

Addressing the Feedback Loop Between Depression, Diabetes, and Cardiovascular Disease

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Cardiovascular disease (CVD), diabetes, and depression are all potentially deadly in their own rights, but together they create a much more complicated clinical scenario. For instance, in a retrospective analysis of over 500,000 patients without CVD at the start of the study, type 2 diabetes and depression individually raised the 7-year risk of myocardial infarction (MI) by 30%; for patients with both diabetes and depression, that risk shot up to 82%.¹ Moreover, more severe depression predicts proportionally worse outcomes across the CVD spectrum, including higher mortality, more hospital readmissions, lower quality of life, and worse perioperative complications.² And although depression is more common among CVD and diabetes patients than in the general population,^{2,3} screening and treatment rates remain low.^{2,4}

A SELF-PERPETUATING LOOP

Archana Sadhu, MD, endocrinologist at Houston Methodist Hospital, notes that the three conditions have a "synergistic" relationship that causes them to feed into one another.

"If you are starting off with depression and you didn't have diabetes or prediabetes, the physiologic and lifestyle changes that accompany depression will increase your risk for diabetes and cardiovascular disease," Sadhu says. "Additionally, having chronic diseases can induce depression."

Depression, diabetes, and CVD interact to form a complicated web that increases risk and worsens outcomes for each individual condition (Figure 1). For instance, depression can lead to, result from, or exacerbate CVD. It independently predicts both CVD onset and poor outcomes.² One meta-analysis found that major depressive disorder (MDD) led to a 60% increased risk for developing coronary heart disease (CHD), and research shows that MDD after MI leads to five times the risk of cardiac mortality within six months.⁵

Likewise, depression confers a 65% increased risk for diabetes,³ a risk factor for CVD unto itself. (Meanwhile,

coronary artery disease is the leading cause of morbidity and mortality in patients with diabetes. See issue 14.4 of the Methodist DeBakey Cardiovascular Journal for more about CVD and diabetes.) A multitude of physiological factors are thought to lead from depression to diabetes, including biological and neurohormonal changes causing hyperglycemia and insulin resistance.^{3,6}

Depression, in turn, fosters unhealthy lifestyle decisions, such as smoking, lack of physical activity, poor dietary habits, and lower adherence to medications and cardiac rehabilitation. These habits increase the risk of developing CVD and diabetes and make it more difficult to manage all three conditions.^{2,6}

"Patients with depression are not motivated to get out, exercise, and be physically active and tend to isolate themselves. They may also use overeating as coping mechanism," Sadhu said. "Those are the exact risk factors for diabetes."

This three-way relationship then loops back to depression, as both diabetes and CVD also have the potential to aggravate a patient's depression due to several physiological and mental factors. Diabetes disrupts glucose metabolism, causing hyperglycemia that leads to hippocampus dysfunction and atrophy, which in turn leads to depressed mood.³ Cardiovascular disease, Sadhu notes, impairs blood perfusion to the organs, including the brain, thus increasing a patient's risk for depression or other psychological problems. The mental distress that comes from managing chronic diseases—whether it be feelings of helplessness from a diabetes diagnosis³ or post-traumatic stress following shocks from an implantable cardioverter-defibrillator²—worsen or cause depression. Moreover, Sadhu says, it's important not to overlook the lifestyle implications of CVD and diabetes.

"These are chronic diseases, which means a daily and lifelong struggle with lifestyle behavior that can be burdensome. That, in and of itself, can cause depression," she says.

