Screening for Depression in Hospitalized Medical Patients

Waguih William IsHak, MD, FAPA[1–3*], Katherine Collison, PhD Candidate[1,4], Itai Danovitch, MD, MBA[1], Lili Shek, MD[5], Payam Kharazi, PsyD[1], Tae Kim, DO Candidate[1,6], Karim Y. Jaffer, MD Candidate[1,7], Lancer Naghdechi, DO Candidate[1,6], Enrique Lopez, PsyD[1], Teryl Nuckols, MD, MSHS[8]

[1]Cedars-Sinai Medical Center, Department of Psychiatry and Behavioral Neurosciences, Los Angeles, California; [2]Cedars-Sinai Medical Center, Department of Health Sciences, Los Angeles, California; [3]David Geffen School of Medicine at UCLA, Los Angeles, California; [4]Purdue University, West Lafayette, Indiana; [5]Cedars-Sinai Medical Center, Department of Internal Medicine, Los Angeles, California; [6]Western University, Los Angeles, California; [7]Cairo University School of Medicine, Cairo, Egypt; [8]Cedars-Sinai Medical Center, Division of General Internal Medicine, Los Angeles, California.

Depression among hospitalized patients is often unrecognized, undiagnosed, and therefore untreated. Little is known about the feasibility of screening for depression during hospitalization, or whether depression is associated with poorer outcomes, longer hospital stays, and higher readmission rates. We searched PubMed and PsycINFO for published, peer-reviewed articles in English (1990-2016) using search terms designed to capture studies that tested the performance of depression screening tools in inpatient settings and studies that examined associations between depression detected during hospitalization and clinical or utilization outcomes. Two investigators reviewed each full-text article and extracted data. The prevalence of depression ranged from 5% to 60%, with a median of 33%, among hospitalized patients. Several screening tools identified showed high sensitivity and specificity, even when self-administered by patients or when abbreviated versions were administered by individuals without formal training. With regard to outcomes, studies from several individual hospitals found depression to be associated with poorer functional outcomes, worse physical health, and returns to the hospital after discharge. These findings suggest that depression screening may be feasible in the inpatient setting, and that more research is warranted to determine whether screening for and treating depression during hospitalization can improve patient outcomes. *Journal of Hospital Medicine* 2017;12:118-125. © 2017 Society of Hospital Medicine

In our current healthcare system, pressure to provide cost- and time-efficient care is immense. Inpatient care often focuses on assessing the patient's presenting illness or injury and treating that condition in a manner that gets the patient on their feet and out of the hospital quickly. Because depression is not an indication for hospitalization so long as active suicidality is absent, inpatient physicians may view it as a problem best managed in the outpatient setting. Yet both psychosocial and physical factors associated with depression put patients at risk for rehospitalization.[1] Furthermore, hospitalization represents an unrecognized opportunity to optimize both mental and physical health outcomes.[2]

Indeed, poor physical and mental health often occur together. Depressed inpatients have poorer outcomes, increased length of stay, and greater vulnerability to hospital readmission.[3,4] Among elderly hospitalized patients, depression is particularly common, especially in those with poor physical health, alcoholism,[5] hip fracture, and stroke.[6] Yet little is known about how often depression goes unrecognized, undiagnosed, and, therefore, untreated.

The US Preventive Services Task Force (USPSTF) recommends screening for depression in the general adult population, including pregnant and postpartum women, and further suggests that screening should be implemented "with adequate systems in place to ensure accurate diagnosis, effective treatment, and appropriate follow-up."[2] The USPSTF guidelines do not distinguish between inpatient and outpatient settings. However, the preponderance of evidence for screening comes from outpatient care settings, and little is known about screening among inpatient populations.[7]

This study had 2 objectives. First, we sought to examine the performance of depression screening tools in inpatient settings. If depression screening were to become routine in hospital settings, screening tools would need to be sensitive and specific as well as brief and suitable for self-administration by patients or for administration by nurses, resident physicians, or hospitalists. It is also important to consider administration by mental health professionals, who may be best trained to administer such tests. We, therefore, examined 3 types of studies: (1) studies that tested a self-administered screening instrument, (2) studies that tested screening by individuals without formal training, and (3) studies that compared screening tools administered by mental health professionals. Second, we sought to describe associations between depression and clinical or utilization outcomes among hospitalized patients.

METHODS

We adhered to recommendations in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement,[8,9] including designing the analysis before performing

***Address for correspondence and reprint requests:** Waguih William IsHak, MD, FAPA, 8730 Alden Drive, Thalians E-132, Los Angeles, CA 90048; Telephone: 310-423-3515; Fax: 310-423-3947; E-mail: waguih.ishak@cshs.org

Additional Supporting Information may be found in the online version of this article.

Received: April 25, 2016; **Revised**: August 19, 2016; **Accepted**: September 5, 2016

