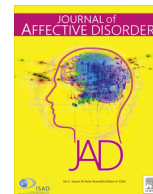




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Research paper

Major depression in hospitalized Argentine general medical patients: Prevalence and risk factors



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ABSTRACT

Background: Depression is not uncommon among medically hospitalized patients, though reported prevalence has varied widely, often in samples involving elderly patients with particular illnesses. Accordingly, we evaluated risk of major depression in three metropolitan general hospitals in Buenos Aires, in subjects with a range of medical disorders and ages, comparing several standard screening methods to expert clinical examinations.

Methods: Consecutively hospitalized general medical patients were evaluated over a six-months. Excluded were subjects under age 18 and those unable to participate in assessments because of illness, medication, sensory or speech impairment, or lack of language fluency, or scored <25 on the Mini Mental State Examination (MMSE). Consenting participants were examined for DSM-IV-TR major depression by psychiatrists guided by MINI examinations, compared with other standard screening methods. Risk factors were assessed by preliminary bivariate analyses followed by multivariate logistic regression modeling.

Results: Overall prevalence of major depression in 257 subjects was 27% by psychiatric examination. The rate was most similar (25%) with the Hospital Anxiety & Depression Scale (HADS), and much higher with the Beck Depression Inventory-II (BDI, 44%) and Patient Health Questionnaire (PHQ, 56%). Factors associated independently with depression by multivariate modeling included: prior psychotropic-drug treatment, female sex, more children, and heavy smoking. Depression was associated most with neoplastic, urological, and infectious disorders, least with pulmonary, neurological, and hematologic conditions.

Limitations: Modest numbers limited power to test for associations of depression with specific medical conditions.

Conclusions: Major depression was identified in over one-quarter of Argentine, general medical inpatients, with marked differences among screening methods. Several risk factors were identified. The findings encourage assertive identification of depression in hospitalized medical patients using valid, reliable, and cost-effective means of improving their care.

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1. Introduction

Clinical depression is a leading cause of disability worldwide, and a major contributor to the global burden of disease (Vos et al., 2015). Patients hospitalized for medical illnesses have greater risk

Table 1
Reported prevalence of depression in patients hospitalized for medical illnesses.

Study	Country	Population sampled	Diagnostic criteria	Assessments (crit. score)	Subjects (% men)	Mean age (years)	Prevalence (%)
Kok et al. (1995)	Netherlands	Elderly (≥ 65)	GMS	AGECAT	198 (58.1)	74.0	5.90
Alrot et al. (1998)	Germany	Adults	DSM-III R; ICD-10	CIDI	250 (53.6)	–	16.4
Hosaka et al. (2002)	Japan	Adults	DSM-IV MDD	Psychiatric interview	65	–	21.5
Freedland et al. (2003)	USA	Adults, heart failure	DSM-IV MDD	DIS BDI (≥ 10)	682 (33.3)	66.0	20.0
McCusker et al. (2005)	Canada	Elderly (≥ 65), 2 sites	DSM-IV MDD	DIS	380	–	14.2–44.5
Lesman-Leegte et al. (2006)	Netherlands	Adults, heart failure	–	CES-D (≥ 16)	572 (62.1)	71.0	40.7
Agudelo-Velez et al. (2008)	Colombia	Adults	–	BDI-II (≥ 14) HADS-D (≥ 10)	82	–	BDI: 41.5 HADS: 11.0
Zhang et al. (2008)	China	Adults, chronic illness	DSM-IV	SDS (≥ 50)	322 (57.1)	60.3	78.9
Lesman-Leegte et al. (2009)	Netherlands	Adults heart failure	–	CES-D (≥ 16)	958 (63.1)	71.0	39.0
Mendes-Chiloff et al. (2008)	Brazil	Elderly (≥ 60)	–	GDS (≥ 6)	189 (45.0)	70.0	56.1
Michopoulos et al. (2009)	Greece	Adults (≥ 65)	DSM-IV MDD	SCID-I/P	200 (53.0)	74.0	14.0
Pakriev et al. (2009)	Russia	Adults	DSM-IV MDD	MINI interview	323 (45.5)	–	12.1
Unsar et al. (2010)	Turkey	Elderly (≥ 60), chronic illness	–	GDS (≥ 11)	100 (49.0)	70.8	64.0
Zhong et al. (2010)	China	Adults	DSM-IV MDD	SCID-I	513 (47.2)	–	9.40
Dal BO et al. (2011)	Brazil	Adults	–	HDRS (≥ 7)	201 (43.3)	56.4	53.3
Suzuki et al. (2011)	Japan	Adults, cardiovascular	DSM-IV	SDS (≥ 50)	505 (71.7)	61.0	22.0
Von Mühlbrock et al. (2011)	Chile	Elderly (> 60)	–	GDS (≥ 6)	131 (51.2)	74.4	22.1%
Fraizer et al. (2012)	USA	Adults, acute MI	–	BDI-II (≥ 14)	789 (68.6)	62.3	Men 22.0 Women 35.0
Helvik et al. (2012)	Norway	Elderly (≥ 65)	–	Had-D (≥ 8)	484 (49.8)	80.7	10.0
Polo-Gascón et al. (2012)	Brazil	Adults, dermatological	–	PRIME-MD	75 (37.3)	44.5	45.3
Conde Martel et al. (2013)	Spain	Elderly (≥ 65)	–	GDS (≥ 6)	115 (38.3)	70.5	40.0
Pelletier et al. (2014)	Canada	Adults (≤ 55) with MI	DSM-IV MDD	Self-report questionnaire	1023 (70.5)	48.0	25.0
Mean/total [95%CI]	14 countries	–	–	–	8157 (52.5)	65.9 [60.6–71.2]	30.9 [22.4–39.4]

