

IMPLEMENTATION OF DEPRESSION SCREENINGS IN A CARDIAC SURGERY
SPECIALITY PRACTICE

by

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Abstract

Background: Depression does not typically occur in isolation; it is a major risk factor for heart disease. The neuroendocrine disturbances, endothelial dysfunction, enhanced platelet activation, and inflammation associated with depression increase patients' risk for cardiovascular disease.

Local Problem: Although cardiac surgery providers in an academic medical center located in the Mid-Atlantic region were aware of the prevalence of depression in cardiac patients, patients were not routinely screened for depression after cardiac surgery using a validated tool.

Intervention: The purpose this quality improvement project was to implement the Patient Health Questionnaire-9 depression screening tool coupled with a referral, if needed, in a cardiac surgery practice. Using the Plan-Do-Study-Act cycle as a framework for implementation, cardiac surgery nurse practitioners screened eligible patients using the Patient Health Questionnaire-9. Eligible patients were adults who understood English, were being seen for their postoperative coronary artery bypass grafting surgery visit, and were not being treated for depression at the time of the screening. The first cycle of implementation involved just-in-time training of nurse practitioners for Patient Health Questionnaire-9 administration, interpretation, and referral. Before the second cycle, barriers and facilitators were identified before implementation continued. During the second cycle, providers performed the screening using an algorithm to streamline screening and appropriate referral.

Results: Two nurse practitioners in the cardiac surgery practice were trained to administer, score, and interpret the PHQ-9. Out of the 38 patients eligible for screening, 29 were screened for depression and had the PHQ-9 documented in their chart. The mean percentage of patients screened during each clinical day was 83.3%, with an upper limit of 100% and lower limit of 0%. During implementation, two patients screened positive for depression.

Conclusions: The Patient Health Questionnaire-9 is a feasible and useful screening tool for depression in a busy cardiac practice. Adapting the addition of the depression screening tool to the workflow and minimizing the additional workload incurred by implementation increased the likelihood of compliance. As undertreated mental health comes to the forefront of many issues worldwide, increased depression screening in various settings that can connect patients to care is an important and necessary addition to public health resources.

Implementation of Depression Screenings in a Cardiac Surgery Specialty Practice

Background and Significance of the Problem

Depression is the number one cause of disability worldwide, affecting more than 300 million people (World Health Organization [WHO], 2017). Clinicians diagnose patients with major depression if the patient has at least five of the following symptoms that are not attributable to other diseases for greater than two weeks: anhedonia, subjective depression, significant weight changes, insomnia, psychomotor disturbances, fatigue, excessive guilt, diminished cognitive functioning, or preoccupation with death (American Psychiatric Association, 2013). In the United States, about 16.2 million adults have experienced a major depressive episode (Substance Abuse and Mental Health Services Administration [SAMHSA], 2017). Despite the existence of valid screening tools and effective treatment, only 65.3% of these adults received treatment for their depression in 2016 (SAMHSA). This percentage has remained fairly constant for the past 10 years (SAMHSA).

Depression does not often occur in isolation; it is a major risk factor for heart disease. Year after year, heart disease has been the number one cause of mortality for Americans (Centers for Disease Control and Prevention, 2017). The neuroendocrine disturbances, endothelial dysfunction, enhanced platelet activation, and inflammation that is associated with depression increase patients' risk for cardiovascular disease (Lichtman et al., 2014). Depression can worsen the risk factors associated with cardiovascular disease, such as nonadherence to cardiac disease prevention efforts, such as smoking cessation and active lifestyles (Lichtman et al.).

Although cardiac surgery providers in an academic medical center located in the Mid-Atlantic region were aware of the prevalence of depression in cardiac patients and they educated their patients about the risk of developing depression, patients were not routinely screened for

depression. Nurse practitioners, the main providers who evaluate cardiac surgery patients during the postoperative visits, reported that they do not screen for depression in the cardiac surgery practice unless it is an obvious issue despite the American Heart Association's recommendation to routinely screen (Nurse practitioners in the cardiac surgery clinic, personal communication, October 2017). Providers needed a protocol that established routine depression screening and guided them through the indicated treatment and referral process.

Purpose

The purpose of this doctor of nursing practice (DNP) project was to implement and evaluate the effectiveness of the Patient Health Questionnaire (PHQ) depression screening tools coupled with a referral, if needed, in a cardiac surgery practice. Several studies in the outpatient setting with similar patient populations demonstrated the validity and reliability of the PHQ-2 and PHQ-9 for depression screenings (Lennart van der Zwaan et al., 2015; Lichtman et al., 2014).

Short-term and Long-term Goals

The short-term goal of this project was that 100% of cardiac surgery outpatient nurse practitioners would rate their understanding of the benefits of using the PHQ-9 to screen for depression as "Strongly Agree" when surveyed using Likert scales. This survey also assessed their understanding of how to use the PHQ-9. A mid-term (week 8) goal was that at least 50% of the post-operative cardiac surgery patients would be screened for depression via a joint effort between the nurse practitioners and medical assistants. The long-term goal (week 13) of this project was that 100% of patients in a cardiac surgery practice would be screened via the PHQ-9. These goals supported Healthy People 2020's and the WHO's initiative to decrease the burden of mental health worldwide (U. S. Department of Health and Human Services, 2016; WHO, 2017).

PDSA Cycle: Major Concepts and its Role in Quality Improvement

The PDSA cycle is a quality improvement framework based on the four major concepts, for which it derives its name: Plan, Do, Study, and Act (Institute for Healthcare Improvement [IHI], 2016). In this quality improvement project, each concept of the cycle influenced the next to advance the project's success and sustainability. First, a "Plan" to evaluate the intervention was created. To ensure the project was effective within the site of the intervention, the cardiac surgery practice, several small-scale tests of depression screenings with a select number of cardiac surgery patients were completed to improve implementation. These small-scale tests were applied to the education arm of the DNP project's logic model first, and then, to the screening implementation arm. As depicted in Appendix A, the logic model serves as a visual to illustrate how the implementation plan will work according to the organization's workflow, the implementation interventions, and the goals of the quality improvement project. The "Do" concept involved carrying out the plan with a focus on identifying and addressing problems before completing the cycle via another small-scale test or widening the scale of the test. Facilitators and barriers were identified during the project via personal communication with the nurse practitioners and medical assistants in the practice. Next, the "Study" concept included an analysis of the results of the first small-scale test (IHI). The results were the percentage of cardiac surgery patients screened for depression. During the "Act" concept, modifications based on the analysis in the "Study" concept were incorporated in the plan to improve intervention implementation (IHI). The PDSA cycle influenced how this project measured progress, altered plans to meet goals, and improved the screening process based on past experiences (IHI). The PDSA framework lent itself to the ongoing need to evaluate and improve the implementation process.