2017 Society of Hospital Medicine DOI 10.12788/jhm.2693

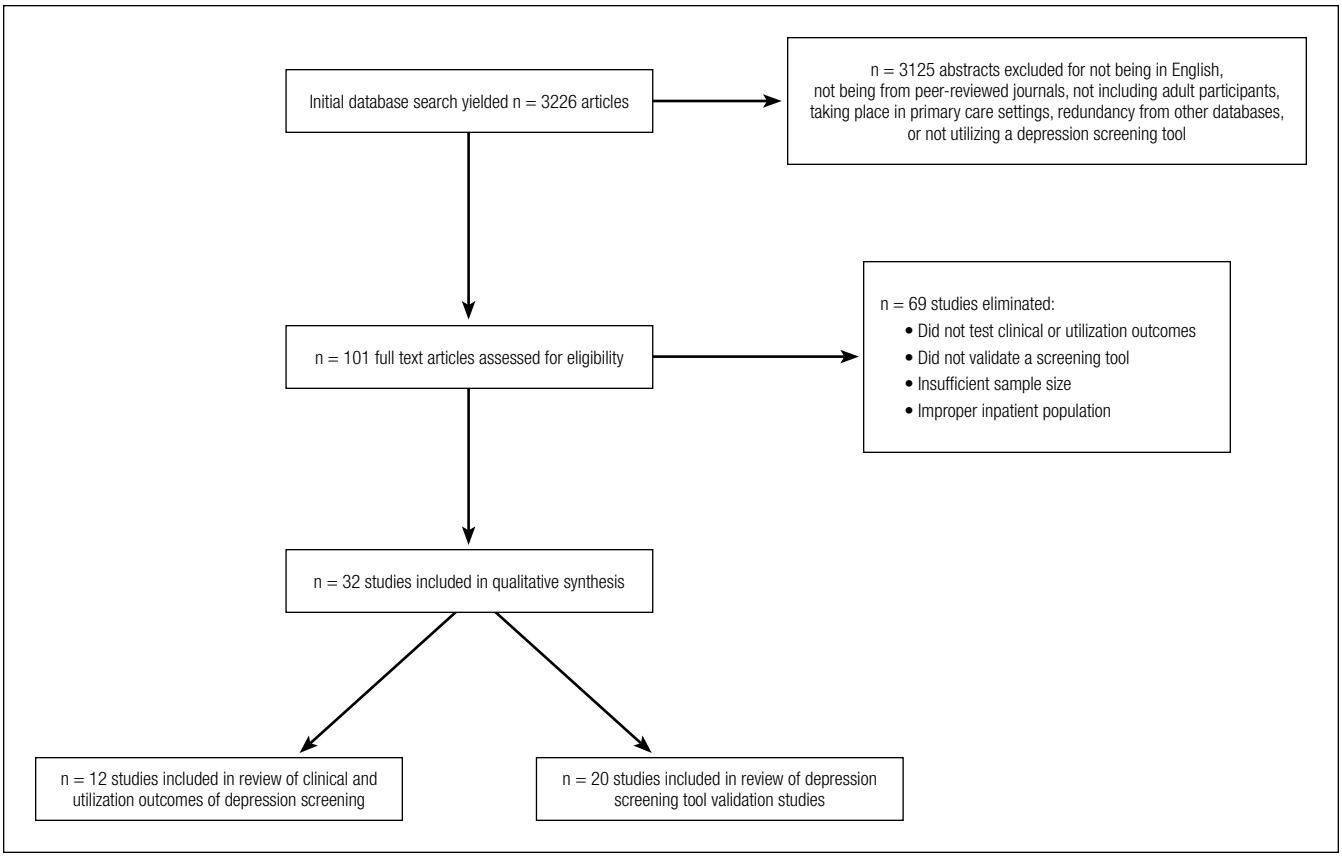

FIG. PRISMA diagram of studies for inclusion.

the review. However, we did not post a protocol in an online registry, formally assess study quality, or perform a meta-analysis.

Data Sources and Searches

We searched PsycINFO and PubMed databases for articles published between 1990 and 2016 (as of July 31, 2016). In PubMed, 2 search term strings were used to capture studies of depression screening tools in inpatient settings. The first used the advanced search option to exclude studies related to primary care settings or children and adolescents, and the second used MeSH terms to ensure that a wide variety of studies were included. Specific search terms are included in the Appendix. A similar search was conducted in the PsycINFO database and these search terms are also included in the Appendix.

Study Selection

Articles were eligible if they were published in English in peer-reviewed journals, included at least 20 adults hospitalized for nonpsychiatric reasons, and described the use of at least 1 measure of depression. The studies must have either tested the validity of a depression screening tool or examined the association between depression screening and clinical or utilization outcomes. Two investigators reviewed each title, abstract, and full-text article to determine eligibility, then reached a consensus on which studies to include in this review.

Data Extraction

Two investigators reviewed each full-text article to extract information related to study design, population, and outcomes regarding screening tool analysis or clinical results. From articles that assessed the performance of depression screening tools, we extracted information related to the nature and application of the index test, the nature and application of the reference test, the prevalence of depression, and the sensitivity and specificity of the index test compared with the reference test. For articles that focused on the association between depression screening and clinical or utilization outcomes, the data on relevant clinical outcomes included symptom severity, quality of life, and daily functioning, whereas the data on utilization outcomes included length of stay, readmission, and the cost of care.

RESULTS

Altogether, the search identified 3226 records. After eliminating duplicates and abstracts not suitable for inclusion (Figure), 101 articles underwent full-text review and 32 were found to be eligible. Of these, 12 focused on the association between depression and clinical or utilization outcomes, while 20 assessed the performance of depression screening tools.

Depression Screening Tools

Table 1 describes the index and reference instruments as well as methods of administration, the prevalence of depression,

