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Real-World Lessons From the Implementation of a Depression Screening Protocol in Acute Myocardial Infarction Patients

Implications for the American Heart Association Depression Screening Advisory

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Background—The American Heart Association (AHA) statement has recommended routine screening for depression in coronary artery disease with a 2-stage implementation of the Patient Health Questionnaire (PHQ). Because there is little evidence on feasibility, accuracy, and impact of such a program on depression recognition in coronary patients, the AHA recommendation has met substantial debate and criticism.

Methods and Results—Before the AHA statement was released, the Mid America Heart and Vascular Institute (MAHVI) had implemented a depression screening protocol for patients with acute myocardial infarction that was virtually identical to the AHA recommendations. To (1) evaluate this MAHVI quality improvement initiative, (2) compare MAHVI depression recognition rates with those of other hospitals, and (3) examine health care providers' implementation feedback, we compared the results of the MAHVI screening program with data from a parallel prospective acute myocardial infarction registry and interviewed MAHVI providers. Depressive symptoms (PHQ-2, PHQ-9) were assessed among 503 MAHVI acute myocardial infarction patients and compared with concurrent depression assessments among 3533 patients at 23 US centers without a screening protocol. A qualitative summary of providers' suggestions for improvement was also generated. A total of 135 (26.8%) eligible MAHVI patients did not get screened. Among screened patients, 90.9% depressed (PHQ-9 ≥ 10) patients were recognized. The agreement between the screening and registry data using the full PHQ-9 was 61.5% for positive cases (PHQ-9 ≥ 10) but only 35.6% for the PHQ-2 alone. Although MAHVI had a slightly higher overall depression recognition rate (38.3%) than other centers not using a depression screening protocol (31.5%), the difference was not statistically significant ($P=0.31$). Staff feedback suggested that a single-stage screening protocol with continuous feedback could improve compliance.

Conclusions—In this early effort to implement a depression screening protocol, a large proportion of patients did not get screened, and only a modest impact on depression recognition rates was realized. Simplifying the protocol by using the PHQ-9 alone and providing more support and feedback may improve the rates of depression detection and treatment. (*Circ Cardiovasc Qual Outcomes*. 2011;4:283-292.)

Key Words: myocardial infarction ■ risk factors ■ AHA medical/scientific statements ■ patient centered care

Depression is a common comorbidity in patients with acute myocardial infarction (AMI), and is associated with adverse long-term outcomes.¹⁻³ It is also well documented that the majority of patients with coronary artery disease (CAD) with significant depression are not recognized at the time of their AMI.^{4,5} Accordingly, there has been

increasing pressure to improve depression recognition and treatment in CAD, including the incorporation of depression screening recommendations into guidelines for the management of acute and chronic CAD.^{6,7} The American Heart Association (AHA) recently published a scientific statement emphasizing the importance of depression screening in CAD

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and advocating an explicit 2-step protocol for routine clinical practice using the Patient Health Questionnaire (PHQ).⁶ Given the prevalence of depression in CAD patients^{1,8} and the fact that treating depression can improve both depressive symptoms and quality of life,⁹ the AHA recommendations would appear to be an important potential advance in clinical care. Congruent with the logic of the AHA, a multidisciplinary team at Saint Luke's Mid America Heart and Vascular Institute (MAHVI) designed and implemented a depression screening protocol in April 2005. This protocol was implemented as part of routine clinical AMI care after prior evaluations had indicated that depression recognition rates for hospitalized AMI patients at MAHVI were low (25%).⁴

WHAT IS KNOWN

- The American Heart Association published a scientific statement in 2008 to increase the awareness on depression in coronary heart disease, suggesting the use of a 2-step depression screening protocol using the 2-item Patient Health Questionnaire (PHQ), followed by the 9-item PHQ when screened positive, to facilitate the recognition of depression in routine clinical practice.

WHAT THE STUDY ADDS

- Having adopted a similar routine screening protocol in an acute myocardial infarction setting and using parallel PHQ registry data in the same patients, this study demonstrates that 1 in 4 patients did not get screened; patients with the highest risk of depression—women and those with prior cardiac disease—were particularly missed.
- Relying on the full PHQ-9 instrument instead of the 2-step protocol may be more practical and render more reproducible and accurate screening results, as the agreement on a positive screen for depression was low for the PHQ-2, but better when relying on the full PHQ-9 instrument when comparing routine screening data and parallel registry data in the same acute myocardial infarction patients as a control.
- Depression remains widely recognized in acute myocardial infarction centers across the United States; although the institution that adopted the routine screening protocol had comparable overall depression recognition rates as compared with 23 centers that did not have a protocol in place, depression recognition rates in those who underwent the routine depression screening protocol were >90%.
- Feedback from nursing and clinical staff working with the 2-step depression screening protocol in routine clinical care conveyed a need for better support, continued education and feedback, and a simplified process supported by psychiatric or psychological staff.

Recently, however, significant criticism of the AHA recommendations for widespread depression screening has been

raised. These include concerns about the feasibility, accuracy, and consequences of ubiquitous depression screening, which are currently unknown.^{10–12} Given doubts about the potential for routine depression screening in CAD patients to improve depression recognition or treatment, more evidence on the feasibility and outcomes (eg, depression recognition) of routine depression screening is needed. We sought to address this gap in knowledge by (1) evaluating the performance of the implemented depression screening protocol within MAHVI, including feasibility and validity against concurrent assessments by trained interviewers; (2) comparing MAHVI current depression recognition rates with depression recognition rates at 23 other US centers that did not have a depression screening protocol in place; and (3) assessing MAHVI providers' perspectives on the implementation of the depression screening protocol. Given the concerns about routine depression screening in the setting of AMI, as proposed in the 2008 AHA advisory,⁶ the evaluation of a real-world experience with a comparable depression protocol could provide valuable feedback both with respect to the potential of the AHA recommendations to improve depression recognition and to highlight opportunities to better implement depression recognition protocols in AMI patients.