Literature Review

This literature review identified evidence to support the need to screen for depression in postoperative cardiac surgery patients. The review identifies evidence that highlighted screening tools for depression in an outpatient, non-psychiatric setting. The review continues with the evidence that supported the use of the PHQ-9. The review concludes with a discussion of why screening for depression in postoperative cardiac surgery patients in the outpatient setting improved patient outcomes.

Choosing a Feasible Depression Screening

When choosing a depression screening tool, ideal characteristics was the ease of use. The PHQs were less time consuming than the other depression screening tools to which they were compared. Typically, the PHQ-2 takes less than one minute and the PHQ-9 takes less than seven minutes for a patient to answer (Elderon, Smolderen, Na, & Whooley, 2011). The Computerized Diagnostic Interview Schedule, the Mini International Neuropsychiatric Interview (MINI), or an interview with a mental health professional are time consuming, which decreased their feasibility and provider adherence in a setting that focused on screening for depression in the setting of other conditions rather than long-term treatment of depression (Elderon et al.; Lennart van der Zawaan et al., 2015). According to several studies, the PHQs were easy to answer and could be completed by patients before seeing providers. Providers were able to review the results and provide necessary referrals or treatment (Elderon et al.; Lennart van der Zawaan et al.). Allowing patients to complete the PHQs prior to seeing a provider maximized the time spent with patients and reduced provider bias of whether or not their patients had depressive symptoms. One study successfully used the PHQ-9 to screen for depression and did not require additional staff (Stenman & Sartipy, 2018). Based on the brevity of the PHQs and that these questionnaires were

designed to allow patients to answer the questions independently, the PHQs were used to screen for the likelihood of depression in cardiac surgery patients in the outpatient setting.

PHQ-9

During the Heart and Soul Study, researchers found that a two-step depression screening, the PHQ-2 then the PHQ-9, had a high specificity (0.91) and a high negative predictive value (0.87) for major depressive disorder in cardiac patients (Elderon et al., 2011). In cardiac patients, the PHQ-9 was able to specifically detect true depressive symptoms over issues associated with cardiac conditions, such as side effects from cardiac medications, better than other screening tools (Lennart van der Zwaan et al., 2016). Using a lower score (score of 8 out of 27) on the PHQ-9 as a threshold for detecting depression was associated with low sensitivity (71%) and specificity (71%). When a higher threshold (score of 10) was used to detect depression, the PHQ-9 yielded a sensitivity of 94% and specificity of 82% for positive screens (Lennart van der Zwaan et al.). Overall, the PHQ-9 had a high specificity for major depression when providers used a higher threshold for a positive screen in cardiac patients. The PHQs are tools that providers, who may have an underlying bias based on previous interactions with their patients, can use to objectively determine if their patients are experiencing depressive symptoms.

Depression Screening for Cardiac Surgery Patients in the Outpatient Setting

In the mid-Atlantic academic medical center-associated cardiac surgery practice, cardiac surgeons and nurse practitioners assessed most cardiac surgery patients thirty days postoperatively. To help prevent cardiac-related readmissions, their assessment needed to include screening for depression. Symptoms of cardiovascular disease and depression have similar symptoms, making it important to distinguish between both conditions (Stenman & Sartipy, 2018). According to Beach et al. (2013), cardiac patients experiencing depression increased their

risk for readmissions by 9% for every additional point earned on the PHQ-9. Most of these readmissions involved a major adverse cardiac event, with a positive PHQ-9 screen (a score of 10 or greater) associated with a 55% higher chance of experiencing a cardiovascular event (Beach et al.; Elderon et al., 2011; Tully, Baumeister, Bennetts, Rice, & Baker, 2016). A PHQ-2 score that was positive independently predicted an increase in all-cause mortality in the next 4 years (Deveney, Belnap, Hum, Mazumdar, & Rollman, 2016). Additionally, delaying screening until one month after discharge helped distinguish true depression from situational depression postoperatively (Deveney et al.).

The United States Preventive Services Task Force recommends that patients are only screened for depression when adequate systems that offer evidence-based care are in place (Siu & USPSTF, 2016). Even when providers screened patients in specialty clinics and then referred them to a provider who could offer comprehensive depression treatment, there was a significant reduction in depression symptoms during follow up appointments at six-month intervals (Marben & Marben, 2015). Although the exact correlation between depression and adverse cardiac events could not be discerned from the studies, cardiac surgery patients needed to be screened in the outpatient cardiac surgery practice to improve treatment of depressive symptoms. One-year mortality rates in acute myocardial infarction patients who had untreated depression were significantly higher than patients who did not have depression (Smolderen et al., 2017).

Strengths and Weaknesses of the Included Studies

Overall, each study in the literature review was a cross-sectional study with or without controls and minimal blinding, making the results less generalizable (refer to Appendix B for individual ratings). The nature of the depression screening made blinding difficult and may have introduced bias. A strength of the included studies was that, except for one study with

a sample of patients experiencing chronic neuromuscular diseases, each study had similar samples of patients with cardiac disease. These samples were very similar to the target population of this project, making the results more generalizable to the desired population. Furthermore, each study applied the PHQ-9 as a screening tool. All of the studies had statistically significant findings regarding the specificity of the PHQ-9 and/or the effects of depression on patient outcomes with a p-value of less than 0.05 (see Appendix B for each study's specific p-values).

Project Description

This DNP project was a quality improvement (QI) project focused on depression screening via the PHQ-9, as depicted in Appendix C, with a sample of cardiac surgery patients seen by nurse practitioners in an academic medical center-associated cardiac surgery practice located in the Mid-Atlantic region. Inclusion criteria was adult patient who could read English, who were being seen for their post-coronary artery bypass grafting (CABG) surgery visit, and who were not being treated for depression at the time of the screening.

Procedures and Timeline

The timeline of this QI project was 13 weeks. The DNP student, as project leader, finalized implementation and the patient educational handout in Appendix D with the project champions during the first three weeks. During weeks four to seven of implementation, each of the project champions received on-the-job training with the project leader on how to interpret PHQ score and document the results in the electronic medical record (EMR) based on the lesson plan in Appendix E and the handout in Appendix F. The project leader attended clinic days to troubleshoot issues and discover ways to make depression screenings more sustainable. The

percentage of patients screened and usability of the PHQs was evaluated at the end of seventh week and presented to the cardiac surgery nurse practitioners.