Definitions: BDI-II, Beck Depression Rating Scale, version 2; CES-D, Center for Epidemiological Studies Depression Scale; CIDI, Composite International Diagnostic Interview; DIS, Diagnostic Interview Schedule; DSM-IV, Diagnostic and statistical Manual version IV; GDS, Geriatric Depression Scale; GMS, Geriatric Mental State Schedule; HADS, Hospital Anxiety & Depression Scale; ICD-10, International Classification of Diseases, version 10; MDD, Major Depressive Disorder; MI, myocardial infarction; MINI, Mini International Neuropsychiatric Interview; PRIME-MD, Primary Care Evaluation of Mental Disorders screening questionnaire; SCID, Structured Clinical Interview for DSM; SDS, Self-rating Depression scale; ZDS, Zung Self-Rating for Depression. Reported prevalence of depression was unrelated to sample size or %-men, but was lower with greater age ($r_s=0.526$, $p=0.04$).

of depression than the general population (Katon and Ciechanowski, 2002; Olver and Hopwood, 2013). However, reported estimates of the prevalence of major depression among medically hospitalized patients has varied from 5.9% to 81% (Arolt et al., 1998; Conde Martel et al., 2013; Dal Bó et al., 2011; Frazier et al., 2012; Freedland et al., 2003; Gascón et al., 2012; Helvik et al., 2012; Hosaka et al., 1999; Kok et al., 1995; Lesman-Leegte et al., 2006, 2009; McCusker et al., 2005; Mendes-Chiloff et al., 2008; Michopoulos et al., 2010; Pakriev et al., 2009; Pelletier et al., 2014; Suzuki et al., 2011; Unsar and Sut, 2010; Zhang et al., 2008; Zhong et al., 2010). This extraordinarily wide, 14-fold, range (Table 1) may be related to differences in case-ascertainment methods. Most of these reports have involved diagnosis based on symptom rating scales or simple diagnostic screening questionnaires. In contrast, when depression has been identified by structured clinical interviews, reported prevalence ranged only from 14% to 45% (3.2-fold) (Michopoulos et al., 2009; Polo-Gascon et al., 2012); the range was much larger when based on symptom-rating scales: 5.9% to 81% (14-fold) (Helvik et al., 2012; Zhang et al., 2008). Another source of variance is subject-sampling. In addition, many of the cited studies considered only one type of illness or selected age groups, and so are unlikely to be representative of all medically hospitalized patients (Evans et al., 2005; Olver and Hopwood, 2013; Stoner et al., 1998).