Methods

Participants and Study Design

The primary objective was to report a single-center experience of the implementation and performance of a formal depression screening protocol (Figure 1, objective 1). This protocol was implemented at Saint Luke's MAHVI, Kansas City, MO, on April 1, 2005, and was consistent with the AHA Advisory that was subsequently published in 2008.⁶ Concurrent with the implementation of this screening protocol, AMI patients from MAHVI—together with AMI patients from 23 other US hospitals—were consecutively enrolled between April 11, 2005, and December 31, 2008, into the prospective multicenter Translational Research Investigating Underlying disparities in acute Myocardial infarction Patients' Health Status (TRIUMPH) study.

The group of patients screened within MAHVI will be referred to as "MAHVI"; MAHVI patients who underwent parallel depression assessments within TRIUMPH will be denoted as "TRIUMPH-MAHVI"; and the remaining group of patients that were enrolled for all other centers in the TRIUMPH registry will be referred to as "TRIUMPH-ALL" (Figure 2).

Patients in the TRIUMPH registry were eligible for inclusion if they were 18 years or older, had elevated cardiac enzymes (troponin-I or creatinine kinase-MB) within 24 hours of hospital admission, and had supporting evidence suggestive of AMI, including prolonged ischemic symptoms or ECG ST changes. Patients were excluded if they were transferred to the participating hospital from another facility >24 hours after initial presentation, were incarcerated, refused participation, were unable to provide consent, did not speak English or Spanish, or died or were discharged before being contacted by the investigators. Demographic, clinical, and psychological data for all TRIUMPH patients were collected from chart abstraction and standardized baseline interviews by trained hospital research staff during the index AMI admission. All participants provided written informed consent, and the study protocol was approved by the institutional review board at each participating center.

To evaluate the performance of the depression screening protocol (Figure 1, objective 1), data on depressive symptoms obtained from the MAHVI screening protocol were analyzed for those patients (TRIUMPH-MAHVI) whose depressive symptoms were similarly assessed in the TRIUMPH registry, so that the concordance between

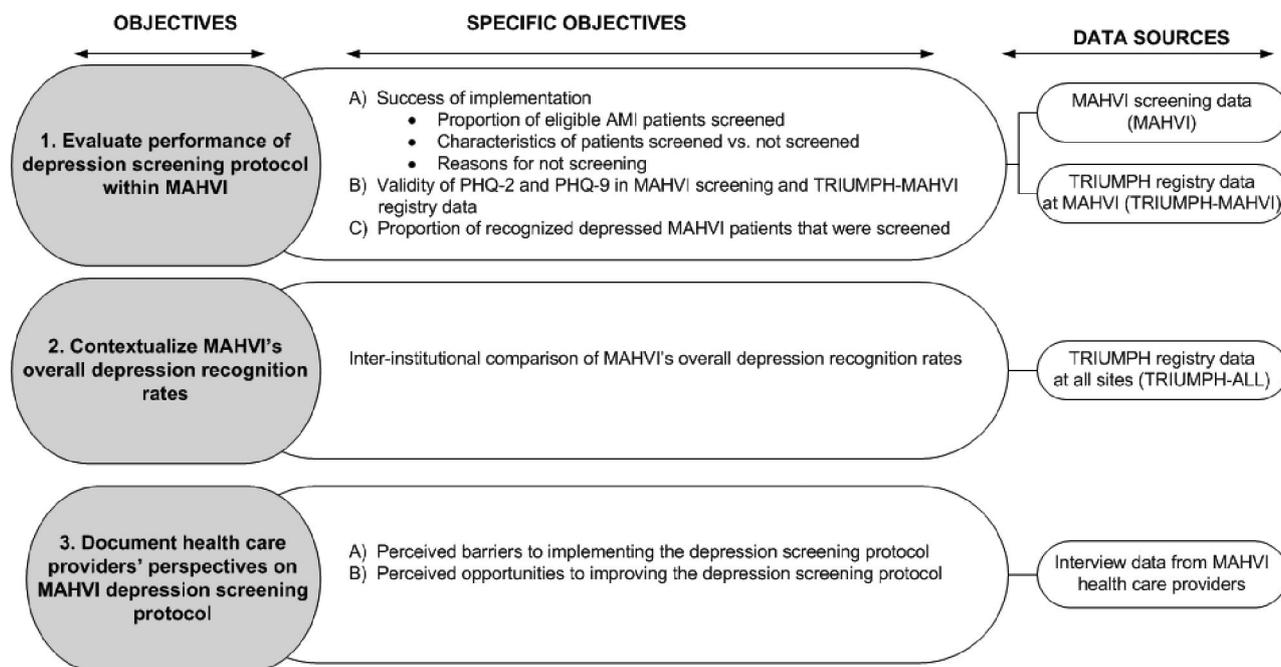


Figure 1. Main objectives and data sources of the study.

the 2 assessments could be evaluated. Next, to provide a context for interpreting MAHVI recognition rates, we compared MAHVI depression recognition rates with those from the remaining TRIUMPH sites (TRIUMPH-ALL) that had not implemented a formal depression screening protocol (Figure 1, objective 2). Finally, a descriptive approach was adopted to evaluate postimplementation feedback on the MAHVI screening protocol and to explore what health care providers perceived as barriers to the implementation and how the protocol might be improved. (Figure 1, objective 3).

Measures

MAHVI Depression Screening Protocol

As part of a quality-of-care initiative prepared by a multidisciplinary team (clinicians, researchers, and quality managers), a standardized 2-step depression screening protocol was designed and implemented at MAHVI in patients who were on an acute coronary syndrome care management pathway (online-only Data Supplement).¹³ This pathway was incorporated into the MAHVI AMI pathway, which mandated depression screening by nursing staff for each patient during their index admission. This protocol required the 2-item PHQ-2 to be administered as a first step¹³ in defining whether the patient was at risk for major depressive symptoms and to determine whether the full PHQ-9 was required. Specifically, as soon as patients were medically stabilized, patients were asked whether over the past 2 weeks, (1) they have been feeling down, depressed, or hopeless and (2) whether they felt little interest or pleasure in doing things they normally would have enjoyed. Items on the PHQ-2 are answered along a 4-point Likert scale (0=not at all to 3=nearly every day), using a cutoff of ≥ 1 on the PHQ-2, a sensitivity of 91%, and a specificity of 64% for the diagnosis of major depression has been established in CAD patients.¹⁴ Scores ≥ 1 automatically led to the next step of the screening protocol—the administration of the full PHQ-9—which was performed immediately after completion of the PHQ-2.

