



Diabetes in Patients with Mental Illness

Comprehensive Monograph

Casey Williams, MD

Diabetes in Patients with Mental Illness

The purpose of this guide is to provide case managers with information to facilitate treatment of individuals with serious and persistent mental illness who also have co-occurring diabetes mellitus. The guide presents an overview of clinical recommendations for patients with diabetes.

Introduction

Diabetes mellitus is a common chronic disease in which affected patients cannot regulate their blood sugar. There are two types of diabetes mellitus, both discussed within this guide. Patients affected by diabetes are at risk for developing both short term and long term complications, including blindness, kidney disease, heart disease, stroke, and amputations. A diabetic patient may also be more susceptible to infections, and may be prone to have delayed wound healing. The care of the diabetic patient requires a team of health care professionals to deliver the best quality care, and the case manager plays an integral role in this team assuring the coordination of care.

In general, life expectancy for patients with serious mental illness is 10-15 years shorter than the general population. Compared to the general population, patients with serious mental illnesses, such as major depressive disorder, schizophrenia, and bipolar disorder, are nearly twice as likely to have diabetes. Although the reason for this is unknown, it is likely related to:

- Patient factors, such as diet, tobacco use, lack of exercise, obesity, low education level
- Illness factors, such as pro-inflammatory states from depression
- Medication factors, such as the use of some atypical antipsychotics to treat schizophrenia
- Environmental factors, such as decreased access to health care and low availability of screening programs and social supports.

These factors place patients with serious mental illness at an increased risk of experiencing complications from diabetes. It is important to note that not all mental health patients with diabetes will have been diagnosed and actually know that they have the disease.



The objectives of this guide are to familiarize Health Care Home Case Managers with:

- (1) The definition of diabetes
- (2) Risk factors for diabetes
- (3) Symptoms and diagnosis of diabetes
- (4) Management of diabetes
- (5) Preventing complications of diabetes
- (6) Special considerations for diabetic patients with mental illness.

Definition of Diabetes

Diabetes Mellitus is a medical condition that affects the production or working function of insulin, resulting in an inability to regulate the sugar level within the bloodstream. Normally, blood sugar ranges between 70 and 110 mg/dL. Patients with diabetes (who are not optimally treated) often have blood sugar values higher than this range.

There are two types of diabetes:

- Type 1 diabetes is a condition in which a person's immune system produces antibodies that act against cells within the pancreas that produce insulin, a hormone responsible for driving glucose (sugar) from the blood into cells for use as energy. Previously known as juvenile or insulin-dependent diabetes, Type 1 diabetes is usually diagnosed in children and young adults. Type 1 diabetes is characterized by a lack of insulin, which must be replaced by injections in order to regulate blood sugar. Type 1 is less common; only 5% of all diabetics are Type 1.
- Type 2 diabetes is much more common and typically develops in middle age. Although the exact causes of Type 2 diabetes are not completely understood, it is thought to be a result of both insufficient insulin production and resistance of cells to insulin. Although Type 2 diabetes tends to run in families, it is also attributed to an unhealthy lifestyle. People who eat excessive calories (especially from carbohydrates) without getting physical activity are much more likely to develop Type 2 diabetes. Consequently, Ninety-five percent of all diabetic patients have Type 2 diabetes.

Causes of Diabetes:

While Type 1 diabetes is caused by the production of autoantibodies against insulin-producing cells, Type 2 diabetes is caused by a combination of health habits and family history (genetics). Patients who gain weight and consume excessive sugar in their diets are more likely to develop Type 2 diabetes, although not all do. In

fact, no one really knows why some people develop diabetes and others do not. It appears that diabetes may be caused by both genetic factors (it tends to run in families) and environmental factors. Several studies have shown that individuals who have a strong family history of diabetes, do not develop diabetes themselves if they maintain a normal weight, proper diet and exercise. In patients with serious mental illness, certain medications may also be associated with the development of diabetes.