Based on the results, the implementation process of the PHQs was modified during week eight. The decision tree in Appendix G was created to streamline and clarify the screening process. From weeks nine to twelve, the modified process for depression screening was implemented. At the end of the twelfth week, the same data collected at the end of the seventh week was collected by the project leader and analyzed. Based on the results, the process for depression screening was modified again to leave the cardiac surgery clinic with a more sustainable depression screening process.

Data Collection

During the training phase of the QI project, an adapted form of the System Usability Scale (SUS), which is a validated and reliable (>0.9) Likert scale questionnaire, was used to assess the depression screening training (Lewis & Sauro, 2017). To adapt the scale to this project, the word “system” was replaced with “depression screening and referral process.” The modified SUS, as seen in Appendix H, was completed on paper after training. In accordance with the SUS recommendations for scoring, each of the ten items in the SUS were re-coded, totaled, and multiplied by two and a half. A score of 68 out of 100, or greater, meant that the PHQ screening had above-average usability. Before implementing the training again, the project leader would have modified the lesson plan if the SUS scores were less than 68 out of 100 (Usability.gov, n.d.). After the QI project implementation, the number of patients who had a recent, 30 days to 3 months, surgical history of a CABG and the number of patients who met the eligibility criteria and were screened via the PHQ-9 were calculated at weekly intervals (Chart Audits in Appendix I).

Data Analysis Plan

The percentage of eligible cardiac surgery patients screened for depression during the project period was calculated using the total number of patients who had a completed PHQ-9 in their EMR divided by the number of patients who have a past surgical history of a CABG. These percentages were tracked on a run chart, where the x-axis was the week of implementation and the y-axis was the percentage of eligible cardiac surgery patients screened for depression.

Plans to Protect Human Subjects, Obtain Permissions, and Obtain IRB Approval

A project description was submitted to and approved by the University of Maryland, Baltimore (UMB) Institutional Review Board for a *Non-Human Subjects Research* determination to ensure minimal risk for the patients who participated in the project. The project leader collected de-identified data at the end of each clinic day to track progress.

Sustainability Plan

An element of the QI project that improved its sustainability is the inclusion of the champions who worked in the practice and could continue the depression screenings. The existence of the PHQ screenings in the EMR improved sustainability by making documentation of the screenings quick and easy. To improve and spread routine screening for depression among all cardiac surgery patients, the project's significance, implementation, and outcomes were presented in cardiac surgery rounds to encourage other cardiac surgeons and nurse practitioners incorporate screenings into their practice.

Results

Two nurse practitioners in the cardiac surgery practice were trained to administer, score, and interpret the PHQ-9. Both of these nurse practitioners were the only providers in the practice who treated eligible patients. They rated their perceived ease of using and learning the

depression screening process a score of 95 out of 100 on the modified SUS, where any score above 68 out of 100 is above average for usability.

Throughout the implementation process, the percentage of eligible patients screened for depression was tracked on a run chart, as depicted in Figure 1. A total of thirty-eight patients were eligible for screening. Out of the eligible patients, twenty-nine were screened for depression and had the PHQ-9 documented in their chart. The mean percentage of patients screened during each clinical day was 83.3%, with an upper limit of 100% and lower limit of 0%. During implementation, two patients screened positive for depression.

Discussion

Implementation of depression screenings in the cardiac surgery specialty practice allowed providers to identify two patients who had depression and did not have an active diagnosis of depression documented in their chart. Upon further inquiry, these patients reported that they had been diagnosed post-cardiac surgery during an appointment with their primary care provider. At the time of their post-operative appointment, depression was added to their medical history and their medications were updated. Tully et al. (2016) similarly found that patients who screened positive on the PHQ-9 were more likely to experience depressive symptoms and be on an antidepressant six months after the screening. It was anticipated that at least 50% of the eligible patients would be screened for depression by week seven of implementation, which was met during the project. Ideally, 100% of eligible patients would have been screened for depression each week during weeks eight to twelve, but this outcome was not met. As a result, continued implementation would involve identifying further change to the implementation plan per the PDSA cycle. By analyzing the new barriers identified in the cycle to improve depression screening compliance, sustainability of the screenings would improve.

A major strength of the project was use of the PHQ-9, which has documented reliability and validity that is published in the literature reviewed (Appendix B). Routine PHQ-9 for eligible patients eliminates provider subjectivity of when patients should be screened for depression, which may increase the number of patients who are identified as having depression and can receive treatment. A screening that removes subjectivity increases the reliability of the depression screening. Another strength of the project was that the project champions were invested in ensuring that implementation was supported and successful. Their support was extremely crucial to the success of implementation. A contextual barrier to the intervention in the beginning of the project was opposition from office staff because they did not feel that they had the time to administer the screenings and were not interested in the additional workload. This barrier, which was analyzed during the second “Study” phase of the PDSA cycle, was offset by the importance and support that the project champions lent to the intervention. Staff resistance was offset by simplifying the screening process from a two-step process to one step. The PHQ-9 contains the questions asked in the PHQ-2 and personal communication with psychiatric nurse practitioners (2018) revealed that the PHQ-9 offered more valuable data than the PHQ-2 in the clinical setting. The PHQ-2 is a useful tool, but it does not offer the level of validity provided by the PHQ-9 (Gilbody, Richards, Brealey, & Hewitt, 2007). By eliminating the two-step process of requiring a positive PHQ-2 before the PHQ-9 screening, providers no longer had to take the time to analyze the PHQ-2, then administer the PHQ-9. Additionally, the PHQ-9 being embedded in the EMR before the start of implementation and the PHQ-9 being included in required paperwork at intake before starting the second cycle of implementation were important variables that increased the success of the screening process. The PHQ-9 within the EMR contained the screening questions in the same order as the paper form of the PHQ-9, which made transcribing

easier to complete. Providers knew when the screening tool was complete, because a total score would automatically populate at the bottom of the EMR flowsheet.

An unexpected benefit for patients who completed the PHQ-9 was that they could measure their own recovery after cardiac surgery. An observation made by the project leader and champions was that patients would use the PHQ-9 as talking points and patients often saw that they were progressing well postoperatively. Many of the points addressed by the PHQ-9, such as concentration, fatigue, and poor appetite, were common issues post-CABG patients experienced.