The PHQ-9 is a validated tool for depression screening that incorporates each of the 9 Diagnostic and Statistical Manual of Mental Disorders, 4th Edition criteria,^{15–17} and of which the first 2 items comprise the PHQ-2. Similar to the PHQ-2, 4-item Likert scales are used and responses are summed to create a score between 0 and 27 points. A PHQ-9 score of ≥ 10 has a sensitivity and specificity rate of 88% for major depression.^{18–20} Depending on the

PHQ-9 sum score, the MAHVI depression screening protocol recommended different actions (online-only Data Supplement). The required steps were that the nursing staff would notify the physician that patients had a clinically relevant score on the PHQ-9 and place order sheets in the patients' chart. Physicians would then indicate the appropriate depression treatment plan on the patient's chart and had to include this information in the discharge letter. To facilitate these steps, preprinted order sheets were inserted by nursing staff to be selected and signed by the clinician, and a preformatted macro of recommendations was available to clinicians at the time of discharge summary dictation. Treatment options were selected by clinicians and included the following: (1) pharmacy consultations to recommend and initiate antidepressant medications, (2) social services consultations for depression outpatient treatment options, (3) nursing staff provision of educational materials about depression, including the opportunity to view an educational video, (4) chaplain consultation, and (5) in-hospital psychiatry consultations. The last option was mandatory when a patient indicated suicidal ideation.

Depression Screening in the TRIUMPH Study

Parallel with the implementation of the MAHVI protocol, a multi-center, prospective registry of AMI patients' outcomes was conducted at MAHVI and 23 other centers. Data collectors at each center were trained in the administration of the PHQ, and this was prospectively implemented at each center in each consenting AMI patient. For the TRIUMPH registry data, depressive symptoms were assessed with the full PHQ-9. Interviews were conducted after patients were medically stabilized.

Depression Recognition

Depression recognition rates were prospectively documented within the TRIUMPH study. To be classified as recognized, trained data abstractors looked through the physician notes, discharge diagnoses, discharge medications (to screen for the use of antidepressant medications), and discharge summaries for any documentation that the patient's significant depressive symptoms or depression was being recognized during the index AMI. To ensure that we did not misclassify the use of antidepressive medications as indicating depression recognition, patients who were prescribed antidepressant medications solely for the purposes of smoking cessation or neuralgic pains ($n=24$) were not classified as having recognized depression.

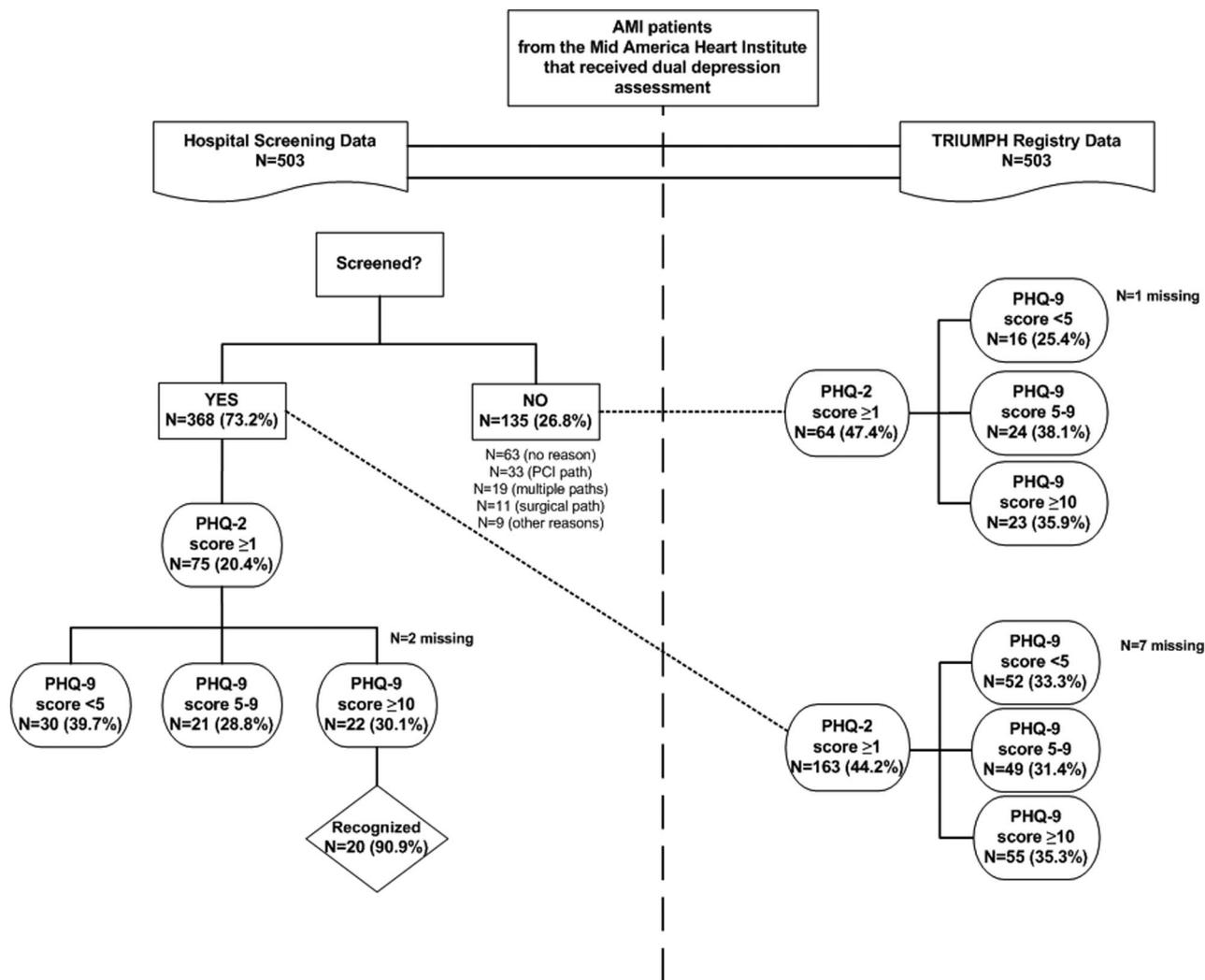


Figure 2. Overview of screening process and registry data.

