

Implementation and evaluation of depression screening in patients with recently diagnosed coronary artery disease

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How to cite: Mailloux LM, Haas MT, Kennedy SP, DeJongh BM. Implementation and evaluation of depression screening in patients with recently diagnosed coronary artery disease. *Ment Health Clin* [Internet]. 2020;10(1):12-7. DOI: 10.9740/mhc.2020.01.012.

Abstract

Introduction: Patients with coronary artery disease (CAD) are at an increased risk for depression. Additionally, comorbid depression in patients with CAD is associated with increased mortality and worse cardiac outcomes. Screening this patient population for depression is recommended but is not routinely done in practice. The purpose of this quality improvement initiative was to implement a protocol to screen patients with CAD for depression using the Patient Health Questionnaire (PHQ-9). Primary objectives were to determine the frequency of positive depression screens and the frequency of acceptance of mental health (MH) service referral.

Methods: Patients with CAD were screened for depression using the PHQ-9 during a hospital admission to the inpatient cardiology unit at the Clement J. Zablocki Veterans Affairs Medical Center. All patients were rescreened for depression at 4 and 8 weeks after discharge. Patients with positive screens for depression were offered referral for MH services, and reasons for decline were documented.

Results: Of the 36 patients screened for depression, 14 (39%) screened positive for depression, including 10 patients at baseline (28%), 3 additional patients (8%) at week 4 after discharge, and 1 additional patient (3%) at week 8 after discharge. Of the 14 patients who screened positive for depression, 3 patients (21%) accepted MH service referral. The most commonly reported reason for declining referral was no perceived benefit.

Discussion: The results of this initiative support the utility of using the PHQ-9 for depression screening in patients with recently diagnosed CAD and offering MH service referral for treatment of comorbid depression.

Keywords: coronary artery disease, depression, depression screening, patient health questionnaire

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Disclosures: There are no actual or potential conflicts of interest by any authors of this article.

Introduction

Literature suggests a bidirectional relationship between coronary artery disease (CAD) and depression.¹ Patients with depression have a 1.64 relative risk of CAD compared with those without depression, and nearly 20% of post-myocardial infarction (MI) patients experience major depression.²⁻⁴ Post-MI patients with comorbid depression have increased all-cause mortality, cardiac mortality, and cardiovascular (CV) events, and patients with CAD and depression have significantly increased mortality.⁵⁻⁸

The American Heart Association recommends screening patients with CAD for depressive symptoms using the Patient Health Questionnaire (PHQ-9) to identify patients at risk for depression and provide further assessment and treatment.⁹ The PHQ-9 is specifically recommended because it has high specificity for detecting depression among this patient population, is easy to use, and is useful for identifying patients at risk for adverse CV outcomes from untreated depression.¹⁰ The American Academy of Family Physicians recommends screening post-MI patients for depression at regular intervals after the acute event, including during their inpatient hospital admission.¹¹ However, this is not routinely being done in practice because a national survey found 79% of CV physicians used no standard screening method to diagnose depression.¹²

The Clement J. Zablocki Veterans Affairs Medical Center (ZVAMC) is a tertiary care and academic medical center with an established inpatient cardiology service and numerous mental health (MH) resources, including a Primary Care Mental Health Integration (PCMHI) clinic. Primary Care Mental Health Integration is easily accessible and offers assessment, brief therapy, and medication management of common MH concerns. Despite the availability of these services, there is currently no protocol in place at the ZVAMC for depression screening in patients with CAD. Therefore, a protocol to screen patients with CAD for depression using the PHQ-9 was implemented. The primary objectives of this initiative were to determine the frequency of positive depression screens prior to hospital discharge and at 4 and 8 weeks after discharge, and to determine the frequency of acceptance of MH service referral for patients with positive screens.

Methods

Patients with CAD were screened for depression during admission to the inpatient cardiology service at the ZVAMC. This project was determined to be an operations activity by the institutional review board and therefore did not require further approval.