Limitations of the implementation process include the potential for discrepancy in the original PHQ-9 documentation when the scores were completed by the patients on paper and then, transferred to the EMR by the nurse practitioners. The transfer of accurate data was reliant on whether the recorder accurately transcribed the screening and if the data was recorded before the original document was discarded or possibly lost. The implementation process did not encounter this barrier, which could have skewed the patients' scores and the nurse practitioners' abilities to interpret the score accurately. Another limitation to the project was that only CABG patients were screened. Cardiac valve replacement, heart transplant, and other cardiac surgery patients were not screened for depression. Additionally, implementation ended at week ten since there was limited access to the practice due to accrediting surveys and cardiac surgery providers being unavailable to see patients secondary to sickness. As a result, the run chart of the results displays weeks one through ten of implementation in Figure 1. Since this project was tailored specifically to the cardiac surgery specialty practice, the implementation process and the results are not generalizable to other projects but can offer guidance for similar implementation efforts.

Conclusion

Depression is an extremely pervasive disorder throughout the world. This disorder decreases a patient's self-efficacy and increases their risk of cardiovascular problems (Lichtman et al., 2014). The PHQ-9 is a feasible and useful screening tool for depression in a busy outpatient practice when the process of screening is simplified to decrease the additional workload associated with the intervention and when the screening process is adapted to the workflow of the particular setting. Once depression screening is standardized within the workflow of practice and providers are invested in ensuring each of their patients are screened, the PHQ-9 screening process is extremely sustainable. The simplicity of the PHQ-9 and the patients' ability to complete the PHQ-9 independently adds to the sustainability of the intervention.

Screening for depression via the PHQ-9 could easily be implemented in other busy outpatient practices to ensure that each patient is screened for depression as least annually, which is consistent with the USPSTF's recommendations and supports the Healthy People 2020 goal of decreasing the burden of mental health in the United States (U. S. Department of Health and Human Services, 2016). Routine depression screening creates an opportunity for patients to recognize the symptoms of depression and discover a resource for treatment. As undertreated mental health comes to the forefront of many issues worldwide, increased depression screening in various settings that can connect patients to care is an important and necessary addition to public health resources.

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Beach, S.R., Januzzi, J.L., Mastromauro, C.A., Healy, B.C., Beale, E.E., Celano, C.M., & Huffman, J.C. (2013). Patient Health Questionnaire-9 score and adverse cardiac outcomes in patients hospitalized for acute cardiac disease. *Journal of Psychosomatic Research, 75*, 409-413. doi: <http://dx.doi.org/10.1016/j.jpsychores.2018.08.001>
- Centers for Disease Control and Prevention. (2017). Heart disease facts. Retrieved from <https://www.cdc.gov/heartdisease/facts.htm>
- Deveney, T.K., Herbeck Belnap, B., Hum, B., Mazumdar, S., & Rollman, B.L. (2016). The prognostic impact and optimal timing of the Patient Health Questionnaire depression screen on 4-year mortality among hospitalized patients with systolic heart failure. *General Hospital Psychiatry, 42*, 9-14. doi: <http://dx.doi.org/10.1016/j.genhosppsy.2016.06.005>
- Elderon, L., Smolderen, K.G., Na, B., & Whooley, M.A. (2011). Accuracy and prognostic value of American Heart Association-recommended depression screening in patients with coronary heart disease: Data from the Heart and Soul Study. *Circulation, 4*, 533-540. doi: [10.1161/CIRCOUTCOMES.110.960.302](https://doi.org/10.1161/CIRCOUTCOMES.110.960.302)
- Gilbody, S., Richards, D., Brealey, S., & Hewitt, C. (2007). Screening for depression in medical settings with the patient health questionnaire (PHQ): A diagnostic meta-analysis. *Journal of General Internal Medicine, 22*(11), 1596-1602. doi: [10.1007/s11606-007-0333-y](https://doi.org/10.1007/s11606-007-0333-y)
- Institute for Healthcare Improvement. (2016). How to Improve. Retrieved from <http://www.ihl.org/resources/Pages/HowtoImprove/default.aspx>

- Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a Brief Depression Severity Measure. *Journal of General Internal Medicine, 16*(9), 606–613. <http://doi.org/10.1046/j.1525-1497.2001.016009606.x>
- Lennart van der Zwaan, G., van Dijk, S.E.M., Ariaanse, M.C., van Marwijk, H.W.J., van Tulder, M.W., Pols, A.D., & Bosmans, J.E. (2015). Diagnostic accuracy of the Patient Health Questionnaire-9 for assessment of depression in type II diabetes mellitus and/coronary heart disease in primary care. *Journal of Affective Disorders, 190*, 68-74. doi: <http://dx.doi.org/10.1016/j.jad.2015.09.045>
- Lewis, J.R., & Sauro, J. (2017). Revisiting the factor structure of the System Usability Scale. *Journal of Usability Studies, 12*(4), 183-192.
- Lichtman, J.H., Froelicher, E.S., Blumenthal, J.A., Carney, R.M., Doering, L.V., Frasura-Smith, N. ... Wulsin, L. (2014). Depression as a risk factor for poor prognosis with acute coronary syndrome: Systematic review and recommendations. *Circulation, 129*, 1350-1369. doi: <https://doi.org/10.1161/CIR.0000000000000019>
- Marben, K., & Marben, C. (2015). Implementation of depression screening using the patient health questionnaire to identify at risk individuals, refer for depression management plan, and monitor effectiveness. *Developmental Medicine and Child Neurology, 57*, 16-17. doi: [10.1111/dmcn.24_12887](https://doi.org/10.1111/dmcn.24_12887).
- Office of Disease Prevention and Health Promotion. (2016). Mental health and mental disorders. In *Healthy People 2020*. Retrieved from <https://www.healthypeople.gov/2020/topics-objectives/topic/mental-health-and-mental-disorders/objectives>

- Siu, A.L., & U.S. Preventive Services Task Force [USPSTF]. (2016). Screening for depression in adults: U.S. Preventive Services Task Force recommendation statement. *JAMA*, *315*(4), 380–387. doi:10.1001/jama.2015.18392
- Smolderen, K.G., Buchanan, D.M., Kensey, G., Whooley, M., Chan, P.S., Vaccarino, V., . . . Spertus, J.A. (2017). Insights from the TRIMPH registry (translational research investigating underlying disparities in acute myocardial infarction patients' health status). *Circulation*, *135*, 1681-1689. doi: <https://doi.org/10.1161/CIRCULATIONAHA.116.025140>
- Stenman, M., & Sartipy, U. (2018). Depression screening in cardiac surgery patients. *Heart, Lung & Circulation*. doi: <https://doi.org/10.1016/j.hlc.2018.04.298>
- Substance Abuse and Mental Health Services Administration. (2017). *Key substance use and mental health indicators in the United States: Results from the 2016 National Survey on Drug Use and Health* (HHS Publication No. SMA 17-5044, NSDUH Series H-52). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved from <https://www.samhsa.gov/data/>
- Usability.gov. (n.d.). System Usability Scale. Retrieved from <https://www.usability.gov/how-to-and-tools/methods/system-usability-scale.html>
- Tully, P.J., Baumeister, H., Bennetts, J.S., Rice, G.D., & Baker, R.A. (2016). Depression screening after cardiac surgery: A six month longitudinal follow up for cardiac events, hospital readmissions, quality of life and mental health. *International Journal of Cardiology*, *206*, 44-50. doi: [http://dx.doi.org/10.1016.j.ijcard.2016.01.015](http://dx.doi.org/10.1016/j.ijcard.2016.01.015)

U. S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion (2016). Mental health and mental disorders. In Healthy People 2020.

