Preoperative Depression Symptom Severity and Its Impact on Adherence to Preoperative Beta-Blocker Therapy

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Objectives: **To test the association among depression symptoms, distressed personality type, and preoperative beta-blocker nonadherence and to estimate the prevalence of untreated major depression in this population.**

Design: **Prospective observational study.**

Setting: **A veterans hospital.**

Participants: **One hundred twenty patients on outpatient beta-blocker therapy presenting for surgery.**

Interventions: **The Patient Health Questionnaire (PHQ)-9, the D-Scale-14 (DS14), and Modified Morisky Scale (MMS) questionnaires.**

Measurements and Main Results: **Of 99 participants who presented for surgery, the incidence of preoperative nonadherence was 14.1% (95% confidence interval 7%-21%), consistent with prior research. Nonadherence was 9.5% among those with no depression, 27.8% among those with mild depression, and 28.6% among those with moderate-to-severe depression (Cochran-Armitage test for trend p = 0.03). Distressed personality type was found in 35% of the cohort (95% confidence interval 26-45%) and was not associated with beta-blocker nonadherence (Fisher's exact test, p = 0.24). Among participants with symptoms of major depressive disorder (n = 25, 25.3%), more than half (n = 14, 56%) had no indication of depression listed at their most recent primary care visit.**

Conclusions: **Patients with symptoms of depression on chronic beta-blocker therapy are susceptible to medication nonadherence on the day of surgery. Most surgical patients with symptoms of major depression lack a diagnosis of depression. Preoperative depression screening may thus (1) identify a population at increased risk of beta-blocker withdrawal, and (2) identify patients who may benefit from anesthesiologist-initiated referral for this treatable condition.**

KEY WORDS: ***beta-adrenergic blockers, depression, preoperative care, medication adherence, preventive medicine***

PREOPERATIVE BETA-BLOCKER nonadherence is a common and potentially modifiable behavior that may predispose patients to adverse perioperative cardiovascular events.[1–10] Preoperative beta-blocker withdrawal previously has been shown to occur in 9% to 31% of surgical patients prescribed chronic outpatient beta-blockers.[11] Discontinuous use of perioperative beta-blockade has been associated with increased perioperative mortality.[10] It is, therefore, important to understand patient characteristics that may increase the likelihood of medication nonadherence, particularly in those patients who present for surgery from home and who, therefore, may not benefit from in-hospital electronic decision-support initiatives.

In the nonsurgical outpatient population, depression is one patient factor that previously has been identified to increase risk for medication nonadherence to cardioprotective medications.[12–15] Within the surgical context, depression has been linked to delirium and postoperative cognitive dysfunction,[16,17] but its potential association with preoperative medication nonadherence has remained unexplored. Similarly, the distressed personality type known as "type-D personality"—a well-validated personality type characterized by negative affectivity and social inhibition[18]—has been associated with poor medication adherence and unhealthy lifestyle choices outside of the perioperative milieu among patients with ischemic heart disease. Again, however, the association of type-D personality and medication nonadherence has not been examined in perioperative patients.[19–21] The connections among emotional distress, social inhibition, depression, and cardiovascular health continue to be studied intensively in the cardiology literature,[22–28] and such literature may carry particular relevance within the perioperative period—a timeframe that frequently is experienced as highly stressful for patients and their families and that is known to be associated with acute increases in the incidence of major adverse cardiac events.

If depressive symptoms or the distressed personality type is shown to be associated with increased rates of preoperative beta-blocker nonadherence, then screening for these conditions would assume added importance within the preoperative testing environment. Moreover, if significant numbers of patients with previously undetected depression symptoms or emotional distress could be identified during preoperative evaluations, then the preadmission testing clinic could present a valuable opportunity for care coordination among perioperative physicians and primary care doctors for longitudinal treatment of depression—a disease that is common, treatable, and associated with significant morbidity. Similar anesthesiologist-initiated care coordination efforts have been encouraged to promote smoking

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cessation[29–31] and to improve treatment of hypertension[32,33] among surgical patients. Each of these care-coordination initiatives that targets long-term improvement in health outcomes among surgical patients may provide a further justification for the anesthesiologist's central role in the relatively nascent concept of the perioperative surgical home.[33–36]

Accordingly, the purpose of this prospective, observational study was (1) to test the association of preoperative depression symptom severity and type-D personality with day-of-surgery beta-blocker nonadherence in patients on chronic beta-blocker therapy and (2) to measure the prevalence of untreated major depression symptoms among this population. Secondary aims were to test (1) the association between depression symptom severity and self-reported knowledge and motivation about beta-blocker usage and (2) the association between perioperative beta-blocker nonadherence and day of surgery vital signs.

METHODS

This study was approved by the appropriate institutional review boards of the study institutions. Patients with an active prescription for outpatient beta-blocker therapy who presented to the preadmission testing clinic at a tertiary care VA medical center between May 2011 and August 2012 were eligible for inclusion. Potential subjects proceeded through their standard preoperative testing visit. As part of each visit, patients received both verbal and written instructions to continue taking their beta-blocker medication as directed, up to and including the day of surgery (or the evening before surgery in the case of once-daily evening dosing). At the conclusion of their preadmission testing visit, eligible patients were approached about study participation.