Inclusion criteria encompassed all patients with a recent diagnosis of CAD who were admitted to the ZVAMC inpatient cardiology service between October 1, 2018, and January 18, 2019. A diagnosis of recent CAD was defined as admission for acute coronary syndrome (ACS), a new diagnosis of CAD during the current hospitalization as verified by a coronary angiogram, or a prior diagnosis of CAD as verified by a coronary angiogram within the previous 2 years. Inclusion criteria were initially limited to patients with ACS upon admission but were expanded on November 1, 2018, to include patients with a diagnosis of CAD within the previous 2 years to increase the sample

size. Patients were excluded from the study if they were deemed to lack decision-making capacity or if they were actively being followed by an MH provider, as defined by a documented visit with an MH provider within the previous year.

Eligible patients were identified via ongoing chart review by an inpatient cardiology pharmacist. Patients who met inclusion/exclusion criteria were screened for depression using the PHQ-9 during their inpatient admission by an MH pharmacist. Patients with a positive screen for depression, defined as a PHQ-9 score greater than or equal to 5, were offered referral to the PCMHI clinic. All patients were rescreened for depression by an MH pharmacist at 4 and 8 weeks after discharge via telephone call. Screens were repeated at these intervals based on the protocol for depression management in the ZVAMC PCMHI clinic. Referral to the PCMHI clinic was offered to any patient with a positive screen. Patients could decline treatment with the PCMHI provider or follow-up PHQ-9 screenings at any time. Reasons for declining PCMHI referral were surveyed and recorded. Any patient who screened positive for suicidal ideation (SI) was administered the Columbia-Suicide Severity Rating Scale (C-SSRS). The project protocol allowed for consultation of inpatient MH services or a home wellness check, depending on whether this occurred inpatient or outpatient, for any patient exhibiting SI with plan or intent.

The primary outcome measures were the frequency of positive depression screens prior to hospital discharge and at 4 and 8 weeks after discharge and the frequency of accepted MH service referral. Secondary outcome measures included a comparison of changes in mean PHQ-9 scores between the initial depression positive and negative groups at discharge and at 4 and 8 weeks after discharge as well as reasons for declining PCMHI referral.

Descriptive statistics were used to analyze demographic data, the number of patients with positive depression screens, the number of patients who accepted PCMHI referral, and reasons for declining PCMHI services. Chi-square tests were used to analyze differences between patients with initial positive screens and patients with initial negative screens. The Friedman test was used to compare changes in paired samples of initial and follow-up PHQ-9 scores. All statistical analyses were based on a priori α value of 0.05 and a β value of 0.8. No sample size calculation was done because the protocol was a facility-specific quality improvement initiative and because of limitations of convenience sampling and time constraints in data collection.

Results

Sixty-three patients met inclusion criteria. Of these, 27 patients were excluded for the following reasons: 21 patients were already established with an MH provider, 5 patients were missed during their inpatient admission, 1 patient was deemed to lack decision-making capacity, and 1 patient declined depression screening. This left 36 patients who were screened for depression during their inpatient hospital stay. Of the patients screened, 18 (50%) had an admitting diagnosis of ACS and 18 (50%) were admitted for another cardiac-related reason but had a diagnosis of CAD within the previous 2 years (Table 1). The patient population was all male and largely white ($n=34$ [94.4%]). The mean patient age was 69.6 years (SD, 8.26). Statistically significant differences in baseline characteristics identified between the group that initially screened positive for depression and the group that initially screened negative were mean age and frequency of prior MI, past MH diagnosis, and diagnosis of insomnia (Table 1). The initial positive group was significantly younger compared with the initial negative group (63.3 [SD, 6.77] vs 72.7 [SD, 7.33], $P=.001$) and had significantly more patients with prior MI (44% vs 31%, $P=.011$), past MH diagnosis (42% vs 23%, $P=.001$), and diagnosis of insomnia (8% vs 0%, $P=.017$).

During the initial inpatient screen, 10 patients (28%) screened positive for depression, and 26 patients (72%) screened negative for depression. Only 1 patient screened positive for SI and was administered the C-SSRS. The C-SSRS indicated the patient did not have any intent or plan, and the patient accepted referral for MH services. Of the patients with initial positive screens, 3 patients had sustained positive screens at 4 and 8 weeks after discharge, 3 patients had negative screens at 4 and 8 weeks after discharge, and 4 patients were lost to follow-up after discharge. Of the 26 patients with initial negative screens, 3 patients screened positive at week 4 after discharge, with 1 of these remaining positive at week 8 after discharge. Additionally, 1 patient screened positive for depression at 8 weeks after discharge who had initially screened negative at discharge and at week 4 after discharge (Figure).