Retrieved from <https://www.healthypeople.gov/2020/topics-objectives/topic/mental-health-and-mental-disorders/objectives>

World Health Organization. (2017). Depression. Retrieved from

<http://www.who.int/mediacentre/factsheets/fs369/en/>

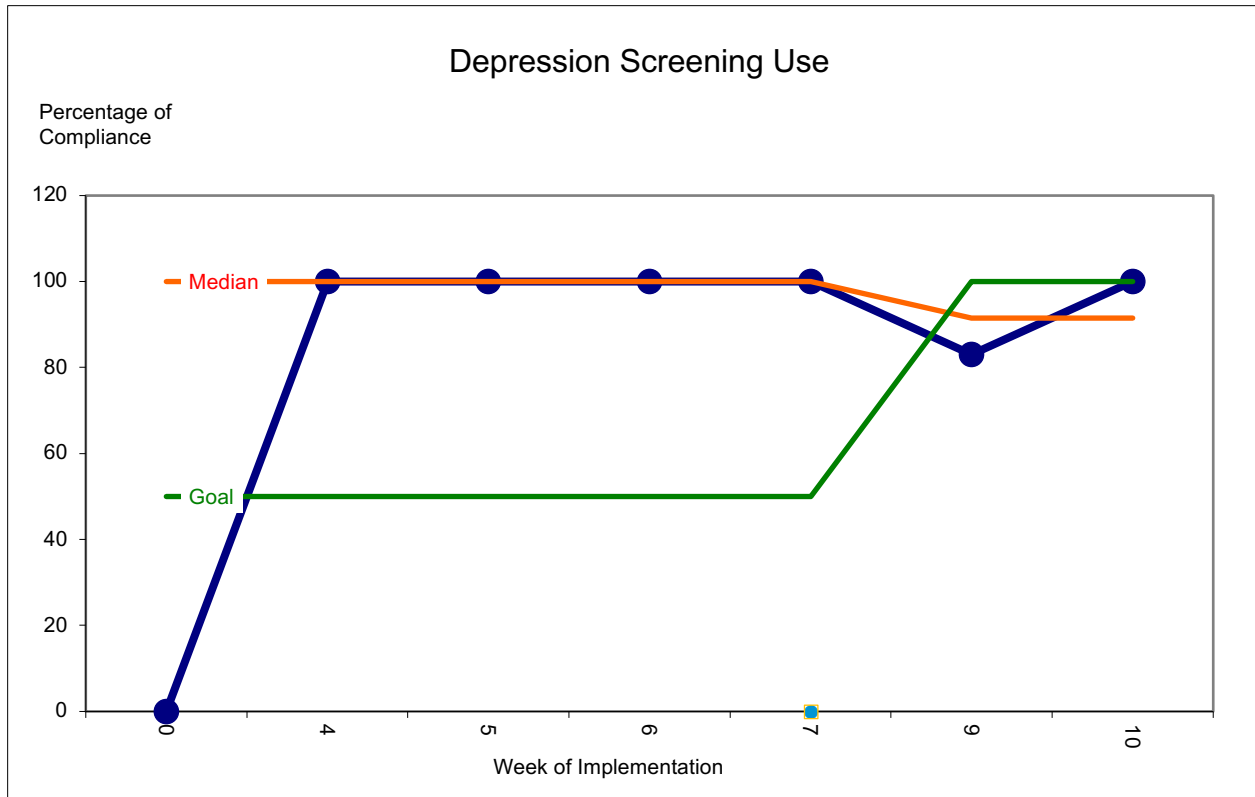
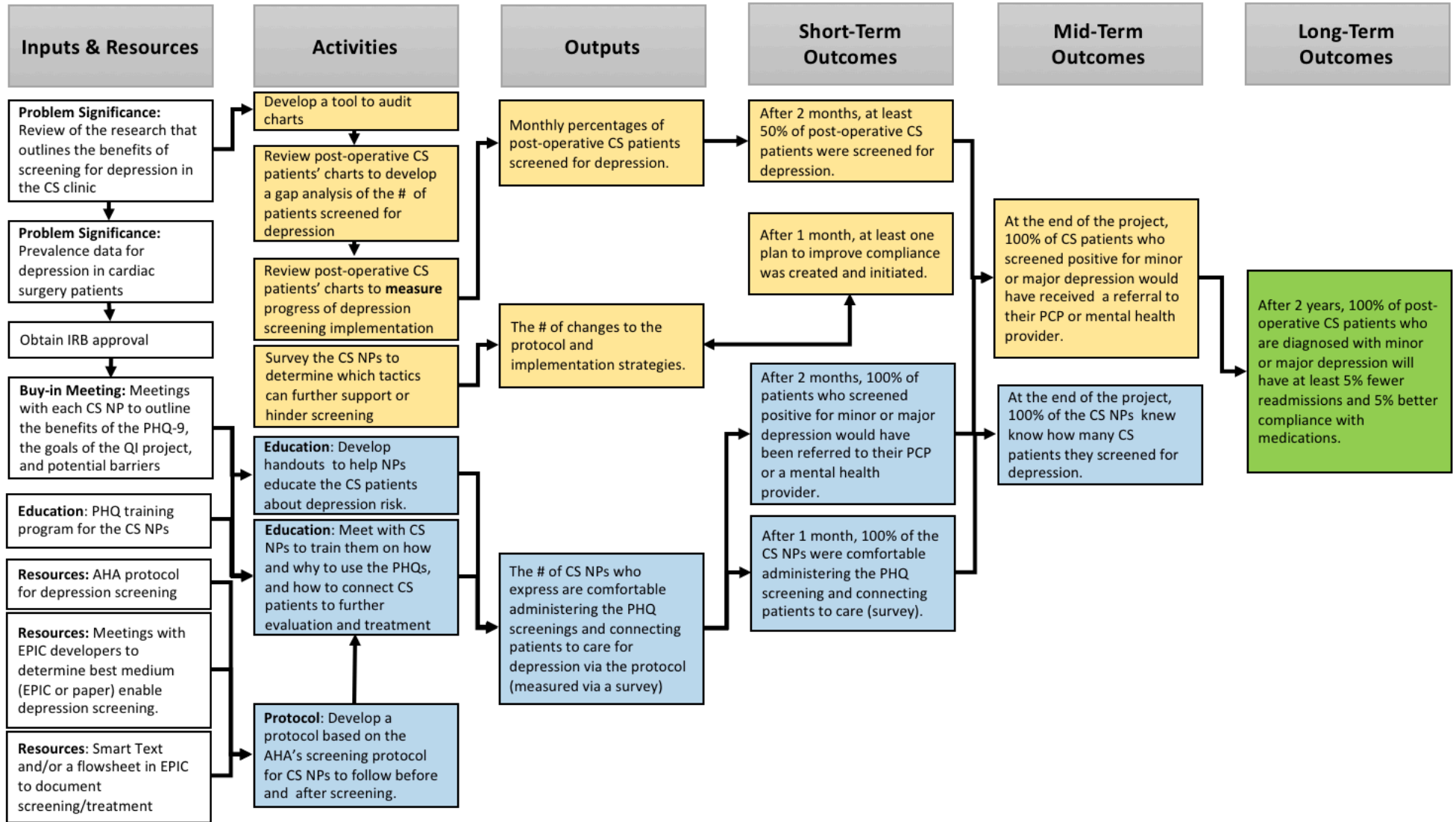