This information on depression recognition was available within the TRIUMPH registry and was used to determine the proportion of recognized depressed patients that were screened within the MAHVI screening protocol (Figure 1, objective 1) and to compare MAHVI overall depression recognition rates with depression recognition rates across TRIUMPH-ALL centers, 23 centers that did not have a formal depression screening protocol in place (Figure 1, objective 2).

Perceived Barriers and Opportunities for Depression Screening

Qualitative data were obtained from a convenience sample of MAHVI health care providers to identify how well the quality-improvement protocol had been received in daily clinical practice (Figure 1, objective 3). The convenience sample consisted of 3 nurses, a social worker, 2 nurse practitioners, 3 medical residents, and 2 cardiologists who were recruited between August 1, 2009, and September 31, 2009. Postimplementation feedback was documented using a standardized, open-ended interview approach with the following 2 questions being asked to all interviewees: (1) “What is your experience with the acute coronary syndrome depression screening protocol?” and (2) “Do you have any suggestions to optimize the acute coronary syndrome depression screening protocol?” The health care providers were all interviewed in person and interviews were led by 3 interviewers (K.N. and K.S. performed all interviews with the nurses and social worker, A.A. interviewed the physicians and other health care providers). Interviews ranged from

10 to 20 minutes in length. Data were recorded by taking notes during the interview.

Statistical Analyses

Evaluate the Performance of Depression Screening Protocol Within MAHVI

Numbers of patients who did and who did not receive screening at MAHVI and reasons for not screening were evaluated. To compare baseline characteristics of patients who were screened per MAHVI depression screening protocol and those who were not, Student *t* tests (for normally distributed continuous variables) and Wilcoxon tests (for continuous variables not following a normal distribution) and χ^2 or Fisher exacts tests for categorical variables were used as appropriate.

Next, for MAHVI patients who received routine depression screening in the hospital and had a positive PHQ-2 screen, the proportion of patients in the following PHQ-9 score categories were provided: PHQ-9 score <5 (no depressive symptoms); PHQ-9 score 5 to 9 (mild depressive symptoms); and PHQ-9 score ≥ 10 (moderate to severe depressive symptoms). Similarly, we described parallel PHQ-2 and PHQ-9 registry data obtained for the TRIUMPH-MAHVI patients.

The concordance between the PHQ-2 MAHVI screening and TRIUMPH-MAHVI registry data were determined by (1) generating cross-comparisons (for PHQ-2 ≥ 1 across the MAHVI screening and TRIUMPH-MAHVI registry data; using the McNemar test), (2)

determining the test-retest reliability (correlating continuous PHQ-2 MAHVI screening and TRIUMPH-MAHVI registry data), and (3) calculating the Cohen κ coefficient (defined as the agreement between the MAHVI screening and TRIUMPH-MAHVI registry data, each of which classified a patient's responses on the PHQ-2 as "positive" [ie, presence of clinically relevant depressive symptoms; PHQ-2 ≥ 1] or "negative" [ie, absence of clinically relevant depressive symptoms; PHQ-2=0]).^{21,22} Similarly, the concordance between the MAHVI screening and TRIUMPH-MAHVI registry data were determined for the PHQ-9 data: (1) cross-comparisons (for PHQ-9 ≥ 10 across the MAHVI screening and TRIUMPH-MAHVI registry data; using the McNemar test) were performed; (2) the test reliability was performed; and (3) Cohen κ coefficient was calculated. Finally, MAHVI depression recognition rates are described for patients who were screened and who had clinically relevant depressive symptoms (PHQ-9 score ≥ 10).

Contextualize MAHVI Overall Depression Recognition Rates

Overall depression recognition rates for MAHVI (including screened and unscreened patients) and for the TRIUMPH-ALL group (ie, 23 other hospitals from the TRIUMPH registry for which no systematic screening protocol was in place) were summarized by the mean rate of recognition among patients with PHQ-9 ≥ 10 during the TRIUMPH interviews. To test for the statistical difference between the depression recognition rate at MAHVI and the TRIUMPH-ALL sites, a hierarchical logistic regression model, adjusting for clustering by site, was constructed to evaluate the effect of having a program in place on depression recognition. All statistical analyses were conducted with SAS software version 9.2 (SAS Institute Inc, Cary, NC). All statistical tests were 2-tailed, and probability values < 0.05 were considered statistically significant.

Document Health Care Providers' Perspectives on MAHVI Depression Screening Protocol

Field notes obtained from the interviews were reviewed and were searched for the presence of common themes regarding reported barriers and opportunities for improvement of the depression protocol. The identified categories were named by the researchers (A.A., D.B., K.N., K.G., K.S.), and responses were categorized accordingly. For both the implementation barriers and opportunities for improvement of the depression screening protocol, the top 5 themes were identified.

Results

Performance of Depression Screening Protocol Within MAHVI

Success of Implementation

A total of 503 AMI patients from MAHVI were eligible for parallel depression assessment—consisting of the in-hospital depression screening per standardized protocol (MAHVI patients) and the depression data obtained from the concurrent TRIUMPH registry (TRIUMPH-MAHVI patients)—during their index AMI admission. The mean age of this cohort was 58 ± 11 years, and 29% were female. Among these patients, more than 1 in 4 patients (26.8%) did not receive routine screening during their hospital stay (Table 1 and Figure 2). Median time from admission to depression screening per protocol (MAHVI group) was 1.0 days (interquartile range, 0.0 to 2.0), slightly shorter than the median time from AMI admission to depression assessment within the parallel TRIUMPH registry (TRIUMPH-MAHVI), which was 2.0 days (interquartile range, 1.0 to 3.0 days) ($P < 0.0001$).