The presence of depression is reported to worsen medical prognosis, increase symptom burden, complicate self-care and treatment-adherence, increase length of hospitalization and the costs of care, and probably also increases mortality (Katon and

Ciechanowski, 2002; Katon, 2011; Olver and Hopwood, 2013). Identification and treatment of depression in general medical settings should have important beneficial effects associated with lessening of the risks and impact of such adverse outcomes. However, identifying depression in medically ill patients is complicated by the overlap and interactions of general medical and psychiatric manifestations of illness (Olver and Hopwood, 2013). Case identification may be improved by use of appropriate screening methods for depression and estimating individual levels of risk of adverse outcomes.

The present study aimed to estimate the prevalence of major depressive episodes (MDE) among patients hospitalized for a general medical illness, and to compare prevalence estimates based on psychiatric examination guided by the Mini International Neuropsychiatric Interview (MINI) with scores of widely employed, standardized rating scales, including the Beck Depression Scale version 2 (BDI-II), the Hospital Anxiety and Depression Scale (HADS), and the nine-item Patient Health Questionnaire (PHQ-9). We also evaluated associations between the presence of MDE and selected clinical and demographic variables.

2. Methods

2.1. Study design

The study was observational and cross-sectional, involving three sites in Buenos Aires, Argentina, at : Bernardo Houssay

Hospital in the Vicente Lopez district, Eva Peron Hospital in the San Martín district, and Bernardino Rivadavia Hospital in the Autonomous City district. These general hospitals serve in the metropolitan area of Buenos Aires which has 12.8 M population, and particularly serves low-income patients without health insurance. The study protocol was approved by the Ethics Committees of the participating hospitals, and subjects provided written, informed consent.

2.2. Participants

On the basis of previous studies we conservatively estimated a prevalence of depression of 20% for a power calculation that estimated a minimum sample size of 246 participants to yield a prevalence measure with 95% confidence within a precision of $\pm 5\%$ (Charan and Biswas, 2013). All consecutive patients hospitalized for a general medical illness over a six-month period were eligible for the study. Included subjects were native Spanish speakers aged ≥ 18 years. Potential subjects were excluded if they were: [a] unable to participate in clinical assessments or to complete symptom-ratings because of illness, medication, sensory or speech impairment, or lack of language fluency, or [b] scored < 25 on a preliminary Mini Mental State Examination (MMSE) suggesting dementia or delirium.

A total of 754 patients were hospitalized at study sites between August 2013 and May 2014. Of these, 497 were excluded: 389 scored < 25 on the MMSE, 49 could not complete study questionnaires, 33 refused to participate, 15 were younger than 18 years, 7 were unable to communicate effectively, and 4 were transferred to other sites within two days of hospitalization, to yield $N=257$ consenting study participants (Eva Perón Hospital, $n=150$, 58.4%; Bernardino Rivadavia Hospital, $n=54$, 21.0%; Bernardo Houssay Hospital, $n=53$, 20.6%).