Figure 1. Depression Screening Use

Appendix A
Logic Model



Note. Key: AHA- American Heart Association, CS- cardiac surgery, NP- nurse practitioner, PCP: primary care provider, PHQ: Patient Health Questionnaire to screen for depression, QI: quality improvement

Appendix B
Evidence Review Table

Author, year	Study objective/intervention or exposures compared	Design	Sample (N)	Outcomes studied	Results	*Level and Quality Rating
Elderon, Smolderen, Na, & Whooley, 2011	To determine the sensitivity and specificity of the American Heart Association's 2-step screening process to identify depression in cardiac patients.	Prospective cohort study <u>Intervention:</u> 2 step screening with PHQ-2 and PHQ-9 <u>Control:</u> Computerized Diagnostic Interview Schedule	N=1024 adult patients with stable CHD	Sensitivity and specificity of the 2-step screening for depression Risk of cardiovascular events	High specificity of 0.91 and low sensitivity 0.54 for MDD Those who screened positive via the 2-step process had a 55% higher chance of cardiovascular events.	4 A
Deveney, Belnap, Hum, Mazumdar, & Rollman, 2016	To determine the effect of positive PHQ-2 and PHQ-9 screenings on HF mortality.	Controlled cross-sectional study	<ul style="list-style-type: none"> Hospitalized adults with systolic HF Positive PHQ-2 subjects (n=372) vs negative PHQ-2 subjects (n=100) 	HF mortality	A PHQ-2 score that was positive for depression independently predicted an increase in all-cause mortality in the next 4 years (p=.04).	4 B
Tully, Baumeister, Bennetts, Rice, & Baker, 2016	To determine the 6-month outcomes of screening cardiac patients for depression.	Observational cross-sectional study with some blinding (MACE calculations)	N=481 adult patients at least 30 days after cardiac surgery divided into groups: previous diagnosis of depression (n=90), screened positive for depression (n=46), screened negative for depression (n=345)	MACE, symptomatic depression, use of pharmacologic and counseling for depression, quality of life, hospital readmission	Patients who screened positive for depression had a higher MACE risk than those who screened negative for depression (p=.02). Positive screen patients were more likely to experience depressive symptoms (p<.001) and be on an anti-depressant (p=.004) at 6 months.	4 B
Lennart van der Zwaan et al., 2015	To determine the ability of the PHQ-9 to identify patients at risk for developing minor and major depression.	Cross-sectional study with convenience sampling; no blinding.	N=586 adult patients with type 2 diabetes and CHD seen in 23 general practices	Optimal cut-off score of PHQ-9 for minor/major depression	PHQ-9 was sensitive enough to detect minor depression at a score of 8 (sensitivity 71% and specificity 71%) and major depression at a score of 10 (sensitivity 84% and specificity 82%). PHQ-9 is a useful	4 B

		<u>Intervention:</u> PHQ-9 <u>Control:</u> MINI			screening tool but should be used in conjunction with a more specific diagnostic tool, such as the MINI, if patients screen positive.	
Marben & Marben, 2015	To determine the feasibility of a referral program for patients seen in a specialty clinic who complete the PHQ-9 at baseline, 6 months, and 12 months.	Retrospective cross-sectional study, no control	N= 511 adults with cerebral palsy (n=286), neuromuscular conditions (n=155), or spina bifida (n=70) who were treated in specialty clinic	PHQ-9 scores at 6 months and 12 months	There was a significant reduction from the baseline PHQ-9 score to the follow up scores at 6 and 12 months (p=.000).	4 B
Beach et al., 2013	To determine if high PHQ-9 scores predicted cardiac readmissions in hospitalized patients with depression hospitalized for an acute cardiac event.	Cross-sectional study, no control	N= 172 depressed patients who were admitted for ACS, HF, or arrhythmia	Cardiac readmission rate	Cardiac patients with depression had a 9% increase in risk for cardiac readmission for every additional point on the PHQ-9.	4 B
Stenamn & Sartipy, 2018	To determine if depression screening via the PHQ-9 was feasible in the institution.	Population-based cohort study	N= 2512 patients who had cardiac surgery	Response-rate for completed the PHQ-9 PHQ-9 score \geq 10	One-thousand one-hundred thirty-three (45%) patients completed the PHQ-9. Fifteen percent of those who completed the PHQ-9 had a score \geq 10.	4 B
Smolderen et al., 2017	To determine if patients whose depression was treated had a different prognosis from patients whose depression was untreated.	Observational multicenter cohort study	N= 4062 patients who were at least 18 years old and had acute myocardial infarctions within a 3.5-year span in 24 United States hospitals	One-year mortality rates	Patients whose depression was not treated had higher 1-year mortality than patients who did not have depression (95% CI, 1.39-2.62).	4 B

Note. Key: ACS- acute coronary syndrome, CI-confidence interval, CHD- coronary heart disease, HF-heart failure, MACE- major adverse cardiac events, MDD-major depressive disorder, MINI- Mini International Neuropsychiatric Interview, PHQ- Patient Health Questionnaire

Rating System for Hierarchy of Evidence

<u>Level of the Evidence</u>	<u>Type of the Evidence</u>
I (1)	Evidence from systematic review, meta-analysis of randomized controlled trials (RCTs), or practice-guidelines based on systematic review of RCTs.
II (2)	Evidence obtained from well-designed RCT
III (3)	Evidence obtained from well-designed controlled trials without randomization
IV (4)	Evidence from well-designed case-control and cohort studies
V (5)	Evidence from systematic reviews of descriptive and qualitative studies
VI (6)	Evidence from a single descriptive or qualitative study
VII (7)	Evidence from the opinion of authorities and/or reports of expert committees

Melnyk, B.M. & Fineout-Overholt, E. (2014). *Evidence-based practice in nursing & healthcare: A guide to best practice* (3rd ed.). New York: Lippincott, Williams & Wilkins.