TABLE 1. Studies That Have Tested Screening Instruments in Inpatient Settings

	Study Population			Index Test(s)		Reference Test					
Study	Population and Setting	Inclusion Criteria	Exclusion Criteria	Instrument (Minimum Positive Score)	Method of Administration	Instrument	Method of Administration	Prevalence of Depression	Sensitivity of Index Test	Specificity of Index Test	Other Measures of Index Test Performance
Index Test Self-Administered by Patient											
Le Fevre et al., 1999[10]	79 patients admitted to a hospice unit, United Kingdom	Able to complete tests	Serious illness, confusion, delirium	HADS (20)	Completed by patient	CIS-R	Investigating psychiatrist	29%	77%	85%	AUC 0.92
Lloyd-Williams et al., 2000[11]	100 inpatients in hospice or oncology ward for at least 48 h, England	Age 18-70, English-speaking, prognosis of ≤6 months, able to complete tests	On antidepressant, brain metastases, or prognosis ≤1 week	EPDS (13)	Completed by patient	PSE	First author of paper, blinded	22%	81%	79%	PPV 53%; NPV 94%
Amadori et al., 2011[12]	188 randomly selected geriatric inpatients, Germany	Not specified	Not specified	GDS-4 (1/4)	Completed by patient	GDS-15	Completed by patient	44%	76%	86%	—
Diez-Quevedo et al., 2001[13]	1003 inpatients, 1 university hospital, Spain	Age 18-74, medical and surgical patients	Substance dependence, or admitted to psychiatry or obstetrics	PHQ-9 in Spanish (5/9)	Completed by patient	BDI	Completed by patient	42%	84%	92%	—
Young et al., 2015[14]	105 inpatients from cardiology and cardiac surgery step-down units	Age ≥19, cardiac inpatient, able to complete tests	Presence of dementia or delirium	Single item on depression from STOP-D (4)	Completed by patient	HADS	Completed by patient	Not reported	91%	85%	—
Index Test Administered by Individuals Without Formal Training											
Loke et al., 1996[15]	102 consecutive patients admitted to 2 geriatric wards, Western Australia	English-literate, MMSE ≥24/30	Not specified	BASDEC (7) SCL-5 (10)	Medical house officer or research geriatrician	GMS	Blinded research psychiatrist	22%	BASDEC: 91% SCL-5: 77%	BASDEC: 85% SCL-5: 74%	AUC BASDEC: 0.88 SCL-5: 0.77
Shah et al., 1998[16]	50 patients from geriatric inpatient medicine ward, London	All patients admitted to a specific geriatric ward team	Severe cognitive impairment	mDSS (3)	Charge nurse scores based on clinical observation	BAS	Trained interviewer	38%	63%	58%	PPV: 48% NPV: 72%
Payne et al., 2007[17]	167 inpatients in palliative care unit, Ireland	Age ≥18, MMSE ≥24	Actively dying, dysphagia, deaf	2 items on depressed mood and anhedonia (yes on both)	Specialist palliative care registrars	DSM-IV	Formal psychiatric interview by study author	25.7%	90.7%	67.7%	PPV: 49.4% NPV: 95.5%
Rinaldi et al., 2003[18]	60 patients in acute geriatric ward, Italy	Age >65	MMSE score indicating cognitive impairment	GDS-5 (2) GDS-15	Geriatrician	DSM-IV	Geriatrician with experience in depression	48.3%	GDS-5: 97% GDS-15: 90%	GDS-5: 74% GDS-15: 81%	PPV GDS-5: 74% GDS-15: 81% NPV GDS-5: 96% GDS-15: 89%
McGuire et al., 2013[19]	101 patients from cardiac step-down units, United States	Age >18, acute coronary syndrome, English speaking	MMSE ≤24, psychiatric diagnosis other than depression or anxiety, or taking psychotropic medications	PHQ-2 (3, scale 0-6) PHQ-9 (10, scale 0-27)	Staff nurses assigned to patients	Depression Interview and Structured Hamilton	Advanced practice nurse	23%	PHQ-2: 95.6% PHQ-9: 95.6%	PHQ-2: 71.4% PHQ-9: 72.3%	AUC PHQ-2: 0.912 PHQ-9: 0.926

Continued on page 121

and the sensitivity and specificity of the index instruments relative to the reference instruments. Across the 20 studies, the prevalence of depression ranged from 15% to 60%, with a median of 34%.[10–29] This finding may reflect different methods of screening or variation among diverse hospitalized populations. Many of the studies excluded patients with cognitive impairment or communication barriers.

The included studies tested a wide range of unique instruments, and compared them with diverse reference standards. Five studies examined instruments that were self-administered by patients[10–14]; 9 studies assessed instruments administered by nurses, physicians, or research staff members

TABLE 1. Studies That Have Tested Screening Instruments in Inpatient Settings *(continued)*