Compared with MAHVI patients who did receive screening, a greater proportion of nonscreened MAHVI patients was

female, had a history of AMI, angina, or lung disease, and had an in-hospital cardiac arrest. These patients were also less likely to have higher PHQ-9 scores within TRIUMPH, to present with an ST-elevation AMI and were less likely to undergo an in-hospital percutaneous coronary intervention (Table 1).

For the majority of nonscreened MAHVI patients, no valid reason for nonscreening could be found, with a change in the patients' clinical pathway shortly after admission being the most reported reason as to why patients did not receive screening (Figure 2, left). Other reasons for nonscreening included patients who were going for surgery and patients being too sick at the time of screening.

Validity of MAHVI Screening and TRIUMPH-MAHVI Registry Data

Of those who were screened per in-hospital MAHVI depression protocol, 20.4% had a positive PHQ-2 screen (PHQ-2 ≥ 1), of which 30.1% classified for clinically relevant depressive symptoms, with a PHQ-9 score ≥ 10 (Figure 2, left).

From the TRIUMPH-MAHVI registry data obtained within the same MAHVI patients (Figure 2, right), it became evident that among those who did not receive clinical depression screening, almost half (47.4%) screened positive on the PHQ-2, and of these patients, more than 1 in 3 patients (35.9%) had clinically relevant depressive symptoms with a PHQ-9 score ≥ 10 .

Table 2 describes the concordance (column percentages are provided) in scoring between the MAHVI screening and TRIUMPH-MAHVI registry data for the PHQ-2 and PHQ-9 data. When comparing PHQ-2 data obtained from the MAHVI clinical screening protocol versus the TRIUMPH-MAHVI registry data, the concordance between positive cases (PHQ-2 ≥ 1) was low-moderate; 35.6% (95% confidence interval, 28.2% to 42.9%) of patients who screened positive based on the MAHVI inpatient clinical screening protocol also had a positive PHQ-2 screen in the TRIUMPH-MAHVI registry data, whereas the concordance for negative cases was much higher (91.7%) (Table 2). The interobserver variation was substantial, as expressed by a κ statistic of 0.29, judged to indicate only fair agreement.²³ The correlation between the continuous PHQ-2 MAHVI screening and PHQ-2 TRIUMPH-MAHVI registry scores was $r = 0.43$ ($P = 0.01$), which was judged to be moderate. The McNemar test indicated that there was a significant difference between the 2 different assessments (MAHVI screening and TRIUMPH-MAHVI registry data) using the PHQ-2 ($P < 0.0001$).

In contrast to the low-moderate concordance between MAHVI and TRIUMPH-MAHVI PHQ-2 data, the agreement between PHQ-9 data from the 2 assessments was 61.5% (95% confidence interval, 42.8% to 80.2%) for the positive cases (PHQ-9 ≥ 10) and 87.2% for the negative cases. The κ coefficient was 0.51 and the correlation between continuous PHQ-9 scores from MAHVI clinical screening and TRIUMPH-MAHVI registry data were $r = 0.54$ ($P = 0.01$), which were both judged to indicate moderate agreement.²³ The McNemar test indicated that there was no difference

Table 1. Baseline Characteristics of Patients Who Did and Who Did Not Receive Routine Depression Screening During Index AMI Hospitalization: Data Collected From the MAHVI Within the TRIUMPH Registry

	Received Depression Screening		P Value
	Yes (n=368, 73.2%)	No (n=135, 26.8%)	
Demographics			
Age, y, mean±SD	58.1±11.4	59.3±11.1	0.27
Female sex, n (%)	98 (26.6)	49 (36.3)	0.04
Race, n (%)			0.62
White/Caucasian	330 (89.7)	120 (88.9)	
Black/African American	31 (8.4)	14 (10.4)	
Other	7 (1.9)	1 (0.7)	
Socioeconomic factors, n (%)			
Married	239 (65.1)	81 (60.0)	0.29
Greater than high school education	224 (61.0)	86 (63.7)	0.59
Having no insurance	54 (14.5)	18 (13.3)	0.74
Working full- or part-time	2229 (62.7)	79 (58.5)	0.39
Medical history, n (%)			
Hypercholesterolemia	176 (47.8)	63 (46.7)	0.82
Hypertension	207 (56.3)	85 (63.0)	0.18
Peripheral arterial disease	17 (4.6)	8 (5.9)	0.55
Diabetes mellitus	73 (19.8)	27 (20.0)	0.97
Prior AMI	27 (7.3)	25 (18.5)	<0.001
Prior angina	15 (4.1)	14 (10.4)	0.007
Prior CABG	29 (7.9)	12 (8.9)	0.71
Prior PCI	61 (16.6)	27 (20.0)	0.37
Prior stroke	10 (2.7)	6 (4.4)	0.39
Chronic renal failure	11 (3.0)	5 (3.7)	0.78
Chronic lung disease	19 (5.2)	14 (10.4)	0.04
Chronic heart failure	11 (3.0)	3 (2.2)	0.77
Cancer (other than skin)	23 (6.3)	7 (5.2)	0.66
Smoked within last 30 d	149 (41.2)	60 (44.8)	0.47
Body mass index, kg/m ² , mean±SD	29.7±5.9	29.1±5.9	0.29
Clinical characteristics index AMI admission, n (%)			
ST-elevation MI, n (%)	247 (67.1)	64 (47.4)	<0.001
Ejection fraction < 40%, n (%)	48 (13.0)	24 (17.8)	0.18
Killip class, n (%)			0.16
I (no heart failure)	344 (93.7)	121 (89.6)	
II (heart failure)	17 (4.6)	9 (6.7)	
III (pulmonary edema)	4 (1.1)	5 (3.7)	
IV (cardiogenic shock)	2 (0.5)	0 (0.0)	
Initial systolic blood pressure, mm Hg, mean±SD	149.1±30.8	145.9±33.8	0.33
Initial heart rate, beats per minute, mean±SD	79.2±19.0	80.3±22.8	0.62
Hospital length of stay, median (interquartile range)	3.0 (3.0, 4.5)	4.0 (3.0, 6.0)	0.14

(Continued)