Fourteen patients (38.9%) had a positive screen at some point during the screening period. Of those patients, 3 (21.4%) accepted referral for PCMHI services. One patient was referred after the initial screening, and 2 patients were referred at the 4-week follow-up. Of these patients, 2 patients received psychotherapy and 1 patient was initiated on an antidepressant. All 3 patients showed improvement in subsequent PHQ-9 scores after receiving treatment. The most commonly reported reason for declining PCMHI referral was no perceived benefit (84.6%).

In the initial positive group, repeat median PHQ-9 scores were significantly decreased at both 4 and 8 weeks after discharge compared with the initial screen. No significant change in repeat median PHQ-9 scores was observed at 4 and 8 weeks after discharge for the group that initially screened negative (Table 2).

Discussion

The results of this initiative support the established association between CAD and comorbid depression, because 28% of patients with CAD initially screened positive for depression.¹⁻⁴ Additionally, the results provide evidence to support the utility of using the PHQ-9 for depression screening in hospitalized patients with CAD because a clinically significant number of patients screened positive either at the time of discharge or at 4 or 8 weeks after discharge. With consideration of the established link between depression and worse cardiovascular outcomes in patients with CAD, it is important to have a process in place to identify and offer referral for treatment of depression as early as possible after a CAD diagnosis.

Although a relatively low percentage of patients who screened positive accepted referral for PCMHI services ($n=3$ [21%]), these patients were provided an opportunity to get connected with various MH services when they otherwise might not have. Given the potential benefit that MH services can have on both the treatment of depression and reducing CV morbidity and mortality, implementation of the protocol was worthwhile even with consideration of the low acceptance rate for treatment referral.

The relatively low acceptance rate for treatment referral was worth exploring in order to identify potential barriers. Overwhelmingly, the most common reason for declining PCMHI was the belief that the service was not needed or would not offer benefit. Previous surveys^{13,14} with similar findings identified the most common reason for not initiating or continuing treatment for a MH disorder was low perceived need versus some other structural barrier. This exposes the need for patient education regarding the effects of depression on mortality in patients with CAD in order to promote MH treatment in this population.

Repeat depression screening at 4 and 8 weeks after discharge allowed for observation of whether an initial positive screen was sustained over time or if it normalized after discharge. Normalization of an initial positive score after discharge could potentially be the result of an initial false-positive screen. In addition,

TABLE 1: Baseline demographics and clinical characteristics

Characteristic	Total, n (%) (n = 36)	Initial Positive, n (%) (n = 10)	Initial Negative, n (%) (n = 26)	2-Sided P Value
ACS (STEMI, NSTEMI, or UA)	18 (50)	7 (70)	11 (42.3)	.137
STEMI	4 (11.1)	1 (10)	3 (11.5)	.895
NSTEMI	11 (30.6)	5 (50)	6 (23.1)	.116
UA	3 (8.3)	1 (10)	2 (7.7)	.822
Other	18 (50)	3 (30)	15 (57.7)	.137
Age, y, mean (SD)	69.6 (8.26)	63.3 (6.77)	72.7 (7.33)	.001*
BMI, mean	31.2	33.3	30.6	.208
Male	36 (100)	10 (100)	26 (100)	...
White	34 (94.4)	10 (100)	24 (92.3)	1.00
Prior MI	16 (44.4)	8 (80)	8 (30.8)	.011*
Prior stent	14 (38.9)	5 (50)	9 (34.6)	.462
Prior CABG	11 (30.6)	5 (50)	6 (23.1)	.224
Smoker	4 (11.1)	2 (20)	2 (7.7)	.305
Alcohol use disorder	3 (8.3)	0 (0)	3 (11.5)	.545
Illicit drug use	2 (5.6)	2 (20)	0 (0)	.071
Anxiety	4 (11.1)	2 (20)	2 (7.7)	.305
Depression	10 (27.8)	5 (50)	5 (19.2)	.100
PTSD	5 (13.9)	2 (20)	3 (11.5)	.429
Insomnia	3 (8.3)	3 (30)	0 (0)	.017*
Past MH diagnosis ^a	15 (41.7)	9 (90)	6 (23.1)	.001*
Past antidepressant use	9 (25)	6 (60)	3 (11.5)	.006*
Heart failure	18 (50)	4 (40)	14 (53.8)	.711
HTN	34 (94.4)	10 (100)	24 (92.3)	1.00
HLD	36 (100)	10 (100)	26 (100)	...
PVD	8 (22.2)	1 (10)	7 (26.9)	.397
Valvular heart disease	3 (8.3)	2 (20)	1 (3.8)	.181
Prior stroke/TIA	6 (16.7)	2 (20)	4 (15.4)	1.00
Atrial fibrillation	7 (19.4)	1 (10)	6 (23.1)	.645
OA	12 (33.3)	5 (50)	7 (26.9)	.247
Chronic pain	26 (72.2)	9 (90)	17 (69.2)	.223
T2DM	19 (52.8)	6 (60)	13 (50)	.717
Hyperthyroidism	1 (2.8)	0 (0)	1 (3.8)	1.00
Hypothyroidism	4 (11.1)	0 (0)	4 (15.4)	.559
History or active cancer	5 (13.9)	0 (0)	5 (19.2)	.293
COPD	8 (22.2)	1 (10)	7 (26.9)	.397