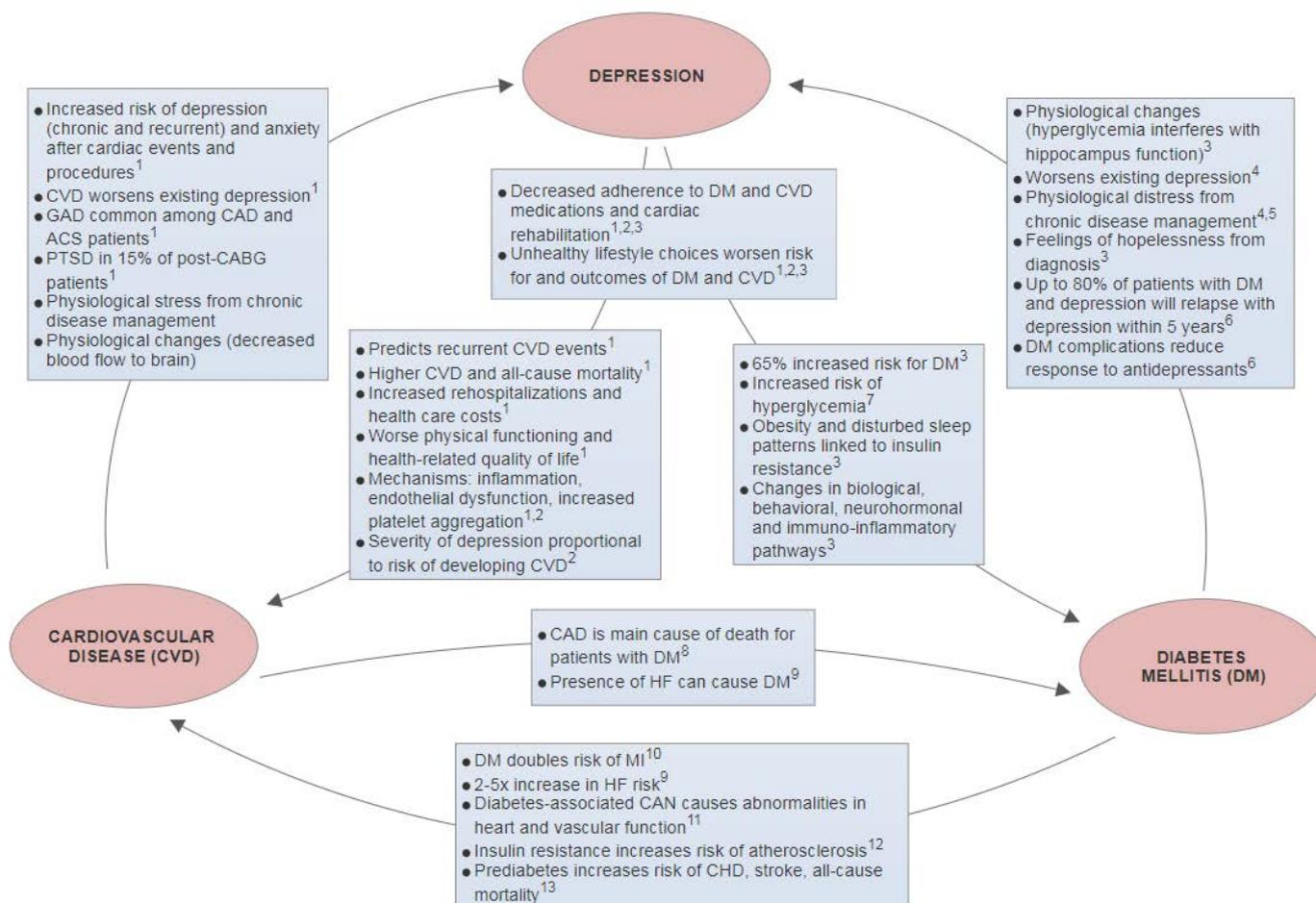


Figure 1.

Depression, diabetes, and cardiovascular disease feedback loops. GAD: generalized anxiety disorder; CAD: coronary artery disease; ACS: acute coronary syndrome; PTSD: post-traumatic stress disorder; CABG: coronary artery bypass graft; HF: heart failure; MI: myocardial infarction; CAN: cardiovascular autonomic neuropathy; CHD: coronary heart disease

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ADDRESSING THE PROBLEM

In light of these feedback loops, the American Heart Association (AHA) recommends that all cardiac patients be screened for depression using the 2- and 9-item Patient Health Questionnaires (PHQ-2 and PHQ-9).⁷ The AHA encourages clinicians to routinely ask patients if they have “little interest or pleasure in doing things” or “feel down, depressed, or hopeless.”⁸ Positive screens using these questionnaires together have been linked to subsequent cardiac events in patients with coronary artery disease, and positive PHQ-2 screenings in patients with heart failure have been associated with mortality.²

According to the Cleveland Clinic, temporary feelings of sadness following a heart attack or a cardiac procedure are normal.⁸ However, recurring or persistent depression has a much stronger association with CVD, and patients with CVD often experience depression long after an event, highlighting the need for follow-up screenings.²

For patients with both CVD and depression, the first-line antidepressant treatment is selective-serotonin reuptake inhibitors (SSRIs), such as sertraline (Zoloft) and citalopram (Celexa), which are well studied and safe for use in this population.^{5,8,9} On the other hand, tricyclic antidepressants (TCAs) and monoamine oxidase inhibitors (MAOIs) are not recommended for patients with CVD because of cardiotoxic side effects.^{5,9} Although these treatments are generally effective at reducing depression—and thus improving quality of life—it is still not clear whether any of these antidepressants improve cardiac outcomes.⁵

Due to the significant impact of depression on diabetes and CVD, and vice versa, even small lifestyle modifications can greatly benefit a person’s health. Exercise, whether through cardiac rehabilitation or other group settings, has improved depression in randomized trials of patients with CVD.⁹ In general, exercising more and avoiding smoking, alcohol, or other unhealthy lifestyle habits can help manage all three diseases and improve overall quality of life. Sadhu stresses the importance of making these lifestyle changes, as well as early intervention and treatment, in preventing the cycles that can be created by depression, diabetes, and CVD.

“Diabetes, cardiovascular disease, and hypertension are very influenced by diet and physical activity. So, every visit with every patient with diabetes or cardiovascular disease should always address this topic in the conversation—what’s happening with their diet, and are they able to have a regular exercise program,” Sadhu said. “These lifestyle changes, by themselves, will have a great impact on the disease and, therefore, on our treatment plan.”

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Conflict of Interest Disclosure:

Ryan Chang is an intern at the *Methodist DeBakey Cardiovascular Journal* and Laura Gerik is assistant managing editor.

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