	Study Population			Index Test(s)		Reference Test					
Study	Population and Setting	Inclusion Criteria	Exclusion Criteria	Instrument (Minimum Positive Score)	Method of Administration	Instrument	Method of Administration	Prevalence of Depression	Sensitivity of Index Test	Specificity of Index Test	Other Measures of Index Test Performance
Furlanetto et al., 2005[20]	155 adults in medical wards in university hospital, Rio de Janeiro	Not specified	Discharge expected within 72 h, severe cognitive impairment	BDI-SF (10)	Blinded research assistant	Clinical Interview Schedule (detects moderate to severe depression)	Psychiatrist	Not reported	100%	83.1%	PPV: 59.6% NPV: 100%
Heidenblut et al., 2014[21]	331 patients from 3 geriatric inpatient units, Germany	MMSE ≥15	Aphasia, delirium, psychotic disorders	DIA-S (3.5) GDS-15 (5.5)	Blinded trained interviewer	MADRS	Clinical psychologist	45.6%	DIA-S: 82%; GDS-15: 79%	DIA-S: 79% GDS15: 71%	AUC DIA-S: 0.88 GDS-15: 0.82
Pantilat et al., 2012[22]	162 inpatients with palliative care consultations at large academic center, United States	Age >65, English-speaking	(None)	Depressed mood in past 24 h: NRS (7, scale 0-10), Categorical (mild or worse)	Research assistant	GDS-15	Research assistant	20%	NRS: 37.5% Categorical: 21.9% (article also reports other cut points)	NRS: 80.3% Categorical: 68.8% (article also reports other cut points)	—
Adshead et al., 1992[23]	72 elderly medical inpatients in general hospital, United Kingdom	Cognitively intact patients who could understand English and read large print	Not specified	BASDEC (7) and GDS-30 (14)	Lay interviewer	Formal psychiatric interview	Psychiatrist	33%	BASDEC: 71% GDS-30: 71%	BASDEC: 88% GDS-30: 88%	BASDEC and GDS-30 PPV: 74% BASDEC and GDS-30 NPV: 86%
Index Test Administered by Mental Health Professionals											
Singh et al., 2008[24]	20 randomly chosen, HIV-positive antiretroviral-naïve, inpatients, South Africa	CD4 count <200 cells/mm^3, age <18, no delirium	Not specified	CES-D (16)	Trained psychology counselor	DSM-IV	Psychiatrist	60%	91%	44%	—
Bonin-Guillaume et al., 2007[25]	165 inpatients from different geriatric units, France	Age ≥65	Severe hepatic, renal, cardiac, or neurologic disease, or neuroleptic use	RRS (10)	Trained neuropsychologist	DSM-IV	Interview by geriatrician trained in psychogeriatrics	43%	79%	80%	AUC: 0.86
Rybarczyk et al., 1995[26]	50 consecutive patients admitted to inpatient rehabilitation service	Recent CVA, NCSE ≥25	Not specified	SIDI (17) CES-D (26)	Psychiatrist or psychiatry residents, psychology graduate students	Interview and self-rating scales	Psychiatrist	34%	SIDI: 94% CES-D: 82%	SIDI: 71% CES-D: 65%	—
Parker et al., 2001[27]	67 hospitalized adults, Australia	Age 18-65, English-speaking	Cognitive disturbance or cerebral pathology	New 16-item screening instrument (18)	Research psychiatrist	HADS or BDI-PC	Not specified	32.8%	100%	96%	—
Samaras et al., 2013[28]	272 patients at a geriatric ward of a university hospital, Switzerland	Age >65, with neuropsychology consultation for memory concerns	Severe dementia	HAD-D (8)	Neuropsychologist	DSM-IV	Psychiatrist	39.7%	50.9%	69.5%	AUC: 0.60
Koenig et al., 1992[29]	78 inpatients age ≥65 admitted for medical or neurological services in a VA hospital	Score of ≥15 on MMSE	Admitted to intensive care, severe medical illness, or communication problems	11-item interview (3)	Masters level social worker	Formal psychiatric structured interview	Psychiatrist	15%	83%	77%	Correlated with GDS (.92), Zung Depression Scale (.58) and CES-D (.67)

NOTE: Abbreviations: AUC, area under the curve (receiver-operator curve); BAS, Brief Assessment Schedule; BASDEC, Brief Assessment Schedule Depression Cards; BDI, Beck Depression Inventory; BDI-PC, Beck Depression Inventory, Primary Care version; BDI-SF, Beck Depression Inventory-Short Form; CES-D, Center for Epidemiological Studies-Depression; CIS-R, Clinical Interview Schedules, Revised; CVA, cerebrovascular accident; DIA-S, Depression in Old Age Scale; DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, 4th ed; EPDS, Edinburgh Postnatal Depression Scale; GDS-4, Geriatric Depression Scale, 4-item version; GDS-5, Geriatric Depression Scale, 5-item version; GDS-15, Geriatric Depression Scale, 15-item version; GDS-30, Geriatric Depression Scale, full version; GMS, Geriatric Mental State Schedule; HAD-D, Hospital Anxiety and Depression Scale, Depression subscale; HADS, Hospital Anxiety and Depression Scale; MADRS, Montgomery-Åsberg Depression Scale; mDSS, Modified Depression Signs Scaled; MMSE, Mini-Mental State Examination; NPV, negative predictive value; NRS, Numeric Rating Scale; PHQ-2, Patient Health Questionnaire, 2-item version; PHQ-9, Patient Health Questionnaire, 9-item version; PPV, positive predictive value; PSE, Present State Examination; RRS, Retardation Rating Scale; SCL-5, Symptom Check List, 5-item version; SIDI, Stroke Inpatient Depression Inventory; STOP-D, Screening Tool for Psychological Distress.

TABLE 2. Clinical and Utilization Outcomes Among Inpatients Screened for Depression

Study	Study Design	Depression Screening Tool	Setting	Population	Sample Size	Prevalence of Depression	Clinical or Utilization Outcome	Summary of Findings
Albrecht et al., 2014[4]	Prospective cohort design	GDS-15	Academic medical center, United States	Adults age ≥60 on general medical and surgical services	750	19%	Unplanned readmission within 30 days	In multivariate logistic regression models, depressive symptoms were not associated with readmission
Cully et al., 2005[30]	Retrospective case-control	GDS-30	Inpatient rehabilitation unit, United States	Patients with and without stroke, mean age 76	Stroke: 207; No stroke: 302	31% using GDS (cutoff: ≥11)	Functional abilities, including self-care, body mobility, sphincter control at discharge	Depression was associated with worse self-care, body mobility, sphincter control, and communication/social interaction across both groups (ANCOVA, $P < 0.05$)
Mitchell et al., 2010[31]	Secondary analysis on randomized clinical trial	PHQ-9	Urban academic safety-net hospital, United States	Hospitalized adults, mean age 50, 52.1% black	738	32%	Hospital utilization within 30 days of discharge (emergency department and readmissions)	Hospital visits were greater for depressed patients (56 vs. 30 visits per 100 patients, adjusted for potential confounders, $P < 0.001$)
Huffman et al., 2011[32]	Prospective study of participants randomized into collaborative or usual care	PHQ-2, PHQ-9	Academic medical center, United States	Patients admitted for acute cardiac disease	175	Patients were included on basis of positive screen for depression	Adequate depression treatment at discharge, anxiety (measured by HADS), mental and physical HRQoL, and cardiac symptoms	Depression was associated with poor mental and physical health. Collaborative care subjects were more likely to receive adequate depression treatment by discharge
Pierlussi et al., 2012[33]	Secondary analysis of prospective cohort study	CES-D	Two urban teaching hospitals, United States	General hospitalized patients, age ≥70	1129	36.3%	IADLs, self-rated global health, mortality	At 1-year follow-up, patients with worse depressive symptoms at discharge maintained fewer independent IADLs and basic activities of daily living
Helvik et al., 2010[34]	Cross-sectional	HADS, MADRS, MMSE	Internal medicine service, rural hospital, Norway	Hospitalized adults age >65, mean age 80.7, 50% female	484	10%	Scale for self-maintaining activities of daily living and IADLs	Depression was associated with less independence in performing daily activities, a higher number of medications (not specified), and impaired reading vision
Unsar et al., 2010[35]	Cross-sectional	GDS	University hospital, Turkey	Hospitalized adults ≥60	100	64%	Length of illness, mobility, pain/discomfort, EQ-5D	Mobility, pain/discomfort, EQ-5D index and visual analog scale scores were significantly worse in the depressed elderly than in the nondepressed elderly