2.3. Assessment measures

Participants were interviewed at days 2–6 of hospitalization to allow time for medical diagnosis and to limit potential mood changes related to prolonged hospitalization. Each subject completed a semi-structured questionnaire to provide basic demographic and clinical information, as well as participating in the following four assessment methods. [1] Direct clinical examination by a psychiatrist, guided by the Mini-International Neuropsychiatric Interview (MINI, Spanish version) (Ferrando et al., 2005) to explore major Axis I diagnoses for DSM-IV and for ICD-9; this basis of diagnosing MDE was the standard for this study. There were 8 interviewers: 4 at Eva Peron Hospital (AYT, AJT, GBC and ATK), 3 at Bernardino Rivadavia Hospital (NO, LM and LMN) and 2 at Bernardo Houssay Hospital (PLE and BGP). [2] The Argentine-validated second edition of the Beck Depression inventory (BDI-II); this self-report questionnaire rated each of 21 items for presence and severity (scored 0–3/item) for the previous two weeks and the current day, with possible scores of 0–63, and ≥ 14 considered positive for depression (Brenlla and Rodríguez, 2006). [3] The Hospital Anxiety and Depression Scale (HADS), a 14-item (scored 0–3/item up to a maximum of 42 self-rated, 7-item subscales for depression and anxiety, with a depression score of ≥ 8 (out of 21) considered positive (Herrero et al., 2003; Zigmond and Snaith, 1983). [4] The Patient Health Questionnaire (PHQ-9) is a nine-item, self-report measure designed to detect and rate the presence and severity of depression in primary-care clinical settings, with continuous scoring (0–3/item, total of 0–27), with scores of ≥ 6 considered consistent with clinical depression (Urtasun et al., 2016). We also used the Short Form (SF-12) questionnaire to assess quality-of-life (Augustovski et al., 2008; Guex et al., 2010).

A psychiatrist or psychiatric resident trained for this purpose,

both held blind to study findings, examined all study participants, collecting demographic and descriptive data and applying the MINI and the three self-administered depression scales (BDI-II, HADS and PHQ-9) in randomized order to limit re-test artifacts.

2.4. Statistical analyses

Categorical measures are reported as frequencies (% of subjects, with 95% confidence intervals [CI] estimated by the binomial method) and compared with contingency tables (χ^2); continuous measures are reported as means \pm standard deviation (SD) or with CI and compared by ANOVA methods (t -test) or Wilcoxon rank-sum test (Mann-Whitney U -statistic) for non-normally distributed continuous data. We used multivariate logistic regression to test for significant and independent association of depression (based on MINI examinations) and factors identified by preliminary bivariate comparisons, as well as sex and age. Independent variables were included stepwise from the least to the most significant in preliminary testing. Data are expressed as Odds Ratios (OR) with their CI, and significance was based on Wald tests. Statistical significance was set at two-tailed $p < 0.05$. Analysis used STATA.12 (StataCorp, College Station, TX) commercial statistical software.

3. Results

3.1. Study population

The 257 subjects included 152 (59.1%) men and 105 (40.9%) women, of average age 54.2 [95%CI: 52.1–56.2] years; of these, 69 (26.85%) were considered to have a current MDE by expert clinical assessment. Identification of MDE by other methods yielded the following prevalences: [a] HADS, 25.1%; [b] BDI-II, 43.9%; [c] PHQ-9, 55.5% (Table 2), indicating close accord of clinical assessments and HADS ratings and higher estimates with BDI-II and PHQ-9. Rates of identification of depression by psychiatric examination did not differ among the three participating general hospitals ($\chi^2=0.91$, $p=0.63$).

3.2. Factors associated with depression

We found 13 factors to be tentatively associated with current MDE diagnosed by psychiatric examination, based on preliminary bivariate analyses (Table 3). By statistical significance they ranked: [1] previous depression, [2] female sex, [3] PHQ-9 depression score ≥ 6 , [4] Beck-II depression score ≥ 14 , [5] lower SF-12 quality-of-life rating, [6] self-report of feeling depressed, [7] HADS scores (total, depression [depression diagnosed at ≥ 8], and anxiety subscores), [8] prior use of any prescribed psychotropic drugs and specifically, antidepressants, [9] psychiatric consultation requested in the index hospitalization, [10] any previous psychiatric or mental-health treatment, [11] a greater number of children, [12] requiring assistance with activities of daily living prior to index hospitalization, and [13] heavy smoking (≥ 20 cigarettes/day).

Table 2

Prevalence of probable depression by four screening methods.

Rating method	Criterion score	Observed prevalence (%)
MINI	Diagnosis	26.8
HADS-D	≥ 8	25.1
BDI-II	≥ 14	43.9
PHQ-9	≥ 6	55.5

MINI, Mini-International Neuropsychiatric Interview; HADS, Hospital Anxiety and Depression Scale; BDI-II, Beck Depression Rating Scale, version 2; PHQ-9, 9-item Patient Health Questionnaire.