Risk Factors for Diabetes

- In the general population, risk factors for developing diabetes include:
- Weight gain, especially in the central abdominal region
- Family history (first degree relative)
- Ethnicity: African Americans, Hispanic Americans, Asian Americans and Native Americans
- Previous diagnosis of gestational diabetes (diabetes during pregnancy)
- Hypertension (blood pressure of 140/90 mmHg or higher)
- High cholesterol. High Density Lipoprotein (HDL) level below 35 mg/dL, or a triglyceride level above 250 mg/dL are all associated with an increased risk for developing diabetes
- Patients with serious mental illness are at further increased risk of developing diabetes because of:
- Patient factors, e.g. unhealthy dietary habits, lack of exercise
- Illness factors, e.g. pro-inflammatory states from major depressive disorder
- Medication factors, e.g. atypical antipsychotic medication therapy
- Environmental factors, e.g. poor access to health care, healthy foods, or fitness resources.

Common Symptoms and Diagnosis

Symptoms of diabetes are often vague and non-specific. Some people with high blood sugar may not have symptoms at all. However, there are some symptoms which may indicate diabetes, such as:

- Frequent urination (also known as polyuria)
- Excessive thirst (also known as polydipsia)
- Extreme hunger
- Unusual or unplanned changes in weight
- Increased fatigue

A Diagnosis of Diabetes is made based on the results of lab testing:

- A random blood sugar greater/or equal to 200 mg/dL,
- A fasting blood sugar greater/or equal to 126 mg/dL. Fasting is defined as nothing to eat or drink for at least 8 hours.
- A 2-hour blood sugar greater/or equal to 200 mg/dL is detected after being administered 75 grams of oral sugar. (This is also known as a Glucose Tolerance Test or GTT)
- A hemoglobin A1C test of 6.5% or higher.

Note: An abnormal result on any one of the above tests is enough to diagnose diabetes.

A patient has Impaired Glucose Tolerance (pre-diabetes) if:

- A 2-hour blood sugar between 140-199 mg/dL (but less than 200) is detected after being administered 75 grams of oral sugar.
- A fasting blood sugar between the ranges of 110 to 125.
- A hemoglobin A1C test between 5.7 and 6.4%

If a patient has high blood sugars, medical providers will sometimes test for Type 1 diabetes by measuring autoantibody levels in the blood.

Screening for Diabetes

Consumers with serious mental illness are at higher risk of developing diabetes. This risk increases if they are on certain medications for their mental conditions. Mental health consumers with diabetes are at especially high risk of complications from diabetes. Therefore, each mental health consumer should:

- Have a risk assessment done inquiring about family history, ethnicity, diet and exercise.
- Have their body mass index (BMI), blood pressure, and cholesterol panel measured each year by their primary care provider.
- Be screened for diabetes with a fasting blood glucose level every year by their primary care provider.

Management of Diabetes

Type 2 Diabetes can be managed successfully at home by eating well, exercising, and managing stress. The principles of self-management include:

- Regular, habitual blood sugar monitoring. This is especially important if a patient is sick or in a high anxiety state.
- Glucose before meals should be between 80-120 mg/dL and two hours after meals between 100-140 mg/dL
- Meal plan balance and timing.
- If a patient takes insulin, the carbohydrate content of meals should be adjusted for the amount of insulin received. Short-acting insulin should never be given without a carbohydrate snack, as this risks hypoglycemia (low blood sugar), discussed below.
- Patients should see a nutritionist at least once.
- Stress management
- Regular exercise program
- Medications when needed (including insulin). These will be discussed separately.

Hemoglobin A1C testing

Hemoglobin A1c is a blood test done in health care settings that measures an average blood sugar over 3 months. The results are measured in a percentage. The usual lab reference range for a normal HgbA1c is from 4.4 - 6.4 percent. Typical diabetic patients should be managed between 7 and 8%. An A1C above 8% is associated with a higher risk of diabetic complications.

