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Diabetes Management

Introduction

The prevalence of diabetes is projected to increase globally in the next several years, so the likelihood of OTs and OTAs treating patients with this chronic condition is quite high. In order to effectively treat diabetes, occupational therapists must not only understand the mechanisms of the condition and its symptomatology, but also assist with a range of interventions for a well-rounded approach. Diabetes requires healthcare intervention in primary, secondary, and tertiary stages. From a rehabilitative lens, OT can intervene in creating healthy habits, managing diabetes symptoms, supporting occupational engagement, preventing complications, promoting self-care routines, and enhancing overall quality of life for individuals living with diabetes. OTs must be aware of diabetes symptoms such as vision changes, fatigue, and neuropathy, which can all affect a patient's functional abilities. Therapists should also be prepared to address these symptoms in an effort to minimize their effects on the therapy process. By having more knowledge about diabetes, occupational therapy professionals can support patients in adapting their routines, behaviors, and environments to maintain independence and manage their condition across the lifespan.

Section 1: Diabetes Background Information

References: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22

Diabetes mellitus (DM), colloquially referred to as diabetes, is one of the most common conditions in the United States. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) reports that 38.4 million Americans were living with this condition in 2021, which totals about 11.6% of the general population. Just over 38 million (38.1) of these individuals were over the age of 18. While the majority of these people have been diagnosed with the condition, a

large portion are dedicated to undiagnosed diabetes cases. It is estimated that 8.7 million adults are living with undiagnosed diabetes, which is around 22.8% of all those living with diabetes.

While these numbers are already quite significant, they are expected to continue rising at a rapid rate. One study estimates that the number of people with diabetes across the globe will more than double in the next 25 years. Projections are expected to reach 1.3 billion by the year 2050. There are several reasons that have contributed to this sharp increase. These include:

1. Greater awareness leading to more diabetes testing and diagnosis
2. A higher number of individuals living with obesity
3. Lack of an effective diabetes mitigation strategy
4. An aging population
5. Increased consumption of carbonated beverages and high-sugar foods

The greater majority of diabetes cases are individuals with type 2 diabetes, which is especially true for older adults with the condition. Type 2 diabetes is also the reason for 95.4% of disability-adjusted life years (DALYs), which is another marker that has significantly risen in the last three decades. While type 2 diabetes is one of the most predominant of this chronic condition, there are several other types:

- **Brittle diabetes:** A form of diabetes that causes severe changes in blood glucose levels
    - This is also known as labile diabetes due to how unstable the condition is and how much management it requires
    - Brittle diabetes can occur with any type of diabetes, but it is almost always found in those with type 1

- **Cystic fibrosis-related diabetes (CFRD):** As the name suggests, this type of diabetes is most common in people who have cystic fibrosis
    - The cause of cystic fibrosis diabetes is an accumulation of mucus that inflames and scars the pancreas, which prevents its cells from producing enough insulin
    - The pancreas function of someone with CFRD correlates with the severity of their cystic fibrosis because this determines how much mucus has built up on the pancreas; for this reason, most individuals with CFRD retain some degree of insulin production
    - Symptoms are similar to types 1 and 2 diabetes, but also come along with a decline in lung function that places someone at a high risk of respiratory infections
- **Gestational diabetes:** A type of diabetes that impacts pregnant women, especially around the second trimester (24 weeks)
    - Gestational diabetes can be asymptomatic and typically resolves after a woman's pregnancy ends, but this condition does increase a woman's risk of developing type 2 diabetes later in life
    - As they age, babies whose mothers had gestational diabetes are at an increased risk of developing diabetes themselves
    - This transient form of diabetes evolves from pregnancy hormones that cause insulin resistance
    - Due to the insidious nature of gestational diabetes, regular screening during pregnancy is crucial

- **Latent autoimmune diabetes in adults (LADA):** A type of diabetes that begins in adulthood and resembles both types 1 and 2 diabetes, but worsens over time
    - Due to the similarities in symptomatology, LADA is sometimes called type 1.5 diabetes and is often misdiagnosed as type 2 diabetes
    - The cause of LADA is largely unknown, but lifestyle changes have proven beneficial, as with other forms of diabetes
- **Maturity-onset diabetes of the young (MODY):** This cluster of diagnoses are rare conditions that cause mild, asymptomatic diabetes primarily in those under the age of 25
    - The most prevalent concern related to MODY is slightly elevated blood glucose levels, which occurs early in the morning before any meals are consumed
    - MODY is also known as type 7 diabetes
- **Neonatal diabetes:** A type of diabetes caused by a genetic mutation that leaves infants between 0 and 6 months of age with chronic hyperglycemia
    - This mutation directly impacts beta cells in the pancreas
    - Babies with neonatal diabetes are not necessarily born to mothers with gestational diabetes, as the two conditions are not related
- **Pancreatogenic diabetes:** A type of diabetes that develops as a result of an illness or other health condition that impairs pancreas function; this condition may also set in if someone has their pancreas surgically removed