Table 3

Factors associated with current major depressive episode (mean or % with 95% CI).

Factor	Not depressed (n=188)	Depressed (n=69)	Relative risk	t or χ^2	p-Value
Statistically significant					
Previous depression (%)	10.0 [6.20–15.3]	27.9 [17.5–39.6]	2.79	12.5	< 0.001
Female (%)	34.6 [27.8–41.8]	58.0 [45.5–69.8]	1.68	11.4	< 0.001
PHQ-9 depression score	5.62 [4.85–6.39]	14.0 [12.7–15.3]	2.49	11.0	< 0.001
Beck-II depression score	10.7 [9.41–12.0]	23.5 [21.0–25.9]	2.20	9.53	< 0.001
SF-12 quality-of-life score	52.1 [50.6–53.6]	36.4 [33.9–38.8]	1.43	10.5	< 0.001
Feels depressed (%)	5.11 [2.58–9.56]	57.4 [45.4–69.0]	11.2	84.7	< 0.001
<i>HADS score</i>					
Total	10.5 [9.54–11.5]	19.8 [18.3–21.3]	1.89	9.89	< 0.001
Depression	4.79 [4.24–5.34]	9.10 [8.18–10.0]	1.90	7.92	< 0.001
Anxiety	5.70 [5.14–6.25]	10.9 [10.0–11.8]	1.91	9.59	< 0.001
<i>Prior psychotropic medicines (%)</i>					
Any	11.1 [7.05–16.4]	35.3 [23.7–47.2]	3.18	19.8	< 0.001
Antidepressants	4.44 [1.85–8.21]	13.4 [6.14–23.3]	3.02	6.06	0.01
Mood-stabilizers	1.68 [0.33–4.59]	2.94 [0.35–10.1]	1.75	0.95	0.33
Psychiatric consultation (%)	7.30 [4.13–12.2]	19.4 [10.4–30.1]	2.66	7.51	0.006
Prior psychiatric treatment (%)	4.44 [1.85–8.21]	11.8 [5.14–21.6]	2.66	4.38	0.04
<i>Children (%)</i>					
Number	2.33 [2.01–2.65]	2.96 [2.45–3.47]	1.27	2.03	0.04
Any	76.9 [70.5–82.9]	84.1 [73.3–91.8]	1.09	1.55	0.21
Living assistance required (%)	19.4 [13.8–25.5]	30.9 [19.9–42.7]	1.59	3.69	0.05
<i>Substance misuse (%)</i>					
Heavy smoking (≥ 20 /day)	11.9 [7.48–17.2]	23.9 [13.9–34.9]	2.01	5.37	0.02
Daily alcohol use	12.8 [10.5–21.4]	7.35 [2.39–16.1]	0.57	1.45	0.23
Drug misuse	5.56 [2.58–9.56]	1.47 [0.04–7.81]	0.26	1.94	0.16
Not significant					
Lack of daily Hospital visitors (%)	11.2 [7.48–17.2]	20.6 [11.6–31.7]	1.84	3.68	0.06
<i>Education</i>					
Years (\pm SD)	9.19 [8.66–9.72]	8.29 [7.40–9.18]	0.90	1.71	0.09
< 12 years (%)	71.4 [64.2–77.6]	81.8 [69.9–89.6]	1.15	2.78	0.10
Lives alone (%)	19.3 [18.5–31.1]	14.5 [7.17–25.0]	0.75	0.77	0.38
<i>Age</i>					
> 60 years (%)	43.6 [36.4–51.0]	37.3 [26.3–50.2]	0.86	0.79	0.38
Mean	54.3 [51.8–56.8]	53.6 [50.2–57.0]	0.99	0.31	0.76
Ever married/stable relationship (%)	64.7 [59.6–71.7]	69.6 [55.8–78.8]	1.08	0.53	0.47
Hypertension (%)	36.7 [29.8–44.0]	32.4 [21.2–44.2]	0.88	0.40	0.53
Hospitalized within 1 year (%)	32.8 [26.3–40.2]	34.8 [23.7–47.2]	1.06	0.09	0.76
Unemployed (%)	48.7 [41.6–56.3]	50.7 [38.4–63.0]	1.04	0.09	0.77
Chronic medical illness (%)	35.6 [28.8–42.9]	33.8 [26.1–51.8]	0.95	0.07	0.80
Argentine native (%)	82.9 [76.8–88.1]	83.8 [73.3–91.8]	1.01	0.03	0.86
Diabetes 1 or 2 (%)	25.8 [19.9–33.0]	26.5 [16.3–38.1]	1.03	0.01	0.92