Checking Blood Sugars

Blood sugars are usually checked in the morning before eating breakfast, which indicates overall levels of glucose after fasting. Additionally, some patients may require testing before meals during the day to determine need for insulin, the effectiveness of medications, etc. Some patients may need to check blood sugars in response to symptoms from possible hypoglycemia.

A spot blood sugar level can be measured using a portable glucometer. This device requires a small amount of blood, which is obtained using a small needle called a lancet. The drop of blood is then placed onto a testing strip, which is inserted into the glucometer. After a short amount of time, the glucometer displays the blood sugar level in mg/dL.

There are several brands of glucometers, and testing supplies may look different for each of them. It is important for case managers to familiarize themselves with each client's glucometer in case the client requires assistance in testing their blood sugars. Most glucometers come with a set of picture-based instructions for

use. Typically, the glucometers themselves are easy to obtain, but the testing supplies are expensive and not easily replaced.

Medications: Oral medications to regulate blood sugar are used in Type 2 diabetics. The most commonly used medication is metformin, followed by sulfonylureas, DPP-4 inhibitors, and GLP-1 agonists. Alpha-glucosidase inhibitors and meglitinides are less common, but still may be prescribed. Thiazolidinediones are no longer frequently prescribed because of concerning associations with cardiovascular disease among other problems. Examples of each of these classes of medications can be found in the table below.

Types of medications

Insulin Therapy

Type I diabetes must be managed with insulin replacement therapy. Type II diabetes is often managed with the oral agents outlined above and lifestyle changes, but sometimes insulin must also be added to obtain maximum blood sugar control. Insulin is most often given by subcutaneous injection using either a needle/syringe, or by a needle pen (such as a Solostar). Some Type I diabetes patients receive insulin through a continuous pump device which is attached to a needle in the skin. An insulin pump requires frequent programming and adjustments, and may not often be suitable for patients with severe mental illness.

There are many types of insulin, and they are categorized by how long they work to decrease blood sugars. Basal (long-acting) insulin works over many hours to provide a longer level of sugar control. Bolus (short-acting) insulin is given just after eating a meal to control sugars immediately. Some insulin is a combination of long and short acting that is given at meals, but also works for hours afterward. Below is a table of categories of insulin therapy, names of individual and combination insulin treatments, and their durations of action.

Types of Insulin:

Patients with impaired glucose tolerance (pre-diabetes) usually do not require any medications. In these patients a diet should be prescribed, along with exercise and they should be followed very closely for the possibility of developing diabetes in the future.

It is important to note that managing blood sugars with either diet/exercise, medications or insulin, is only one part of managing diabetes. An equally important part of managing this disease involves screen-

ing (and if possible preventing) complications of the disease from occurring. The next section focuses on this.

Preventing complications of diabetes

Diabetes can be associated with both short-term and long-term complications.

Short-term complications of diabetes:

Hypoglycemia: This is defined as a blood glucose level below 70 mg/dl. Hypoglycemia is not a complication of diabetes itself, but a result of over-treatment of high blood sugar in diabetic patients. A hypoglycemic episode can result from taking an incorrect dose of a medication (especially a sulfonylurea) or by giving an insulin injection without compensating with a carbohydrate snack or meal. Patients who have had previously uncontrolled blood sugar levels (e.g. above 200) may develop hypoglycemia symptoms with normal blood sugar levels. Symptoms of hypoglycemia can be vague, and can include irritability, confusion, anxiety, heart palpitations, numbness/tingling around the mouth or extremities, tremor, sweating, and hunger. Severely low blood sugars can cause seizures or loss of consciousness and lead to coma, permanent brain damage, or death. If a diabetic patient develops these symptoms, especially after dosing a medication or injecting insulin, check his or her blood sugar immediately and if it reads below 70, give a sugary snack, such as a cup of orange juice or regular soda, or soft candy. Repeat checking sugars and giving snacks until the symptoms improve. If symptoms and/or blood sugars do not improve, arrange for the person to be seen by a medical provider. ANY hypoglycemic episode should be followed up by a medical provider.