Continued on page 123

without formal psychiatric training[15–23]; and 6 studies evaluated instruments administered by mental health professionals.[24–29] Four studies compared different instruments that were administered in the same manner (eg, both self-administered by patients).[12–14,22] In the remaining studies, both instruments and methods of administration differed between the index and reference conditions.

Eight studies tested brief instruments with 5 or fewer items, most of which exhibited good sensitivity (range 38%–91%) and specificity (range 68%–86%) relative to longer instruments.[12,14–19,22] In 2 of these studies, instruments were self-administered. In 1 case, a single self-administered item from the STOP-D instrument ("Over the past 2 weeks, how much have you been bothered by feeling sad, down, or uninterested in life?") performed nearly as well as the 14-item Hospital Anxiety and Depression Scale.[14] In the other 6 studies testing brief instruments, the instruments were administered by individuals without formal training.[15–19,22] In 1 such study, geriatricians asking 2 questions about depressed mood and anhedonia performed well compared with a formal psychiatric interview.[17]

Four studies tested variations of the Geriatric Depression Scale (GDS).[12,18,21,23] In 3 of these studies, abbreviated versions of the GDS exhibited relatively high sensitivity and specificity.[12,18,21] However, a study comparing the 15-item GDS (GDS-15) with the GDS-4 found that GDS-15 correctly classified 10% more patients with suspected depression.[12] Two studies examined variations of the Patient Health Questionnaire (PHQ). One study found that both the PHQ-2 and PHQ-9 obtained by staff nurses performed well relative to a comprehensive assessment by a trained advanced practice nurse.[13,19]

When reported, positive predictive value, negative predictive value, and area under the receiver-operator curve were generally high.

Depression and Clinical or Utilization Outcomes

Of the 12 studies that reported either clinical or utilization outcomes for depression screening in an inpatient set-

TABLE 2. Clinical and Utilization Outcomes Among Inpatients Screened for Depression *(continued)*

Study	Study Design	Depression Screening Tool	Setting	Population	Sample Size	Prevalence of Depression	Clinical or Utilization Outcome	Summary of Findings
Cullum et al., 2008[36]	Prospective cohort design	GDS-15	District general hospital, United Kingdom	Medical inpatients age ≥65	617	43.80%	Length of hospital stay, discharge to community hospital for rehabilitation, institutional care or usual place of residence, dying in the hospital	GDS score was associated with a greater risk of inpatient death, and of living in care home rather than usual residence. After adjusting for gender, depressive symptoms did not make a difference on length of hospital stay
McCusker et al., 2007[37]	Observational prospective study	DSM-IV Diagnostic Interview Schedule	Two university hospitals, Canada	Medical inpatients age ≥65, positive screen for depression	210	Patients were included on basis of positive screen for depression	SF-36	Depressed patients had lower SF-36 scores for both physical and mental health at 12-month follow-up than nondepressed patients (not included in the sample)
Cullum et al., 2003[38]	Prospective cohort design	GDS-15	Medical wards of district general hospital, United Kingdom	Consecutive medical inpatients age ≥65	61	59.02%	Length of hospitalization	Length of stay was significantly longer for patients who screened positive for depression (24 days) than patients who screened negative (13 days)
Beach et al., 2013[39]	Prospective cohort design	PHQ-9	Cardiac units of a hospital, United States	Patients admitted to the cardiac units for acute coronary syndrome, heart failure, or arrhythmia	172	Patients were included on basis of positive screen for depression	Cardiac readmission during 6-month follow-up	Patients with higher PHQ-9 scores were more likely to be readmitted within 6 months. Patients rehospitalized had a mean score of 18.5 (SD = 3.7); patients not rehospitalized had a mean score of 17.0 (SD = 3.3)
Williams et al., 2004[40]	Prospective cohort design	ICD-9	National cohort of patients discharged from any VA medical center with a primary diagnosis of ischemic stroke, United States	Ischemic stroke patients discharged between October 1, 1990, and September 30, 1997	51,119	5%	Mortality within 3 years of stroke	After controlling for specific cardiovascular and mortality risks using the Charlson Index, poststroke depression independently increased risk of death by 13%

Abbreviations: CES-D, Center for Epidemiological Studies-Depression; EQ-5D, European Quality of Life instrument-5 dimensions; GDS-15, Geriatric Depression Scale, 15-item version; GDS-30, Geriatric Depression Scale, full version; HADS, Hospital Anxiety and Depression Scale; HRQoL, health-related quality of life; IADLS, Instrumental activities of daily living; ICD-9, International Classification of Diseases, Ninth Revision; MADRS, Montgomery-Åsberg Depression Scale; MMSE, Mini-Mental State Examination; PHQ-2, Patient Health Questionnaire, 2-item version; PHQ-9, Patient Health Questionnaire, 9-item version; SF-36, Short Form Health Survey; VA, Veterans Administration.

ting,[4,30–40] 3 measured rates of rehospitalization.[4,31,39] The other 9 studies tested for associations between symptoms of depression and either health or treatment outcomes. Table 2 provides a more detailed description of the study designs and results.