Definitions: *Beck-II*, Beck Depression Rating Scale; *Major Depressive Episode* (defined by MINI score; overall prevalence was 26.8%); *HADS*, Hospital Anxiety & Depression Scale; version 2; *MINI* (Mini International Neuropsychiatric Interview, version 6); *PHQ-9*, 9-item Patient Health Questionnaire; *SF-12* (Basic Activities of Daily Living scale, 12-item Short Form, MCS subscale).

In addition to the factors shown, depression was nonsignificantly ($\chi^2 = 7.78$ [9 df], $p = 0.45$) most often associated with neoplastic and dermatological disorders and least with cardiovascular and pulmonary disorders (Fig. 1); rates of depression did not vary across study-sites ($\chi^2 = 0.91$, $p = 0.63$).

Another 11 factors were not significantly associated with depression, including age, education, marital and employment status, being psychiatrically hospitalized within the previous year, having diabetes or hypertension, being chronically medically ill, or not having daily visitors in hospital (Table 3).

3.3. Association with medical illness-type

The observed prevalence of depression varied by up to 2.7-fold among the types of current general medical illnesses, in a rank-order that differed markedly from the prevalence of the medical disorders themselves (Fig. 1). After omitting very small subsamples (4 cases of dermatological disorders and 3 with uncertain medical diagnoses), observed rates of depression by illness type ranked as follows (Fig. 1): neoplastic (40.9%), urological (36.4%), infectious (30.2%), cardiovascular (28.0%), gastrointestinal (27.8%), metabolic-

endocrine (25.8%), hematological (18.1%), neurological (17.1%), and pulmonary (11.1%). These differences, though large, were not statistically significant overall ($\chi^2 = 8.30$ [8 df], $p = 0.40$), probably reflecting in part the moderate number of cases in each medical disorder category (averaging 26 cases/disorder). However, the difference in risk between the three medical disorders with highest (neoplastic, urological, and infectious = 33/97 = 34.0%) versus lowest risk of depression (pulmonary, neurological, and hematological illnesses: 11/70 = 15.7%) was 2.2-fold, and highly significant ($\chi^2 = 7.02$, $p = 0.008$; Fig. 1).

3.4. Multivariate logistic regression analysis

We used multivariate logistic regression to test for factors associated significantly and independently with current clinically diagnosed depression, omitting ratings with various testing