Diabetic Ketoacidosis (DKA):

This is a life-threatening complication most often associated with type 1 diabetes, although it rarely occurs in patients with type 2 diabetes in states of trauma, infection, or other extreme stress. DKA occurs in a setting of extremely high blood sugar (often over 500, but sometimes over 1000 mg/dL). In this state, the cells do not take in the sugar normally used for energy and the body compensates by producing ketones, which do not contain as much energy. As a result, the stressed cells produce acid, which can be detected in the blood. DKA can be triggered by underlying infection (40%, most often are urinary tract infections or pneumonia), missed insulin treatments (25%), and newly diagnosed, previously unknown diabetes (15%). Patients in early DKA may complain of fatigue, malaise, thirst, and frequent urination. As the DKA progresses, they may develop nausea, vomiting and complain of abdominal pain. They may begin breathing rapidly and develop fruity-smelling breath (as a result of the ketones). Late stage DKA can lead to seizures, loss of consciousness, coma, and death.

If you suspect that a patient may be developing DKA, arrange immediate transportation to an emergency room.



The treatment goals of the patient with DKA are as follows: (1) improve the dehydration with intra-venous fluids, (2) decrease the blood sugar (emergent inpatient insulin treatment), (3) reverse the acidic state in the patient's blood, (4) correct electrolyte losses and imbalances, and (5) find and treat the underlying causes.

Infections and Illnesses: Patients with diabetes are more susceptible to infections and often take longer to heal from injuries and illness when compared to the general population. All members of a diabetic patient's care team should be aware of his or her vaccination status.

Long-term complications of diabetes:

The long-term health problems that occur in diabetes are caused by injury to both large and small blood vessels within the body. Over time, this results in damage to the kidneys (nephropathy), nerves (peripheral neuropathy), and eyes (retinopathy). Injury to blood vessels can also lead to erectile dysfunction and poor functioning of the stomach and intestines (gastroparesis). Large vessel disease increases the risk of hypertension, stroke and heart attacks. Many of the above complications result in permanent disability. As such, steps are taken to screen for them at least yearly.

Screening for kidney disease: Every patient should have a blood creatinine test and a urine protein (micro-albumin) test done once a year. The urine test is able to detect early damage to the kidneys from diabetes. Anyone who has positive micro-albumin in the urine should be started on an ACE-inhibitor medication, as these have been shown to slow down the progression of kidney disease.

Screening for peripheral nerve damage: Diabetes leads to damage to nerves in the legs and feet, causing pain and decreased sensation (numbness). Patients may be unaware of foot injuries and poorly able to heal them, which may result in significant infections and eventually need for amputation. All patients with diabetes should be instructed on proper foot care and have an annual foot exam to determine both sensory perception and circulation to the legs and feet. Any evidence of poor circulation or wounds over the feet or legs should be evaluated by the patient's primary or specialist doctors.

Screening for diabetic retinopathy: Diabetes is the leading cause of blindness, and there are often no symptoms or loss of vision until significant, permanent damage is already present. All diabetic patients should have yearly diabetic eye exams to detect early damage (microscopic hemorrhages) or changes to the eye. Damage to the retina can be prevented with good blood sugar management.

Screening for other chronic diseases: All diabetic patients should be screened at least yearly for high blood pres-

sure and elevated lipids (cholesterol). Low-Density Lipoproteins (LDL) levels should be maintained below 100 in every diabetic patient. Finally, tight control of blood pressure is also essential in the diabetic. Elevated blood pressure places a diabetic at risk for developing blood vessel disease, which may result in strokes, heart attacks, and peripheral vascular disease. Blood pressures should be maintained below 140/90 mmHg.

Point to the Case Manager 11: Yearly screening for diabetic patients includes a urine micro albumin test, a dilated eye exam, a foot exam and cholesterol screening. LDL cholesterol should be 100 mg/dL or less in diabetic patients. Blood pressure should be kept well controlled in diabetic patients.