Table 1. Continued

	Received Depression Screening		P Value
	Yes (n=368, 73.2%)	No (n=135, 26.8%)	
In-hospital AMI treatment			
In-hospital PCI	332 (90.2)	100 (74.1)	<0.001
Thrombolytic therapy	29 (7.9)	5 (3.7)	0.10
In-hospital complications, n (%)			
Bleeding	81 (22.0)	37 (27.4)	0.21
Cardiac arrest	3 (0.8)	5 (3.7)	0.04
Cardiogenic shock	16 (4.3)	8 (5.9)	0.46
CVA	1 (0.3)	0 (0.0)	1.00
AMI	0 (0.0)	1 (0.7)	0.27
Dialysis	1 (0.3)	1 (0.7)	0.47
Depressive symptoms and history			
PHQ-9 score in TRIUMPH, mean±SD	4.8±4.8	5.7±4.8	0.04
History of depression requiring treatment, n (%)	14 (3.8)	6 (4.4)	0.75
Currently taking medications or receiving counselling for depression, n (%)	40 (10.9)	16 (11.9)	0.75

CABG indicates coronary artery bypass grafting; PCI, percutaneous coronary interventions; ACE, angiotensin-converting enzyme; and CVA, cerebrovascular accident.

between the 2 different assessments (screening and registry data) using the PHQ-9 ($P=0.32$).

Proportion of Recognized Depressed MAHVI Patients Who Were Screened

For 9 in 10 screened MAHVI patients (90.9%) with clinically relevant depressive symptoms (PHQ-9 ≥10), further action (“recognized” depressed patients) was undertaken, meaning that they received a diagnosis of depression in the hospital chart, were assigned a diagnosis of depression at hospital discharge, were prescribed depression treatment, or were referred for further depression management at discharge (Figure 2, bottom left).

Table 2. Congruency Between PHQ-2 and PHQ-9 MAHVI Screening and TRIUMPH-MAHVI Registry Data*

MAHVI Screening Data	TRIUMPH-MAHVI Registry Data		
	PHQ-2=0	PHQ-2 ≥1	Total n
PHQ-2=0	188 (91.7%)	105 (64.4%)	293
PHQ-2 ≥1	17 (8.3%)	58 (35.6%)	75
Total n	205	163	368
	PHQ-9 <10	PHQ-9 ≥10	Total n
PHQ-9 <10	41 (87.2%)	10 (38.5%)	51
PHQ-9 ≥10	6 (12.8%)	16 (61.5%)	22
Total n	47	26	73

*Data are represented as n (%); column percentages are provided.

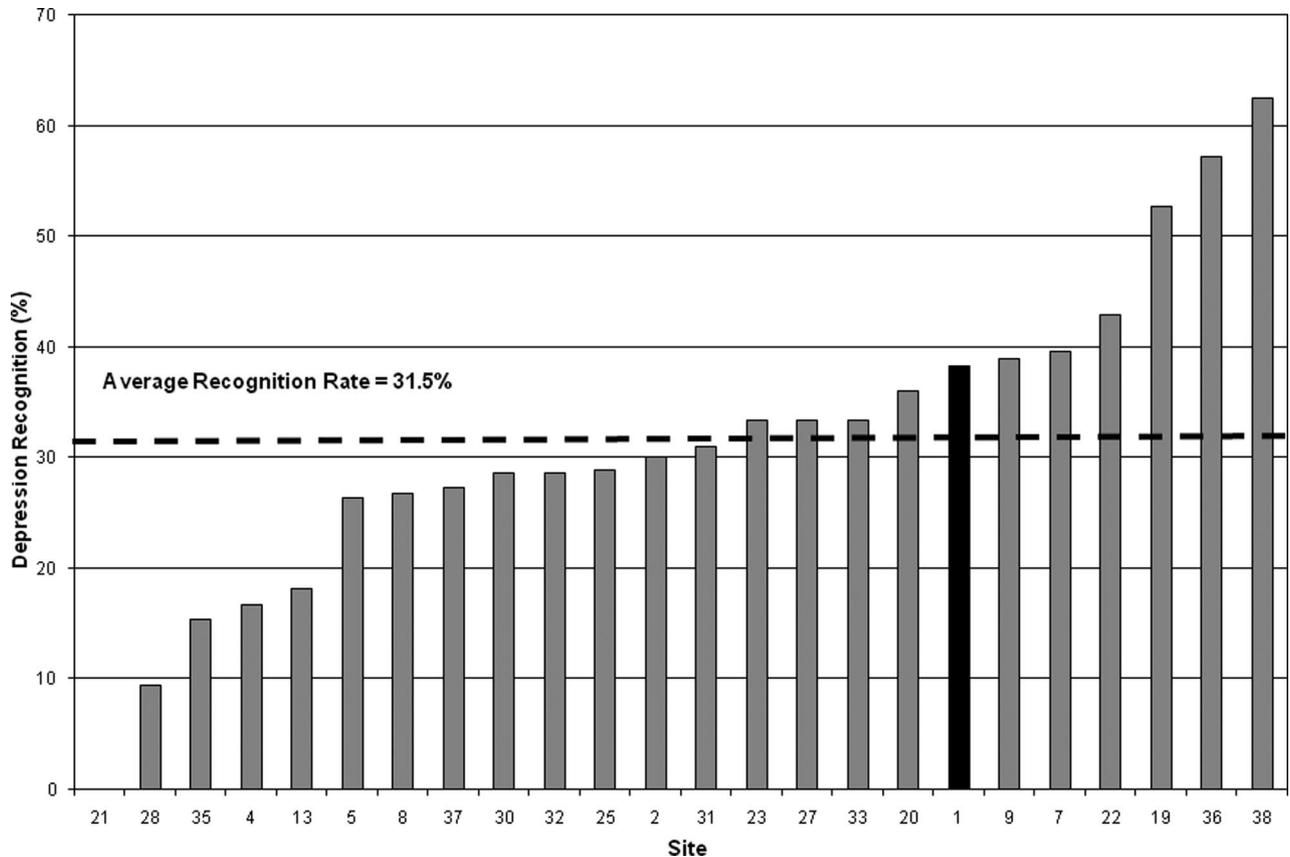


Figure 3. Variation of proportion of patients being recognized as depressed in hospital chart across sites within the TRIUMPH Registry. Site 1 denotes the MAHVI, the site where the formal screening protocol was implemented. The average depression recognition rate is indicated in the dashed horizontal line.