After obtaining written informed consent, study participants were asked to complete a brief psychometric battery that included the Patient Health Questionnaire-9 (PHQ-9),[37] a validated 9-item self-report scale that has been used as a brief instrument to assist primary care physicians in diagnosing, monitoring, and tracking the severity of depression symptoms. The PHQ-9 has been shown to have superior discriminative power versus other comparable instruments.[38] It has been validated extensively validated in multiple populations against trained interviewers using the Diagnostic and Statistical Manual of Mental Disorders IV-Text Revision (DSM-IV-TR),[39] with a cutoff score of 10 or higher demonstrating both a sensitivity and specificity of 88% for Major Depressive Disorder (MDD).[37] Patients also were asked to complete the D Scale-14 (DS-14),[18] a validated 14-item self-report scale used to assess for the presence of type-D personality, a distressed personality-type characterized by negative affectivity and social inhibition and that has been associated with poor cardiovascular outcomes independent from depression.[40–49] Patients also were asked to complete the Modified Morisky Scale (MMS),[50] an expanded 6-question version of the Morisky Medication Adherence Scale,[51] a self-report instrument designed to measure medication adherence.. The MMS questionnaire contains 6 yes/no items, 3 addressing knowledge about a medication and 3 addressing motivation for taking a medication. Each set of 3 items is scored separately, with scores of 0-1 indicating low knowledge/motivation and scores of 2-3 indicating high knowledge/motivation, respectively.

On the day of surgery, participants were asked if they took their most recent beta-blocker dose, and their blood pressure and heart rate were recorded by their treating clinician. Additional perioperative blood pressures and heart rates, comorbidities, and the presence or absence of a prior diagnosis of depression were recorded based on manual chart reviews conducted by the study investigators. Blood pressure and heart rate measurements were obtained for the following four time points: (1) from the most recent primary care visit, (2) upon arrival at the hospital before entering the preoperative holding area, (3) on entrance to the operating room, and (4) maximal blood pressures and heart rates in the operating room. Preoperative blood pressures were measured by a noninvasive automated oscillometric blood pressure cuff. Intraoperative blood pressure measurements were done at the discretion of the anesthesia provider. Maximal intraoperative values were determined by review of the manually recorded intraoperative anesthesia records. Participants were coded as having depression if a provider had listed depression in the past medical history or problem list or if the participant was prescribed an antidepressant medication in the absence of an indication for such medication other than depression.

The primary aims were to test the association of PHQ-9-assessed depression symptom severity and type-D personality with preoperative beta-blocker nonadherence and to measure the prevalence of untreated major depression symptoms among this population. Secondary aims were to test (1) the association between depression symptom severity and self-reported knowledge and motivation about beta-blocker usage, and (2) the association between perioperative beta-blocker nonadherence and day of surgery vital signs.

Following the Veterans Affairs/Department of Defense (VA/DoD) clinical practice guidelines for interpreting the PHQ-9 questionnaire,[52] PHQ-9 scores typically are classified into a 4-level ordinal variable of depression symptom severity as follows: Scores of 0-9 are classified as "no depression or remission," scores of 10-14 are classified as "mild depression symptoms," scores of 15-19 are classified as "moderate depression symptoms," and scores of 20-27 are classified as "severe depression symptoms."[52] Because of a paucity of scores above 20, moderate and severe depressive symptoms were combined into a single category. Type-D or distressed personality type was determined as present or absent based on DS-14 scores as described previously,[18] with scores for both negative affectivity and social inhibition greater than 9 required for the finding of the presence of type-D personality. Preoperative beta-blocker adherence was determined as yes or no based on participant self-report on the day of surgery regarding the most recently scheduled dose. The Cochran-Armitage test for trend was used to measure the possible association between the ordinal PHQ-9 depression severity variable and likelihood of beta-blocker nonadherence. The Fisher's exact test was used to test the association between beta-blocker nonadherence and type-D personality.

Descriptive statistics are reported as n (percent) or mean (SD). Hypothesis tests for significant associations or differences among groups were based on the Cochran-Armitage test for trend, Fisher's exact test, or the Mann-Whitney U test as indicated. All p values are reported for two-tailed tests with $p < 0.05$ considered the threshold of statistical significance without correction for multiple comparisons.

RESULTS

Of 120 patients participating in the study, day-of-surgery data were available for 99. Of the 21 excluded participants, 17 did not have surgery as scheduled, 2 had their beta-blocker stopped by a treating clinician before the day of surgery, and 2 had missing data (Fig 1).

The mean age of the sample was 69.3 (±10.5) years and ranged from 33 years to 89 years; 96 (97.0%) were male, and 15 (15.1%) were scheduled for cardiac or vascular surgery (Table 1). The most commonly prescribed beta-blocker types were metoprolol (n = 59, 59.6%), followed by atenolol (n = 29, 29.3%), with the remaining participants prescribed either carvedilol (n = 6, 6.1%) or propranolol (n = 5, 5.1%). Table 1 provides a descriptive summary of the study cohort stratified by beta-blocker adherence. Adherent and nonadherent participants had similar demographic and comorbid characteristics across all baseline variables with the exception that significantly more