ACS = acute coronary syndrome; BMI = body mass index; CABG = coronary artery bypass graft; COPD = chronic obstructive pulmonary disease; HLD = hyperlipidemia; HTN = hypertension; MH = mental health; MI = myocardial infarction; NSTEMI = non-ST elevation myocardial infarction; OA = osteoarthritis; PTSD = posttraumatic stress disorder; PVD = peripheral vascular disease; STEMI = ST-elevation myocardial infarction; TIA = transient ischemic attack; T2DM = type 2 diabetes mellitus; UA = unstable angina.

*Notes 2-sided *P* value <.05.

^aAny MH diagnosis included anxiety, depression, PTSD, and insomnia.

repeat screening allowed for identification and treatment referral of patients who initially screened negative but later screened positive for depression at 4 or 8 weeks after discharge. This process of repeat screening after discharge proved clinically significant, because 4 of the

26 patients (15%) who initially screened negative eventually screened positive at either 4 or 8 weeks after discharge. This result supports the need for follow-up screening after discharge to identify appropriate patients for treatment referral.

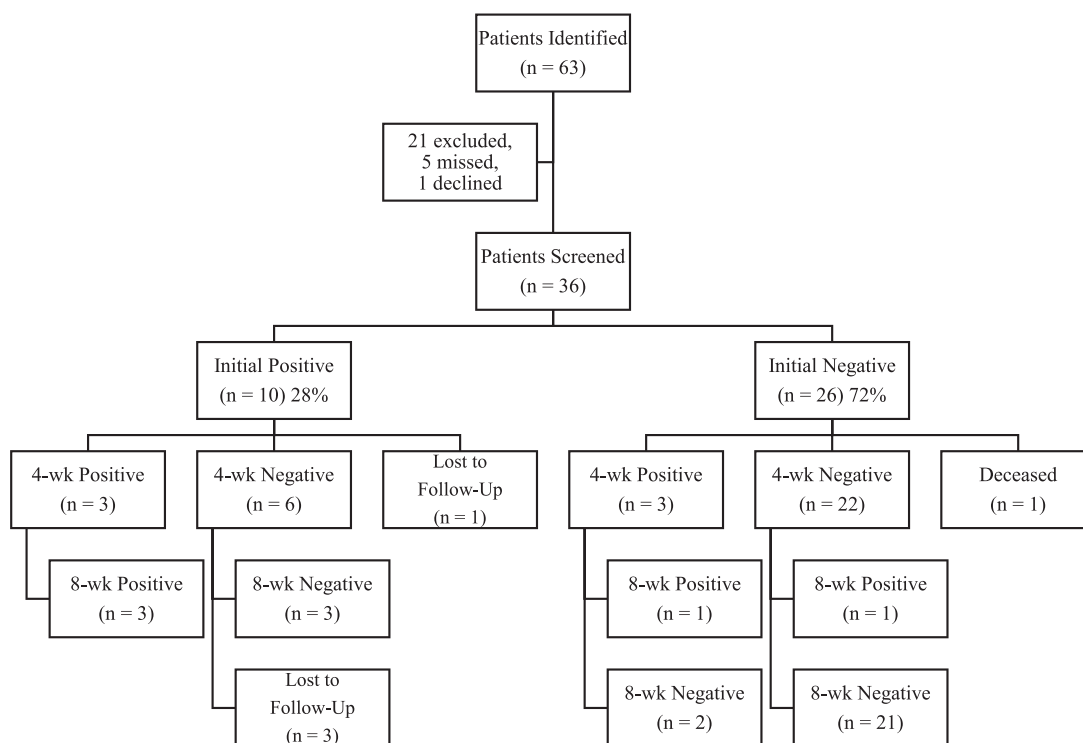


FIGURE: Patient Health Questionnaire-9 screenings at baseline, 4 weeks, and 8 weeks

The overall observed changes in PHQ-9 scores also support the need for sustained screenings at 4 and 8 weeks after discharge. A positive PHQ-9 screen is not diagnostic for depression, and the relative sensitivity and specificity of the PHQ-9 must be taken into consideration. Although the PHQ-9 has shown to have high specificity in the CAD population (91%), it has substantially lower sensitivity (52%).¹⁰ This indicates that although PHQ-9 screenings are likely to identify depression in patients with CAD, there is also a higher likelihood of false-negative screens. The median PHQ-9 score in the initial positive group at the initial screen was 7, which increases the likelihood there were some false-negative screens, because the PHQ-9 has been shown to have higher sensitivity (88%) and specificity (88%) at scores greater than or equal to 10 in the general population.¹⁵ This could partially explain why a patient who screened negative for depression initially may have screened positive for depression at a follow-up screen.