Interinstitutional Comparison of MAHVI Overall Depression Recognition Rates

Depressive symptoms were assessed among a total of 3533 AMI patients enrolled from the 23 TRIUMPH centers that did not have a formal screening protocol, in addition to the 503 patients enrolled from MAHVI. Of the total TRIUMPH-ALL patients assessed ($n=4036$), 752 (18.6%) had clinically relevant depressive symptoms ($\text{PHQ} \geq 10$). The average overall depression recognition rate among those with a $\text{PHQ} \geq 10$ across TRIUMPH sites was 31.5%, with a range between 0% and 62.5% (Figure 3). The overall proportion of depressed patients (including screened and nonscreened patients) being recognized within MAHVI was 38.3% and did not significantly differ from the average recognition rate ($P=0.31$) across sites. Comparisons with site-adjusted means confirmed these findings.

Health Care Providers' Perspectives on MAHVI Depression Screening Protocol

Perceived Barriers to Implementing the Depression Screening Protocol

Responses to the interview questions of nursing and clinical staff working with the MAHVI depression screening protocol were categorized into the most frequently reported barriers preventing the successful completion of the depression screening protocol. Themes included "competing priorities in a short length of stay" (eg, "last on priority list"), "protocol

and logistic issues" (eg, "multiple steps make it difficult"), "concerns about patients' reactions" (eg, "older people get upset"), "lack of ownership/responsibility about process" (eg, "wonder if we are stepping on toes of primary care physicians"), and "lack of education and feedback" (eg, "vaguely remember initial education") were the 5 most-reported barriers (see Table 3 for a complete overview, by profession, and examples of comments).

Other more infrequently articulated barriers referred to "role confusion about responsibilities" (eg, "Should they see a psychiatrist in the hospital, follow up with their primary care physician or psychiatrist, or should I give them an antidepressant?" [said by a cardiologist]), "health care providers' assumptions/biases" (eg, "patients have to be motivated" [said by nurse]), or "unfamiliarity/feeling unqualified to work with mental disease" (eg, "not sure cardiologists are qualified to treat depression" [said by cardiologist]).

Perceived Opportunities to Improving the Depression Screening Protocol

Nursing and clinical staff were also invited to express their views on how they think the process could be improved and what opportunities there are toward that end. The 5 most-reported opportunities referred to providing "more education" (eg, "Provide more education at start of rotation"), the implementation of an "automatic psychiatry consult" when patients screened positive (eg, "Make psychiatry referral

Table 3. Most Reported Barriers by Clinicians, Nurses, and Other Health Professionals Involved in MAHVI Routine Depression Screening Protocol

Theme	Examples of Comments
1. Competing priorities especially in an era of short length of stay	“Too many things to pay attention to” [resident] “Last on the priority list” [nurse] “Fighting against time” [social worker]
2. Protocol logistics/process issues/multiple steps	“Order sets not always on chart” [resident] “Sometimes sticker is missed” [nurse practitioner] “Multiple steps make it difficult” [nurse]
3. Concerned about patients’ reactions/resistance about screening/consult	“Older people get upset” [nurse] “Patients are overwhelmed already” [nurse] “I sometimes rephrase” [nurse]
4. Feel not responsible/lack of ownership about process	“Wonder if we are stepping on toes of primary care physicians” [cardiologist] “I consider the sticker to be documentation” [cardiologist] “The more the process is taken out of my hands, the better and faster the patient will get the appropriate care” [cardiologist]
5. Education and feedback about protocol	“More follow-up education and feedback to the staff is needed” [cardiologist] “Vaguely remember initial education” [resident] “Some nurses are not aware of the protocol” [nurse]

automatic for positive screens”), “improving the visibility of the protocol” (eg, “Please order sheet in with progress notes/sticker”), “providing more reinforcement/feedback” to sustain interest in the process (eg, “Need follow-up education”), and the incorporation of the screening protocol in already existing “chart audits” (eg, “Consider including the screening as a part of the chart audits for other documentation issues”) (see Table 4 for complete overview by profession and examples of comments). Less frequent suggestions for improvement included “having 2 nurses to sign off” (eg, “Consider having 2 nurses sign off to ensure that it is done” [said by nurse practitioner]) and “provide clinical directions for different depressive symptom classifications” (eg, “Consider better guidance on what to do for different PHQ scores” [said by cardiologist]).

Discussion

In light of the controversy surrounding depression screening and the AHA recommendation that this should be routinely performed in CAD patients,^{11,12} this study provides unique real-world insights into the feasibility, validity, consequences, and opportunities for improvement of the AHA advisory recommendations. Moreover, concurrent assessments from a parallel registry allowed for the evaluation of the performance of the depression screening protocol and the comparison of depression recognition rates of a center that used the protocol with 23 other centers that did not use a formal process of depression screening. As such, this study is

Table 4. Most Reported Suggestions by Clinicians, Nurses, and Other Health Professionals to Improve MAHVI Routine Depression Screening Protocol

Theme	Example of Comments
1. More education	“Consider focusing education to those cardiologists that round more often in the hospital” [cardiologist] “More education at start of rotation” [resident] “Follow-up education to everyone involved” [nurse practitioner]
2. Automatic psychiatry consult	“Consider automatic psychiatry consult” [cardiologist] “Make psychiatry referral automatic for positive screens” [resident] “Why can’t there be an automatic consult, without the extra order of the physician?” [nurse]
3. Improve visibility of protocol	“Stickers are small, hard to see” [resident] “Place order sheet in with progress notes/sticker” [cardiologist] “Consider placing the stickers on a different color paper so they are easier to find/see” [nurse practitioner]
4. Provide reinforcement/feedback	“Need follow-up education” [resident] “Give more education” [nurse] “Worked at the beginning, but need to re-fresh” [social worker]
5. Include in chart audits	“Consider including the screening as a part of the chart audits for other documentation issues” [nurse practitioner] “Add to core measure sheet” [nurse]

the first to report on how routine screening—as proposed in the recent AHA guidelines⁶—affects depression recognition.