Other studies found that depression was associated with reduced functional abilities such as mobility and self-care,[30,32–34] and increased hospital readmission[31] as well as physical and mental health deficits.[37] Interestingly, although 1 study did not find that depression and hospital readmission were closely linked (frequency at 19%), it found that comorbid illness and previous hospitalizations predicted readmission.[4]

We also evaluated the associations between depression diagnosed in the inpatient studies and 2 types of outcomes. The first type includes clinical outcomes including symptom severity, quality of life, and daily functioning. Most studies we identified assessed clinical outcomes, and all detected an association between depression and worse clinical outcomes. The second type includes healthcare utilization, which can be measured with the patients' length of hospital stay, readmission and cost of care. In 1 such study, Mitchell aet al.[31] reported a 54% increase in readmission within 30 days of discharge among patients who screened positive for depression.[31] Additionally, Cully et al.[30] found that depression may impinge on the recovery process of acute rehabilitation patients.

DISCUSSION

The purpose of this study was to describe the feasibility and performance of depression screening tools in inpatient medical settings, as well as associations between depression diagnosed in the inpatient setting and clinical and utilization outcomes. The median rate at which depression was detected among inpatients was 33%, ranging from 5% to 60%. Studies from several individual hospitals indicated that depression can be associated with higher healthcare utilization, including return to the hospital after discharge, as well as worse clinical outcomes. To detect undiagnosed depression among inpatients, screening appears feasible. Depression screening instruments generally exhibited good sensitivity and specificity relative to comprehensive clini-

cal evaluations by mental health professionals. Furthermore, several self-administered and brief instruments had good performance. Prior authors have reported that screening for depression among inpatients may not be particularly burdensome to patients or staff members.[41]

The studies we reviewed used diverse screening instruments. Further research is needed to determine which tools are preferable in which patient populations, and to confirm that brief instruments are adequate for screening. The GDS is widely used, and many patients hospitalized in the United States fall into the geriatric group. The PHQ has been validated for self-administration and is widely used among outpatients[42]; it may be more suitable for younger populations. We found that several abbreviated versions of these and other screening instruments have exhibited good sensitivity and specificity among inpatients. However, many of the studies excluded patients with cognitive impairment or communication barriers. For individuals with auditory impairment, the Brief Assessment Schedule Depression Cards (BASDEC) might be an option. Used in 2 studies, the BASDEC involves showing patients a deck of 19 easy-to-read cards. The time required to administer the BASDEC is modest.[15,23] Sets of smiley face diagrams might also be suitable for some patients with communication barriers or cognitive impairment. An ineligible study among stroke survivors found that selecting a sad face had a sensitivity of 76% and specificity of 77% relative to a formal diagnostic evaluation for depression.[43]

In considering the instruments that may be most suitable for inpatients, the role of somatic symptoms is also important because these can overlap between depression and the medical conditions that lead to hospitalization.[44–46] Prior investigators found, for example, that 47% of Beck Depression Inventory (BDI) scores were attributable to somatic symptoms among patients hospitalized after myocardial infarction, whereas 37% of BDI scores were attributable to somatic symptoms among depressed outpatients.[47] Future research is needed to determine the significance of somatic symptoms among inpatients, including whether they should be considered during screening, add prognostic value, or warrant specific treatment. In addition, although positive and negative predictive values were generally high among the screening instruments we evaluated, confirming the diagnosis of depression with a thorough clinical assessment is likely to be necessary.[44,45]

Despite the high prevalence of depression, associations with suboptimal outcomes, and the good performance of screening tools to date, screening for depression in the inpatient setting has received little attention. Prior authors have questioned whether hospital-based screening is an efficient and effective way to detect depression, and have raised valid concerns regarding false-positive diagnoses and unnecessary treatment, as well as a lack of randomized controlled trials.[7,48,49] Whereas some studies suggest that depression is associated with greater healthcare utilization,[3,4] little information exists regarding whether screening during hospitalization and treating previously undiagnosed depression improves clinical outcomes or reduces healthcare utilization.

Several important questions remain. What is the pathophysiology of depressed mood during hospitalization? How often does depressed mood during hospitalization reflect longstanding undiagnosed depression, longstanding undertreated depression, an acute stress disorder, or a normal if unpleasant short-term reaction to the stress of acute illnesses? Do the manifestations and effects of depressed mood differ among these situations? What is the prognosis of depressed mood occurring during hospitalization, and how many patients continue to have depression after recovery from acute illness; what factors affect prognosis? In a small sample of hospitalized patients, nearly 50% of those who had been depressed at intake remained depressed 1 month after discharge.[50] Given that most antidepressant medications have to be taken for several weeks before effects can be detected, what, if any, approach to treatment should be taken? More research is needed on the effectiveness and cost-effectiveness of diagnosing and treating depression in the inpatient setting.

This work has several limitations. We found relatively few studies meeting eligibility criteria, particularly studies assessing clinical and utilization outcomes among depressed inpatients. Among the screening tools that were studied in the hospital setting, the highly diverse instruments and modes of administration precluded a quantitative synthesis such as meta-analysis. Prior meta-analyses on specific screening tools have focused on outpatient populations.[51–53] Furthermore, we did not evaluate study quality or risk of bias.

In conclusion, screening for depression in the inpatient setting via patient self-assessment or assessment by hospital staff appears feasible. Several brief screening tools are available that have good sensitivity and specificity relative to diagnoses made by mental health professionals. Limited evidence suggests that screening tools for depression may be ready to integrate into inpatient care.[41] Yet, although depression appears to be common and associated with worse clinical outcomes and higher healthcare utilization, more research is needed on the benefits, risks, and potential costs of adding depression screening in the inpatient healthcare setting.