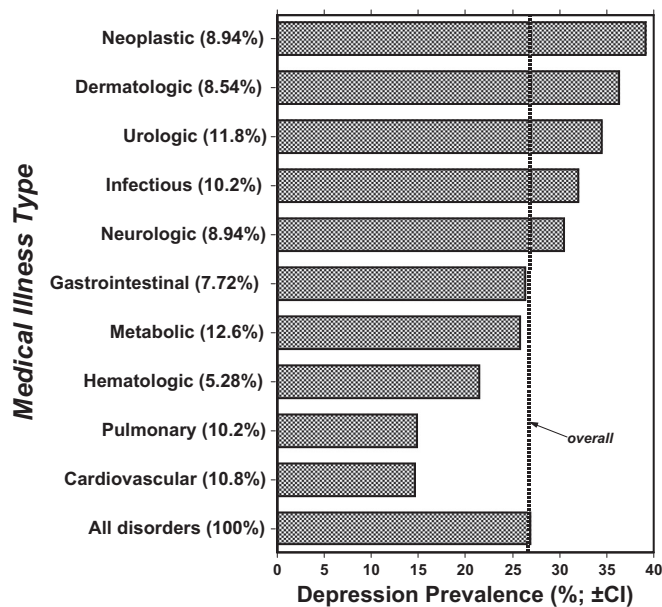


Fig. 1. Observed prevalence of current major depression among subjects versus types of medical illnesses (their prevalence in parentheses). The vertical dotted line is the overall observed prevalence of depression (26.85%). The three disorders with highest risk of depression (above the mean) are neoplastic, urological, and infectious (34.0% [CI: 24.7–44.3]); the three with lowest risk (below the mean) are pulmonary, neurological, and hematological (15.7% [8.11–26.4]), differing by 2.17-fold ($\chi^2 = 7.02$, $p = 0.008$). Prevalence of depression and of medical disorders are not correlated ($r = 0.14$; slope = 0.21 [CI: -1.58 to 2.90]; $p = 0.12$).

methods (Table 3). By statistical significance, 5 factors remained associated with depression: [a] previous psychotropic-drug treatment, [b] female sex, [c] having more children, and [c] being a heavy smoker.

4. Discussion

Major depression has been found to be quite prevalent among medically hospitalized patients. Based on a standardized, structured psychiatric interview guided by the MINI, we found an overall prevalence of MDE of 26.85% among patients hospitalized for medical illnesses at three general hospitals in metropolitan Buenos Aires, Argentina. The reported findings are unusual in providing comparisons among adult inpatients of varied ages with unselected medical disorders, assessing for depression with several standard methods—all evaluated at the same time and in random order.

Previous studies on the prevalence of depression in patients hospitalized for medical illnesses from 14 countries showed 14-fold variation ranging from 5.9% to 81%, and averaging 30.0% [CI: 22.4–39.4] (Table 1), similar to the rate of 26.85% found in the present study. The variation observed in those studies probably is related to the demographic and clinical differences among samples and the methods used to identify cases of depression.

We found that of widely employed screening scales for depression, the HADS yielded most similar estimates of prevalence of depression to that ascertained by psychiatric examination, whereas the BDI-II and PHQ-9 self-report questionnaires yielded higher values that probably represent over-estimation (Table 2). The HADS was developed and tested specifically to assess depression in hospitalized patients with medical illnesses, and emphasizes affective and cognitive, rather than somatic symptoms (Herrero et al., 2003; Zigmond and Snaith, 1983). Previous evidence of probable over-estimation of the prevalence of depression by other methods includes a study of patients hospitalized for

heart failure, among whom the reported prevalence of major depression was 20% using the DSM-IV-based Diagnostic Interview Schedule (DIS), but 51% with the BDI (Freedland et al., 2003). Such observations, as well as the present findings (Table 2), support the conclusion that the BDI-II and PHQ-9 can over-estimate the prevalence of depression among hospitalized, general medical patients. Efforts to improve the validity of such screening for depression need to confront the challenge of risking low specificity and validity of relatively simply administered and evaluated self-rating questionnaires, especially in computerized versions. Such methods are appealingly simple and rapid compared to specialized examinations by highly trained, expert clinical personnel. However, savings based on simpler screening methods can be offset by the impact of over-diagnosis on clinical resources and costs of care. Moreover, most screening questionnaires for depression have had limited field-testing in a range of types and severities of medical illnesses, especially when applied to hospitalized patients of various ages, in whom somatic symptoms may tend to inflate estimates of depression (Zhong et al., 2010).

The prevalence of depression in patients with medical conditions has been found to be greater than that of the general population (Katon and Ciechanowski, 2002), and some medical conditions are associated with higher prevalence values than others. For example, chronic obstructive pulmonary disease has shown a higher prevalence of depression than stroke or diabetes (Olver and Hopwood, 2013). However, these comparisons usually involved different screening tools, particular subgroups (most elderly patients) and only selected diseases (Cleland et al., 2007; Conde-Martel et al., 2013; Freedland et al., 2003; Lesman-Leegte et al., 2006; Mendes-Chiloff et al., 2008; Musselman et al., 2003; Robinson, 2003)—making comparisons risky. The present study compared all ICD-10 medical conditions of medically hospitalized patients, in an effort to provide more realistic comparisons. We found that risk of depression varied from a low of 11.1% with pulmonary disorders to a high of 40.9% with tumors, although moderate numbers of subjects with each type of disorder limited statistical power to test for inter-diagnostic differences in risk of depression (Fig. 1).