Despite the intent to provide routine screening to all AMI patients as part of a quality-of-care improvement initiative, more than 1 in 4 patients were not screened, suggesting only modest feasibility in implementation and demanding further insights into how to further improve routine depression screening. Underscoring the importance of screening, however, we found that if patients were screened per hospital protocol and a positive case was identified, a clinical response to the diagnosis was undertaken in 9 of 10 cases. The consensus on the “positive cases”—or those with significant depressive symptoms—between MAHVI clinically driven depression recognition protocol and the MAHVI-TRIUMPH-based assessments—was disappointing, especially with the PHQ-2 instrument. We also found that although our 38% depression recognition rate was substantially better than our previously reported rate of 25%,⁴ MAHVI current recognition rates were similar to those of 23 other US centers without a formal screening protocol. Finally, interviews with nursing and clinical staff elucidated that time constraints, failure to pay attention to all steps of the protocol, feeling uncomfortable or not responsible for addressing patients’ mental health, and lack of education and feedback were important barriers to successful completion of the protocol. These clinicians suggested that a more simplified depression screening protocol with the entire PHQ-9, with more follow-up and feedback on

performance, might be helpful and could improve the screening protocol.

These findings supplement a large body of research demonstrating that depression after AMI is associated with adverse outcomes, including suboptimal health status outcomes,^{24,25} and worse prognosis as compared with nondepressed counterparts.^{3,26,27} It also extends the insights from several intervention trials and clinical care initiatives seeking to address this problem.^{9,28–31} All of these prior studies apply to CAD patients who were actually identified as having significant depressive symptoms, but these studies were not able to focus on the problem of unrecognized depressive symptoms in real-world practice. Our findings, in a contemporary multicenter AMI population, reveal that almost 7 of 10 patients with significant depressive symptoms (PHQ-9 score ≥ 10) are not recognized and are thus not even eligible for treatment of this common and burdensome comorbidity, regardless of the potential impact of treatment on patients' cardiovascular outcomes. Unfortunately, although the AHA advisory proposes a clinically rational approach to improving recognition, we have identified significant limitations in its implementation at our center and more refinement to define the optimal approach is needed. Thus our data support some of the concerns of critics of the AHA recommendations.^{10,11}

From our real-world experience, we learned 4 important lessons. First, a substantial proportion did not get screening, and the parallel TRIUMPH registry data indicated that many of these unscreened patients had significant depressive symptoms. Among unscreened patients, there was a greater proportion of women and patients with a prior cardiac history, vulnerable groups of patients at increased risk for having depression.^{1,32} Prioritized action will need to go into more complete implementation to improve the recognition of depression among unscreened patients. Second, given that the agreement on the identified "positive cases" was disappointing with the brief 2-item instrument, as compared with the results from the full PHQ-9 instrument, we believe that the full PHQ-9 should be used for depression screening. Standard completion of the PHQ-9 takes minimal additional time once the PHQ-2 is being performed, simplifies the process of screening, and appears to be more reproducible and accurate. Additionally, despite the user-friendliness and strong performance characteristics to detect a major depressive disorder, relatively little is known about the performance characteristics of depression screening instruments in specific populations, such as AMI patients.³³ The limited concordance between different assessments during patients' AMI admission—especially when using the PHQ-2—requires additional research specifically with regard to the variability in results due to its timing and mode of administration in a population wherein the acute condition itself challenges the evaluation of patients' mood status. Third, studying the site variability on overall depression recognition across 24 US centers illustrates that depression remains widely unrecognized, given the fact that 9 of 10 of MAHVI patients who were screened per protocol were actually recognized. Given the encouraging promise of collaborative care and stepped-care models for depression treatment, as exemplified for patients' health status in the Bypassing the Blues Trial⁹ and potentially

patients' prognosis in the Coronary Psychosocial Evaluation Studies (COPES) intervention trial, our data underscore the opportunity to improve the recognition and treatment of depression.³¹ Fourth, the identified barriers and suggestions raised by the nursing and clinical staff collectively point to a need for better support, follow-up education, and feedback and a simplified process supported by psychiatric or psychological staff. These findings are consistent with prior research in primary care implicating that depression screening protocols whereby staff is sufficiently supported and the process is coordinated by a qualified case manager will be the best way to optimize chances of success in improving outcomes for somatic patients with comorbid depression.^{34,35}

Our results should be interpreted in the context of several potential limitations. First, because our quality-improvement initiative concerns a single center, our findings may not translate to other centers' experiences. Nevertheless, the insights from practitioners on how to improve the process—particularly with regular education and feedback on performance—may assist other institutions in developing more effective protocols. Second, the reported observations, particularly regarding the validity of the screening protocol, may have been influenced by differences in the timing of assessments and changes in patients' depressive symptoms during the acute recovery from an AMI. Although some have argued that depression screening should occur in an outpatient setting, when patients are more stable, a robust literature documents the prognostic significance of depressive symptoms at the time of an AMI^{3,26,25} and identifying and preventing patients' risks for adverse outcomes is a cornerstone of AMI care. Finally, we restricted our analysis to the cohort of MAHVI AMI patients who were also enrolled in TRIUMPH and did not assess the performance in those not enrolled.

In conclusion, the real-world evaluation of a 2-step depression screening protocol in AMI patients—consistent with the recent AHA advisory—and its comparison with parallel registry data suggested the following: in those who were screened, the initial screen—using the PHQ-2 instrument—may not be as accurate as one using the full PHQ-9 instrument. Feedback from clinical and nursing staff supported this notion from a more practical standpoint, as noted in the suggestions that a simplified process, with fewer steps, would be preferred. Unfortunately, our experience also documented that many patients were missed by the screening protocol, and centers wishing to implement a systematic depression screening protocol will need to find novel strategies with which to reinforce and sustain such a program in clinical practice. Finally, continuing efforts, both in research and in clinical practice, are needed to further refine strategies that may help to improve detection, care, and outcomes of depressed AMI patients. By improving the recognition of significant depressive symptoms and implementing evolving treatment strategies, an important opportunity to further optimize the care and outcomes of depressed AMI patients may be realized.

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Disclosures

None.

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