, with or without psychiatric comorbidity, seems to confirm that they were both well managed.

Increasing clinical severity was found to directly correlate with absence of psychiatric diagnosis as expected in a medical ward that manages patients in need of emergency care, particularly considering that the proportion of patients hospitalized for psychiatric causes in one group was counterbalanced by patients hospitalised for trauma, important pulmonary or gastrointestinal causes in the other. Analysis of pharmacological therapies was conducted to investigate whether possible interactions between psychoactive drugs and internistic drugs known to have CNS adverse reactions might affect overall clinical severity and duration of hospitaliza-

tion. No significant associations were found.

The CRP levels were significantly higher in the group with psychiatric comorbidity and in patients who presented delirium, agitation or cognitive impairment, conforming our data to literature indicating a link between psychiatric disorders and inflammatory markers.<sup>34-35</sup> Despite CRP values lacking predicting value of the length of hospitalization in our study, an increase of CRP, being a biological correlate of either physical or psychiatric syndromes is a factor to be disentangled in the assessment and treatment of immunological abnormalities in the EMS patient.

This retrospective study began based on the hypothesis that patients with PDs are distinct from other medical inpatients. Our two groups were selected with criteria intended to minimize discrimination of medical characteristics among subjects, except for the presence/absence of psychiatric comorbidity, so that the data collected would be as significant as possible in defining the influence of mental health issues on clinical course and outcome.

## Limitations

Several limitations should be acknowledged. First, the relevance of this study is limited by the small sample size and the fact that we selected patients admitted in emergency medicine settings. Therefore, results cannot be generalized to other general hospital settings. Second, patients admitted to emergency medicine wards were quite heterogeneous in terms of medical diagnosis, comorbidity and prognosis. This might have had an impact on the LoS. Notwithstanding, we could assume that such factors were similarly represented in the two comparison groups. Third, about 30% of patients in the PD group had been admitted because of psychiatric symptoms and then completed medical assessments during hospitalization. Therefore, this group might be, in some way, different from the rest of the patients in the PD group who were admitted with a primary medical condition.

## Conclusions

A longer hospitalization characterized the group with psychiatric comorbidity acting as an adjunct factor to medical severity.

The presence of mental health-related issues in a medically ill patient would make them comparable in predicted need for hospitalization to more severely ill patients without psychiatric comorbidity.

Recognition of medical patients with psychiatric comorbidity and early management could help to prevent negative prognostic events such as delirium, particularly in cognitively impaired patients who are known to be at greater risk, and ultimately take the medical community one step further in giving a relevant part of the population a better quality of care and outcome, while saving on National Health Service funds.

Data on PCR, although not significant in the regression analyses warrant further research on interactions between inflammation and psychiatric symptoms in patients with complex medical illnesses.<sup>34</sup>

Our data corroborate previous findings in the literature in showing that psychiatric disorders are a burden on EMS resources and are potentially associated with higher mortality and long-term unfavorable outcomes in the surviving population, still remaining a prime target for early intervention.<sup>21</sup>