Several other factors were significantly associated with depression (Table 3). Based on multivariate analyses, these included previous treatment with prescribed psychotropic drugs, being female, having more children, and heavy smoking (Table 4). Some previous reports also have proposed risk factors associated with depression among medically hospitalized patients, although most samples involved elderly patients with cardiac disorders (Conde-Martel et al., 2013; Freedland et al., 2003; Lesman-Leegte et al., 2006; Mendes-Chiloff et al., 2008; Zhong et al., 2010). In these studies, identified risk factors for depression have included previous depression, female sex, advanced age, less education, poverty, being unmarried, more severe or complex medical illnesses and physical disability, as well as a history of psychological and social problems.

The association of female sex with risk of depression found in this study has been noted in other patients hospitalized for medical illnesses (Frazier et al., 2012; Freedland et al., 2003), as well as in general

Table 4

Multivariable logistic regression model of factors associated with current depression.

Variables	Odds ratio [95% CI]	χ^2	p-value
Prior psychotropic drug treatment	3.80 [1.85–7.81]	13.2	0.0003
Female sex	2.43 [1.30–4.53]	7.73	0.005
More children	1.19 [1.04–1.36]	6.15	0.013
Heavy smoker	3.80 [1.85–7.81]	5.84	0.016

Factors are ranked by significance. Additional factors from Table 3 (omitting other psychometric ratings) were not significantly associated with depression.

population samples (Frazier et al., 2012; Kessler et al., 1993). A relationship of risk for depression and age (Table 1) was not observed, and has been reported inconsistently among medically hospitalized subjects in some previous studies (Andrade et al., 2003; Freedland et al., 2003) but not others (Cigognini and Furlanetto, 2006; Zhong et al., 2010). Such inconsistencies remain unexplained.

It is hardly surprising that previous depression or psychiatric treatment, including with antidepressants, would be risk factors for depression during medical hospitalization. However, subtle differences may arise in interactions between psychiatric history or vulnerability and the impact of medical illness and hospitalization as stressors leading to acute depression (Rodin and Voshart, 1986). Such differences may call for different types of clinical management and treatment. Improvement of a medical condition may be sufficient to lead to resolution of depression in some patients, but others may require more direct psychiatric intervention (Cigognini and Furlanetto, 2006; Freedland et al., 2003).

Additional social factors appeared not to be significantly related to risk of depression in our findings. These include being unmarried, unemployed, or not having daily visitors in the hospital (Table 1). In other studies, being married and employed and other aspects of social support appeared to be protective against depression in medically hospitalized subjects (Pakriev et al., 2009; Qin et al., 2008; Zhong et al., 2010), as well as for risk of depression generally (McCusker et al., 2005; Zhong et al., 2010).

4.1. Study limitations

A main limitation of this study is the modest number of patients with particular medical disorders, limiting statistical power to test for associations of depression with types of medical illnesses. In addition, the study involved three general hospitals that serve low-income patients without health insurance—factors which might contribute to risk of major depression.

5. Conclusions

The present study, based in three large urban general hospitals in Buenos Aires, found a prevalence of major depressive episode of 27% among medical inpatients. The HADS questionnaire estimated a prevalence of depression that was closest to psychiatric examination, whereas the BDI-II and PHQ-9 screening questionnaires yielded higher rates that are probably over-estimates. Factors strongly associated with current depression were previous treatment with prescribed psychotropic drugs, being female, having more children, and heavy smoking. The findings support screening for depression in medical populations with efficient methods of adequate specificity as well as sensitivity, with the aim of supporting planning for rational allocation of mental-health services.

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