Disclosures: The authors report no conflicts of interest.

References

1. Kahn KL, Keeler EB, Sherwood MJ, et al. Comparing outcomes of care before and after implementation of the DRG-based prospective payment system. *JAMA*. 1990;264(15):1984-1988.
2. U.S. Preventive Services Task Force (USPSTF). Screening for depression in adults: US Preventive Services Task Force recommendation statement. *JAMA*. 2016;315(4):380-387.
3. Dennis M, Kadri A, Coffey J. Depression in older people in the general hospital: a systematic review of screening instruments. *Age Ageing*. 2012;41(2):148-154.
4. Albrecht JS, Gruber-Baldini AL, Hirshon JM, et al. Depressive symptoms and hospital readmission in older adults. *J Am Geriatr Soc*. 2014;62(3):495-499.
5. Grant BF, Hasin DS, Harford TC. Screening for major depression among alcoholics: an application of receiver operating characteristic analysis. *Drug Alcohol Depend*. 1989;23(2):123-131.
6. Lieberman D, Galinsky D, Fried V, et al. Geriatric Depression Screening Scale (GDS) in patients hospitalized for physical rehabilitation. *Int J Geriatr Psychiatry*. 1999;14(7):549-555.
7. Canadian Task Force on Preventive Health Care. Recommendations on screening