This initiative was subject to several limitations. Data collection was limited to a relatively short period of time that resulted in a small sample size, limiting the internal and external validity of the results. Validity of the results is also limited because the inclusion criteria were expanded to capture patients with a new diagnosis of CAD or ACS event in the past 2 years, despite the association between CAD and depression being most strongly established in the immediately post-ACS population. Additionally, the results have limited generalizability due to the patient demographic being largely white, 100% male, and 100% veterans. Because the veteran population has an increased risk for MH disorders at baseline, this may have impacted the observed prevalence of depression in the patient population included in this initiative.^{16,17} Validity of the results was also limited by attrition, because 5 patients (13.9%) did not complete screenings through 4 and 8 weeks after discharge. Lastly, an element of interrater variability may have impacted the results because 3

TABLE 2: Changes in median Patient Health Questionnaire-9 (PHQ-9) score at initial screen, 4 weeks, and 8 weeks

	Initial PHQ-9 Score, Median (Range)	4-Week Follow-Up PHQ-9 Score		8-Week Follow-Up PHQ-9 Score		
		Median (Range)	P Value	Median (Range)	P Value Initial	P Value 4 Weeks
Initial Positive Screen (n = 10)	7 (5-16)	3 (1-24)	.020*	3 (0-6)	.014*	.025*
Initial Negative Screen (n = 26)	1 (0-4)	0 (0-19)	.134	0 (0-6)	.796	.058

*Notes 2-sided P value <.05.

different individuals led encounters for screenings and offers of PCHMI referral.

Potential barriers for implementing a similar service at another facility include coordination of staff to implement depression screenings as part of regular workflow and establishing easily accessible MH services as indicated. Administering depression screens at an outpatient follow-up after a hospital admission for a CV event may be more logistically feasible. Efforts should be made to communicate a standard facility-specific method of MH referral to improve access to care.

Future directions of this project include initiatives to educate cardiology and MH providers on the risk of depression in patients with CAD to encourage more widespread implementation of similar initiatives. In addition, initiatives to educate patients with CAD on this risk may prove useful in encouraging them to accept MH service referral.

Conclusion

Overall, the results of this initiative support the utility of using the PHQ-9 for depression screening in hospitalized patients with CAD and offering MH service referral for patients with comorbid depression. With consideration of the low acceptance rate for treatment referral, increased efforts are needed to educate patients with CAD and comorbid depression regarding the potential for worse CV outcomes in order to encourage acceptance of MH treatment services.

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