Medications and Diabetes

Certain classes of medications can cause or exacerbate high blood sugars or even cause type II diabetes. Some classes of medications are strongly associated with high blood sugars and diabetes, while others are weakly associated:

Strongly associated with causing diabetes:

- Antipsychotics such as clozapine and olanzapine. Discussed below.
- Corticosteroids such as prednisone or methylprednisolone.
- Immunosuppressive and chemotherapy medications such as tacrolimus and ciclosporin A
- Protease inhibitors used to manage HIV, such as ritonavir.

Weakly associated with causing diabetes:

- Beta blockers such as metoprolol or carvedilol
- Thiazide diuretics such as HCTZ and chlorthalidone
- Cholesterol lowering medications (statins)

Special considerations for patients with mental illness

There is an established association between treatment with some atypical anti-psychotic medications and weight gain, new onset of type 2 diabetes, and worsening of existing diabetes. Development of diabetes is independent of weight gain in some patients. Patients treated with clozapine, or olanzapine have an increased risk for diabetes compared to patients treated with other atypical anti-psychotics. The risk associated with risperidone and quetiapine is less clear. Aripiprazole and ziprasidone appear to carry the least risk of development of diabetes.



Point to Case Manager 12: A patient with chronic mental illness who is treated with clozapine or olanzapine needs to be carefully monitored for the onset of diabetes, exacerbation of existing diabetes, or the onset of DKA. This can occur even in those patients who do not experience weight gain and are not obese. The risk associated with risperidone and quetiapine is less clear.

In healthy, non-diabetic patients, the following assessments should be performed before starting treatment with an atypical anti-psychotic medication and at regular intervals:

- Height, weight, and body mass index at every visit
- Vital signs (including blood pressure) at every visit
- Family history of Diabetes at initial visit
- Fasting plasma glucose and lipid levels
- initially at week 12 of treatment
- annually

Obtaining baseline values of the relevant physical and laboratory parameters including blood pressure, weight, height, BMI, waist circumference, fasting serum lipids (total, LDL, and HDL cholesterol along with triglycerides), and a fasting plasma glucose level is critical prior to initiating anti-psychotic medications. During the initiation of anti-psychotic treatment, patients should have these values monitored regularly. The frequency of monitoring depends on individual patients and their clinical features. In general, assessments should be made more frequently during the initial titration phase of treatment. However, all schizophrenia patients treated with anti-psychotic medication should have a yearly assessment of fasting lipids and glucose.

If a patient on an antipsychotic develops weight gain, elevations in cholesterol profile, or elevated glucose levels, switching to another agent that is not associated with significant weight gain or diabetes should be considered. For certain situations clinical benefits may outweigh risks, as is the case with clozapine (improvement in treatment refractory patients outweighs risk of metabolic side effects). These patients should be referred to diabetes self-management education programs as well as a specialist for further medical consultation.

Case managers should be aware of the signs and symptoms of acute metabolic deterioration (e.g., DKA). Confusion, abdominal pain, nausea, frequent urination and thirst can be indicative of life threatening complications and these symptoms should prompt emergent evaluation and treatment.

In addition, schizophrenia patients suffer from impaired insight, lack of resources (i.e., access to medical care),



lower medication and treatment compliance, and more psychosocial stress, all of which can compound medical problems. For these reasons, the case manager must at times be proactive in terms of assessing the patient for risk factors for diabetes.

Finally, case managers have a unique opportunity to provide lifestyle modification counseling and education to their clients. Type 2 diabetes can be both prevented and treated by healthy nutrition and adequate weekly physical activity. Case managers should encourage their clients to avoid excessive sugar, saturated fats, cholesterol, and calorie-dense foods, and participate in 150 minutes of moderate physical activity or 75 minutes of strenuous physical activity per week. Additionally, clients should be encouraged to stop smoking and to avoid consuming more than 1 standard alcoholic drink per day.