for depression in adults. *CMAJ*. 2013;185(9):775-782.
8. Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*. 2009;6(7):e1000097.
9. Shea BJ, Hamel C, Wells GA, et al. AMSTAR is a reliable and valid measurement tool to assess the methodological quality of systematic reviews. *J Clin Epidemiol*. 2009;62(10):1013-1020.
10. Le Fevre P, Devereux J, Smith S, Lawrie SM, Cornbleet M. Screening for psychiatric illness in the palliative care inpatient setting: a comparison between the Hospital Anxiety and Depression Scale and the General Health Questionnaire-12. *Palliat Med*. 1999;13(5):399-407.
11. Lloyd-Williams M, Friedman T, Rudd N. Criterion validation of the Edinburgh Postnatal Depression Scale as a screening tool for depression in patients with advanced metastatic cancer. *J Pain Symptom Manag*. 2000;20(4):259-265.
12. Amadori K, Herrmann E, Püllen RK. Comparison of the 15-item Geriatric Depression Scale (GDS-15) and the GDS-4 during screening for depression in an in-patient geriatric patient group. *J Am Geriatr Soc*. 2011;59(1):171-172.
13. Diez-Quevedo C, Rangil T, Sanchez-Planell L, Kroenke K, Spitzer RL. Validation and utility of the Patient Health Questionnaire in diagnosing mental disorders in 1003 general hospital Spanish inpatients. *Psychosom Med*. 2001;63(4):679-686.
14. Young Q-R, Nguyen M, Roth S, Broadberry A, Mackay MH. Single-item measures for depression and anxiety: validation of the screening tool for psychological distress in an inpatient cardiology setting. *Eur J Cardiovasc Nursing*. 2015;14(6):544-551.
15. Loke B, Nicklason F, Burvill P. Screening for depression: clinical validation of geriatricians' diagnosis, the Brief Assessment Schedule Depression Cards and the 5-item version of the Symptom Check List among non-demented geriatric inpatients. *Int J Geriatr Psychiatry*. 1996;11(5):461-465.
16. Shah A, Karasu M, De T. Nursing staff and screening for depression among acutely ill geriatric inpatients: a pilot study. *Aging Ment Health*. 1998;2(1):71-74.
17. Payne A, Barry S, Creedon B, et al. Sensitivity and specificity of a two-question screening tool for depression in a specialist palliative care unit. *Palliat Med*. 2007;21(3):193-198.
18. Rinaldi P, Mecocci P, Benedetti C, et al. Validation of the five-item geriatric depression scale in elderly subjects in three different settings. *J Am Geriatr Soc*. 2003;51(5):694-698.
19. McGuire AW, Eastwood J, Macabasco-O'Connell A, Hays RD, Doering LV. Depression screening: utility of the Patient Health Questionnaire in patients with acute coronary syndrome. *Am J Crit Care*. 2013;22(1):12-19.
20. Furlanetto LM, Mendlowicz MV, Bueno JR. The validity of the Beck Depression Inventory-Short Form as a screening and diagnostic instrument for moderate and severe depression in medical inpatients. *J Affect Disord*. 2005;86(1):87-91.
21. Heidenblut S, Zank S. Screening for depression with the Depression in Old Age Scale (DIA-S) and the Geriatric Depression Scale (GDS15): diagnostic accuracy in a geriatric inpatient setting. *GeroPsych (Bern)*. 2014;27(1):41.
22. Pantilat SZ, O'Riordan DL, Dibble SL, Landefeld CS. An assessment of the screening performance of a single-item measure of depression from the Edmonton Symptom Assessment Scale among chronically ill hospitalized patients. *J Pain Symptom Manage*. 2012;43(5):866-873.
23. Adshead F, Cody DD, Pitt B. BASDEC: a novel screening instrument for depression in elderly medical inpatients. *BMJ*. 1992;305(6850):397.
24. Singh D, Sunpath H, John S, Eastham L, Gouden R. The utility of a rapid screening tool for depression and HIV dementia amongst patients with low CD4 counts – a preliminary report. *Afr J Psychiatry (Johannesbg)*. 2008;11(4):282-286.
25. Bonin-Guillaume S, Sautel L, Demattei C, Jouve E, Blin O. Validation of the Retardation Rating Scale for detecting in geriatric inpatients. *Int J Geriatr Psychiatry*. 2007;22(1):68-76.
26. Rybarczyk B, Winemiller DR, Lazarus LW, Haut A, Hartman C. Validation of a depression screening measure for stroke inpatients. *Am J Geriatr Psychiatry*. 1996;4(2):131-139.
27. Parker G, Hilton T, Hadzi-Pavlovic D, Bains J. Screening for depression in the medically ill: the suggested utility of a cognitive-based approach. *Aust N Z J Psychiatry*. 2001;35(4):474-480.
28. Samaras N, Herrmann FR, Samaras D, et al. The Hospital Anxiety and Depression Scale: low sensitivity for depression screening in demented and non-demented hospitalized elderly. *Int Psychogeriatr*. 2013;25(1):82-87.
29. Koenig HG, Cohen HJ, Blazer DG, Meador KG, Westlund R. A brief depression scale for use in the medically ill. *Int J Psychiatry Med*. 1992;22(2):183-195.
30. Cully JA, Gfeller JD, Heise RA, Ross MJ, Teal CR, Kunik ME. Geriatric depression, medical diagnosis, and functional recovery during acute rehabilitation. *Arch Phys Med Rehabil*. 2005;86(12):2256-2260.
31. Mitchell SE, Paasche-Orlow MK, Forsythe SR, et al. Post-discharge hospital utilization among adult medical inpatients with depressive symptoms. *J Hosp Med*. 2010;5(7):378-384.
32. Huffman JC, Mastromauro CA, Sowden GL, Wittmann C, Rodman R, Januzzi JL. A collaborative care depression management program for cardiac inpatients: depression characteristics and in-hospital outcomes. *Psychosomatics*. 2011;52(1):26-33.
33. Pierlussi E, Mehta KM, Kirby KA, et al. Depressive symptoms after hospitalization in older adults: function and mortality outcomes. *J Am Geriatr Soc*. 2012;60(12):2254-2262.
34. Helvik A-S, Skancke RH, Selbæk G. Screening for depression in elderly medical inpatients from rural area of Norway: prevalence and associated factors. *Int J Geriatr Psychiatry*. 2010;25(2):150-159.
35. Unsar S, Sut N. Depression and health status in elderly hospitalized patients with chronic illness. *Arch Gerontol Geriatr*. 2010;50(1):6-10.
36. Cullum S, Metcalfe C, Todd C, Brayne C. Does depression predict adverse outcomes for older medical inpatients? A prospective cohort study of individuals screened for a trial. *Age Ageing*. 2008;37(6):690-695.
37. McCusker J, Cole M, Ciampi A, Latimer E, Windholz S, Belzile E. Major depression in older medical inpatients predicts poor physical and mental health status over 12 months. *Gen Hosp Psychiatry*. 2007;29(4):340-348.
38. Cullum S, Nandhra H, Darley J, Todd C. Screening for depression in older people on medical wards: which cut-point should we use? *Int J Geriatr Psychiatry*. 2003;18(4):358-359.
39. Beach SR, Januzzi JL, Mastromauro CA, et al. Patient Health Questionnaire-9 score and adverse cardiac outcomes in patients hospitalized for acute cardiac disease. *J Psychosom Res*. 2013;75(5):409-413.
40. Williams LS, Ghose SS, Swindle RW. Depression and other mental health diagnoses increase mortality risk after ischemic stroke. *Am J Psychiatry*. 2004;161(6):1090-1095.
41. Rao S, Ferris FD, Irwin SA. Ease of screening for depression and delirium in patients enrolled in inpatient hospice care. *J Palliat Med*. 2011;14(3):275-279.
42. Spitzer RL, Kroenke K, Williams JW. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary care evaluation of mental disorders. Patient health questionnaire. *JAMA*. 1999;282(18):1737-1744.
43. Lee ACK, Tang SW, Yu GKK, Cheung RTF. The smiley as a simple screening tool for depression after stroke: a preliminary study. *Int J Nurs Stud*. 2008;45(7):1081-1089.
44. Seymour J. Validation of short screening tests for depression: comment on Goring et al. (2004) [letter to the editor]. *Int J Geriatr Psychiatry*. 2005;20(3):289.
45. Baldwin RC. Validation of short screening tests for depression, response to Seymour [letter to the editor]. *Int J Geriatr Psychiatry*. 2005;20(3):289.
46. Palmer SC. Study provides little insight into routine screening for depression. *Psychooncology*. 2014;23(9):1079.
47. Delisle VC, Beck AT, Ziegelstein RC, Thombs BD. Symptoms of heart disease or its treatment may increase Beck Depression Inventory Scores in hospitalized post-myocardial infarction patients. *J Psychosom Res*. 2012;73(3):157-162.
48. Keshavarz H, Fitzpatrick-Lewis D, Streiner DL, et al. Screening for depression: a systematic review and meta-analysis. *CMAJ Open*. 2013;1(4):E159-E167.
49. Thombs BD, Ziegelstein RC, Roseman M, Kloda LA, Ioannidis JPA. There are no randomized controlled trials that support the United States Preventive Services Task Force guideline on screening for depression in primary care: a systematic review. *BMC Med*. 2014;12(1):13.
50. Pomerantz AS, de-Nesnera A, West AN. Resolution of depressive symptoms in medical inpatients after discharge. *Int J Psychiatry Med*. 1992;22(3):281-289.
51. Brennan C, Worrall-Davis A, McMillan D, Gilbody S, House A. The Hospital Anxiety and Depression Scale: a diagnostic meta-analysis of case-finding ability. *J Psychosom Res*. 2010;69(4):371-378.
52. Mitchell AJ, Meader N, Symonds P. Diagnostic validity of the Hospital Anxiety and Depression Scale (HADS) in cancer and palliative settings: a meta-analysis. *J Affect Disord*. 2010;126(3):335-348.
53. Gilbody S, Richards D, Brealey S, Hewitt C. Screening for depression in medical settings with the Patient Health Questionnaire (PHQ): a diagnostic meta-analysis. *J Gen Intern Med*. 2007;22(11):1596-1602.