## References

1. Echols MR, O'Connor CM. Depression after myocardial infarction. *Current Heart Failure Reports* 2010;7:185-93.
2. Carney RM, Blumenthal JA, Stein PK, et al. Depression, Heart Rate Variability, and Acute Myocardial Infarction. *Circulation* 2001;104:2024-8.
3. Suchyta MR, Beck CJ, Key CW, et al. Substance dependence and psychiatric disorders are related to outcomes in a mixed ICU population. *Intensive Care Med* 2008;34:2264-7.
4. Larkin GL, Claassen CA, Emond JA, et al. Trends in U.S. emergency department visits for mental health conditions, 1992 to 2001. *Psychiatr Serv* 2005;56:671-7.
5. Ranney ML, Locci N, Adams EJ, et al. Gender-specific research on mental illness in the emergency department: current knowledge and future directions. *Acad Emerg Med* 2014;21:1395-402.
6. Roy-Byrne PP, Davidson KW, Kessler RC, et al. Anxiety disorders and comorbid medical illness. *Gen Hosp Psychiatry* 2008;30:208-25.
7. Chapa DW, Akintade B, Son H, et al. Pathophysiological relationships between heart failure and depression and anxiety. *Crit Care Nurse* 2014;34:14-24.
8. Stern T, Freudenreich O, Smith F, et al. *Massachusetts General Hospital Handbook of General Hospital Psychiatry*. 7th Edition. Philadelphia: Elsevier; 2017.
9. Thase ME. The multifactorial presentation of depression in acute care. *J Clin Psychiatry* 2013;74:3-8.
10. Frasure-Smith N, Lespérance F. Recent evidence linking coronary heart disease and depression. *Can J Psychiatry* 2006;51:730-7.
11. Wells KB, Rogers W, Burnam A, et al. How the medical comorbidity of depressed patients differs across health care settings: results from the Medical Outcomes Study. *Am J Psychiatry* 1991;148:1688-96.
12. Cassem EH. Depression and anxiety secondary to medical illness. *Psychiatr Clin North Am* 1990;13:597-612.
13. Miret M, Ayuso-Mateos JL, Sanchez-Moreno J, Vieta E. Depressive disorders and suicide: Epidemiology, risk factors, and burden. *Neurosci Biobehav Rev* 2013;37:2372-4.
14. Doshi A, Boudreaux ED, Wang N, et al. National study of US emergency department visits for attempted suicide and self-inflicted injury, 1997-2001. *Ann Emerg Med* 2005;46:369-75.
15. Fick DM, Steis MR, Waller JL, Inouye SK. Delirium superimposed on dementia is associated with prolonged length of stay and poor outcomes in hospitalized older adults. *J Hosp Med* 2013;8:500-5.
16. Bo M, Fonte G, Pivaro F, et al. Prevalence of and factors associated with prolonged length of stay in older hospitalized medical patients. *Geriatr Gerontol Int* 2016;16:314-21.
17. Meagher D, Adamis D, Trzepacz P, Leonard M. Features of subsyndromal and persistent delirium. *Br J Psychiatry* 2012;200:37-44.
18. American Psychiatric Association: *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*. Arlington, VA, American Psychiatric Association, 2013:20.
19. Abengaña J, Chong MS, Tay L. Delirium superimposed on dementia: phenomenological differences between patients with and without behavioral and psychological symptoms of dementia in a specialized delirium unit. *Int Psychogeriatrics* 2017;29:485-95.
20. Sobin C, Sackeim HA. Psychomotor symptoms of depression. *Am J Psychiatry* 1997;154:4-17.
21. Faurholt-Jepsen M, Brage S, Vinberg M, et al. Differences in psychomotor activity in patients suffering from unipolar and bipolar affective disorder in the remitted or mild/moderate depressive state. *J Affect Disord* 2012;141:457-63.
22. Cummings J, Mintzer J, Brodaty H, et al. Agitation in cognitive disorders: International Psychogeriatric Association provisional consensus clinical and research definition. *Int Psychogeriatrics* 2015;27:7-17.
23. Sachs GS. A review of agitation in mental illness: Burden of illness and underlying pathology. *J Clinical Psych* 2006;67:5-12.
24. Chevolet JC, Joliet P. Clinical review: Agitation and delirium in the critically ill - Significance and management. *Critical Care* 2007;11:214.
25. National Institute of Mental Health. CGI. *Clinical Global Impressions. ECDEU Assessment Manual for Psychopharmacology* 1976.
26. Kadouri A, Corruble E, Falissard B. The improved Clinical Global Impression Scale (iCGI): Development and validation in depression. *BMC Psychiatry* 2007;7:7.
27. IBM SPSS Inc. *SPSS Statistics for Windows*. IBM Corp Released 2012. 2012;
28. Morris PLP, Goldberg RJ. Impact of psychiatric comorbidity on length of hospital stay in gastroenterology patients. *Gen Hosp Psychiatry* 1990;12:77-82.
29. Schor JD, Levkoff SE, Lipsitz LA, et al. Risk factors for delirium in hospitalized elderly. *JAMA* 1992;267:827-31.
30. Stevens LE, De Moore GM, Simpson JM. Delirium in hospital: Does it increase length of stay? *Aust N Z J Psychiatry* 1998;32:805-8.
31. Saravay SM, Lavin M. Psychiatric comorbidity and length of stay in the general hospital. A critical review of outcome studies. *Psychosomatics* 1994;35:233-52.
32. Fulop G, Strain JJ, Vita J, Lyons JS, Hammer JS. Impact of psychiatric comorbidity on length of hospital stay for medical/surgical patients: a preliminary report. *Am J Psychiatry* 1987;144:878-82.
33. Baek JH, Lee H, Myung W, et al. The association between inflammatory markers and general psychological distress symptoms. *Gen Hosp Psychiatry* 2018;46:9-12.
34. Khan BA, Perkins AJ, Prasad NK, et al. Biomarkers of delirium duration and delirium severity in the ICU. *Crit Care Med* 2020;48:353-61.
35. Orsolini L, Sarchione F, Vellante F, et al. Protein-C reactive as biomarker predictor of schizophrenia phases of illness? A systematic review. *Curr Neuropharmacol* 2018;16:583-606.