Rating Scale for Quality of Evidence

- A: High – consistent results with sufficient sample, adequate control, and definitive conclusions; consistent recommendations based on extensive literature review that includes thoughtful reference to scientific literature
- B: Good – reasonably consistent results; sufficient sample, some control, with fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence
- C: Low/major flaw – Little evidence with inconsistent results; insufficient sample size; conclusions cannot be drawn

Newhouse, R.P. (2006). Examining the support for evidence-based nursing practice. *Journal of Nursing Administration*, 36(7-8), 337-40.

Appendix C
Patient Health Questionnaire-9 (PHQ-9)

**PATIENT HEALTH QUESTIONNAIRE-9
(PHQ-9)**

Over the **last 2 weeks**, how often have you been bothered by any of the following problems?
(Use "✓" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

FOR OFFICE CODING 0 + + +
=Total Score:

If you checked off **any** problems, how **difficult** have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Developed by Drs. Robert L. Spitzer, Janet B.W. Williams, Kurt Kroenke and colleagues, with an educational grant from Pfizer Inc. No permission required to reproduce, translate, display or distribute.

Appendix D
Patient Educational Handout
Depression After Heart Surgery

Facts about Depression

- Depression is very common. It affects millions of people in the United States.
- After a cardiac event, 25% of patients have depression. Heart surgery is a cardiac event.
- Depression does not occur by itself. It is a major risk factor for heart disease.
- Depression can worsen the risk factors linked to cardiovascular disease. Depression makes it hard to stop smoking and live an active lifestyle.
- Some common medications that prescribed after surgery can make depression worse.

With depression, you may have:

- an endless feeling of sadness
- a loss of interest in activities
- lower energy or feeling "slowed down"
- trouble concentrating or making decisions
- sleeping difficulties
- appetite changes
- restlessness
- aches or pains with no clear cause that may not go away with treatment

If you experience these symptoms for more than 2 weeks, you need to follow up with your primary care provider. He or she needs to assess you further for depression. If you cannot get an appointment with your primary care provider in the next 2 weeks, you can contact the:

- **Mental Health Association of Maryland at 410-235-1178** (www.mhamd.org)
- **National Mental Health Association at 1-800-969-6642** (www.nmha.org)

These groups help people with depression or mental health problems.

If you have a plan to harm yourself or others, please call the following numbers or go to the nearest emergency room:

- **Maryland Crisis Hotline (24/7):** 800-422-0009
- **Hopeline Network (24/7):** 800-784-2433
- **911**

Appendix E
Depression Screening: Administration and Documentation Lesson Plan

Learning Objectives	Content Outline	Method of Instruction	Time Spent	Method of Evaluation
<p>By the end of the just-in-time training, the learning will be able to:</p> <ol style="list-style-type: none"> 1. Discuss the significance of depression, depression’s relationship to cardiac disease, and why screening for depression in the cardiac surgery clinic is an evidence-based practice. 2. Demonstrate competence in the administration of the PHQ-9. 3. Demonstrate competence in documentation of the PHQs and the associated medical plan to address the outcome of a positive PHQ-9 score in the electronic medical record (EMR). 	<ol style="list-style-type: none"> 1. Background and significance of depression and cardiac disease. 2. The validity and reliability of the PHQs. 3. Who is a candidate for PHQ screening? 4. How to administer the PHQs. 5. For medical assistants: When to give patients the PHQ-9 and depression handouts. 6. For nurse practitioners: What PHQ-9 score warrants a referral and how to document the referral. 	<p><u>Activate Background Knowledge:</u> The project leader will discuss the learner’s prior knowledge of depression and cardiac surgery. Then, she will build upon it.</p>	<p>5 minutes</p>	<p>The project leader will sign off on the learner’s ability to demonstrate to project leader:</p> <ol style="list-style-type: none"> 1. an understanding of who to screen based on specified criteria (NPs) 2. how to screen via the PHQs (NPs) 3. how to document the results in the EMR (NPs) 4. how to interpret the score for referrals (NPs) 5.
		<p><u>Direct Instruction with a Handout:</u> The project leader will model use of the PHQs: how to administer the PHQs, how to document the results of the PHQs in the EMR, and when to refer for depression treatment.</p>	<p>30 minutes</p>	
		<p><u>Guided Practice:</u> After each of above actions mentioned in “Direct Instruction” are performed, the project leader will guide the learner through just-in-time scenarios.</p>	<p>15 minutes</p>	

Appendix F The PHQ-2 and PHQ-9 Learning Handout

Significance of the problem:

- Depression affects more than 20 million people in the United States, and 25% of patients following a cardiac event, such as a coronary artery bypass grafting surgery.
- Depression does not occur by itself; it is a major risk factor for heart disease.
- Depression can enhance the risk factors associated with cardiovascular disease, such as smoking, sedentary lifestyles and being unable to follow through with prevention efforts.
- According to Beach et al. (2013), cardiac patients experiencing depression increased their risk for readmissions by 9% for every additional point earned on the PHQ-9.

Inclusion criteria for screening:

- Adult patients who comprehend English
- Cardiac surgery patients who are being seen for their 30-day post-operative visit

Exclusion criteria for screening:

- Patient has a diagnosis or are currently receiving treatment for a psychiatric disorder
- Pre-operative cardiac surgery patients

To add the PHQ-9 Screening Flowsheets to your Flowsheets:

1. While you are in a patient's chart, click on the **Flowsheets** tab on the left.

2. While in Flowsheets, click the wrench symbol in the top right-hand corner to edit your **Flowsheet Template Order**.

Hit the wrench button to customize the flowsheets:

1. Place a check in the **Override Template Order** to customize
2. Scroll to the bottom to the first empty slot
3. Search for the two flowsheets
4. If you want to change the order, click on the elevator up or down button on the side
5. Click **Accept** to Save changes

3. When the **Flowsheet Template Order** window pops up, ensure that **“Override Template Order”** in the top, left corner of the window is checked.
4. Scroll down to an empty Template box and search for **Patient Health Questionnaire (PHQ-9)** or the ID number **807** under the **Facility Pref List** tab.
5. Now, you should be able to document the depression screenings.

To complete the PHQ-2 and PHQ-9 Screening Flowsheets:

1. Open the patient's chart and click on the **Flowsheets tab on the left**.
2. To begin the depression screening, **click on the PHQ-9 tab**. Fill in the cells based on the patient's answers.
3. Screen for suicide if the patient has mild depression or worse.

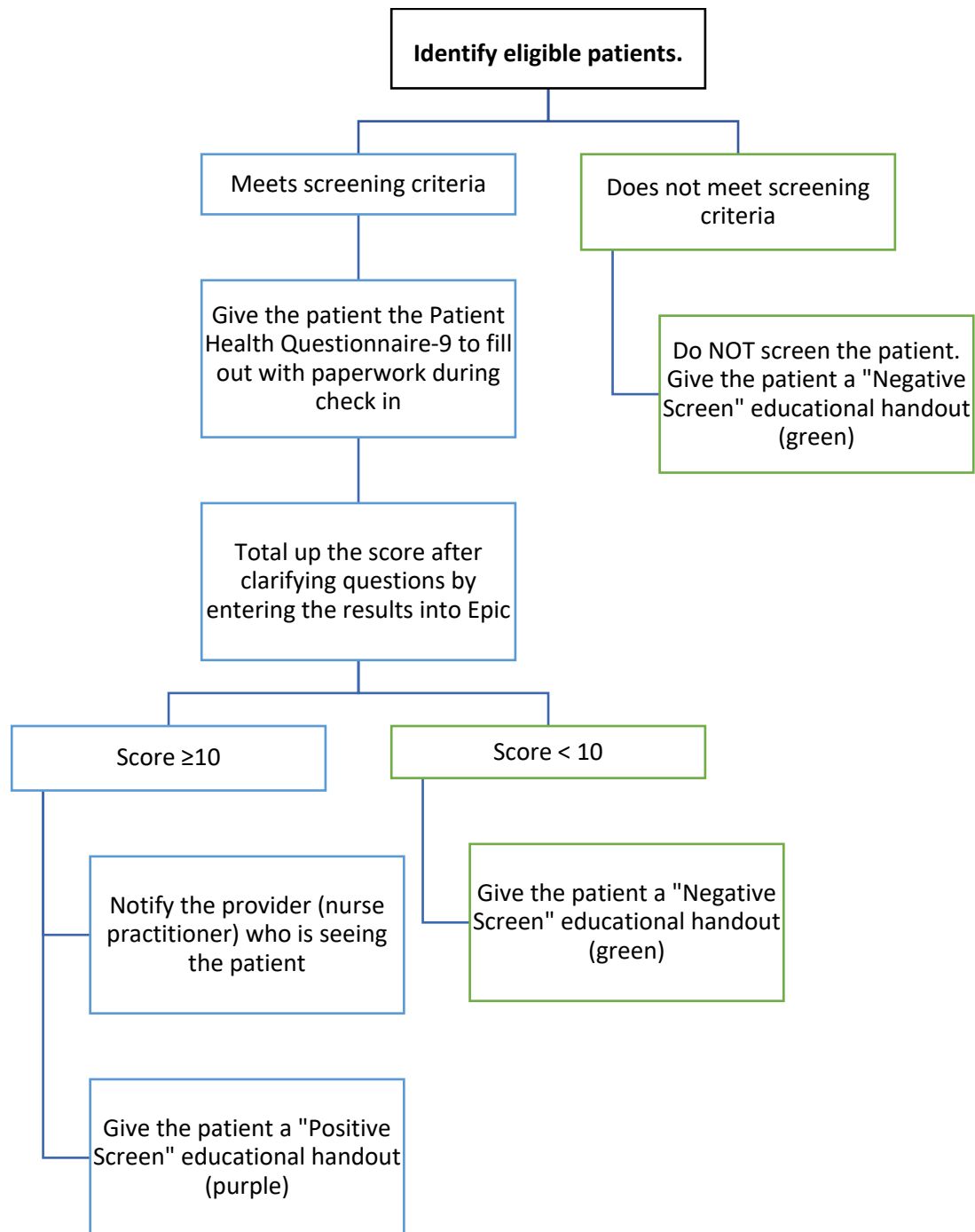
Reference

Beach, S.R., Januzzi, J.L., Mastromauro, C.A., Healy, B.C., Beale, E.E., Celano, C.M., & Huffman, J.C. (2013). Patient Health Questionnaire-9 score and adverse cardiac outcomes in patients hospitalized for acute cardiac disease. *Journal of Psychosomatic Research, 75*, 409-413. doi: <http://dx.doi.org/10.1016/j.jpsychores.2018.08.001>

Appendix G
Depression Screening Procedures and Decision Tree

Inclusion criteria for the adult patient population will be patients who:

- comprehend English,
- are being seen for their 30-day post-cardiac surgery visit, and
- are not being treated for depression at this time.



Appendix H
Modified System Usability Scale (SUS)

		Strongly disagree					Strongly agree					
		1	2	3	4	5						
1	I think that I would like to use this depression screening and referral process.											
2	I found the depression screening and referral process to be unnecessarily complex.											
3	I thought the depression screening and referral process was easy to use.											
4	I think that I would need the support of the project leader to use the depression screening and referral process.											
5	I found the various parts of the depression screening and referral process were well-integrated into the EMR.											
6	I thought there was too much inconsistency in this depression screening and referral process.											
7	I would imagine that most people would learn to use this depression screening and referral process very quickly.											
8	I found the depression screening and referral process very cumbersome to use.											
9	I felt very confident using the depression screening and referral process.											
10	I needed to learn a lot of things before I could get going with this depression screening and referral process.											
Comments:												

Note. Per the Usability.gov website, text and documents are public domain, are not copyrighted, and may be copied and distributed at no cost as long as federal branding and logos are removed. This scale was modified from System Usability Scale, by Usability.gov. Retrieved from <https://www.usability.gov/how-to-and-tools/methods/system-usability-scale.html>

Appendix I
Chart Audit Tools

Date of Cardiac Surgery Specialty Practice Visit (month/day/year)	Number of Patients Screened for Depression via PHQ-2	Number of Patients Eligible for Depression Screenings	Percentage of Eligible Patients Screened