    - Conditions that may cause someone to develop pancreatogenic diabetes include but are not limited to pancreatic cancer, acute or chronic pancreatitis, cystic fibrosis, and hemochromatosis
    - Treatment for this type of diabetes is largely dependent on how much function someone's pancreas has left, but often include lifestyle changes, prescription medication, and/or insulin
    - Someone with pancreatogenic diabetes is more likely to die or suffer complications as a result of hypoglycemic events than someone with another type of diabetes due to how unpredictably their blood glucose levels shift; this also makes the condition more difficult to diagnose and manage than many other types of diabetes
    - This is also known as type 3c diabetes or secondary diabetes
- **Prediabetes:** A type of diabetes characterized by higher-than-normal blood glucose levels, but levels are not high enough for someone to be diagnosed with type 2 diabetes
    - Prediabetes rarely causes any symptoms, but it does raise someone's risk of stroke, type 2 diabetes, and cardiovascular disease
    - While the cause of prediabetes is not entirely clear, this chronic condition does have a genetic component, meaning individuals with a family history of type 2 diabetes are at a higher risk of prediabetes
    - Prediabetes can be reversed through lifestyle changes
    - This condition is also known as impaired glucose tolerance
- **Steroid-induced diabetes:** A sometimes temporary condition in which corticosteroid usage causes a decrease in liver sensitivity, which leads to a rise in blood glucose levels

    - In most cases, hyperglycemia resolves once steroid use stops
    - However, if someone continues to take steroids, there is a chance they will develop type 2 diabetes
    - Symptoms of steroid-induced diabetes typically mimic those of type 2 diabetes, as pancreatic cells do not respond appropriately to insulin
    - In the event someone needs to stay on steroids long-term to manage a different condition and continues to display signs of steroid-induced diabetes, treatment is often similar to that for type 2 diabetes
- **Type 1 diabetes (T1D):** A chronic condition in which the pancreas creates little to no insulin, which leads to heightened blood glucose levels
    - Type 1 diabetes has a genetic component
    - All types of diabetes are classified as autoimmune disorders, but there is evidence that type 1 diabetes in particular may develop from the body's response to viral infections
    - Type 1 diabetes has been referred to as juvenile diabetes (since it typically begins during childhood) and insulin-dependent diabetes (since insulin injections are the predominant treatment for this type of diabetes), but these terms are now outdated
    - Lifestyle changes can assist with the management of type 1 diabetes but, unlike some other forms of diabetes, this condition is not reversible
- **Type 2 diabetes (T2D):** A type of diabetes in which liver cells, fat cells, and muscle cells become insulin resistant, which prevents them from processing enough glucose for the body; type 2 diabetes also prevents the pancreas from making enough insulin to regulate blood glucose levels

- The exact cause of type 2 diabetes is still unclear, but healthcare professionals know that inactivity and being overweight both increase someone's risk
- Other risk factors for type 2 diabetes include increased age, a family history of type 2 diabetes, and an excess of fat in the abdomen
- A diagnosis is made using the glycated hemoglobin (A1C) test, which shows a record of someone's average blood glucose levels over the span of a few months
- A1C test results below 5.7% are considered normal while a range of 5.7% to 6.4% indicates prediabetes and results at 6.5% or more are suggestive of diabetes
- Type 2 diabetes cannot be reversed, but someone can avoid complications through lifestyle changes

Diabetes insipidus is another condition of note, as it may be a differential diagnosis for diabetes mellitus. While diabetes insipidus sounds like a form of diabetes, they differ in an important way. Diabetes insipidus does not cause any fluctuations in blood glucose levels, while all forms of diabetes mellitus do in some way. However, diabetes insipidus does cause similar symptoms (such as excessive thirst and increased urination) to those of diabetes so the two conditions may be mistaken for one another. Diabetes insipidus similarly requires medical management for the best outcomes.

Another similarity between the various types of diabetes is that they typically respond well to lifestyle changes. The most common and impactful lifestyle changes for someone looking to manage diabetes includes healthy eating, regular exercise, weight loss (if one is overweight or obese), and regular at-home blood glucose monitoring. Many individuals with diabetes (particularly types 1 and 2)

are also instructed to take prescription medications or insulin injections to manage their blood glucose levels. We will discuss these interventions as well as how they intersect with occupational therapy's scope of practice in more detail later.

Diabetes Complications & Comorbidities

If not addressed, someone with diabetes is at risk of many other health concerns. Diabetes - in particular, high blood glucose levels associated with untreated diabetes - can cause damage to the smallest parts of the body's circulatory system: the blood vessels. While blood vessels are just one structure that transports vital blood-based nutrients to various parts of the body, they are particularly key in nourishing the neurological system. Over time, nerve fibers are injured by hyperglycemia and portions of nerves may even die off altogether if the damage is severe enough. This is precisely why neurological damage is the common factor in the majority of diabetes complications, including:

- Cardiovascular disease
    - When blood glucose levels are not regulated, large blood vessels that supply the heart are impacted. This can cause and accelerate various cardiovascular complications, including peripheral artery disease, coronary artery disease, angina, and atherosclerosis.
    - Individuals with unmanaged diabetes may also experience heart failure, especially if they have hypertension. High blood pressure increases the force that blood exerts on artery walls, and high blood glucose levels damage the blood vessels. Diabetes leads the blood vessels to narrow so that blood has more difficulty passing through. This causes the heart to progressively weaken over time as a result of receiving less oxygen and nutrients.

- Cerebrovascular accident
    - High levels of blood glucose can lead to an increase in fatty deposits and blood vessel clots in the neck and/or brain. These clots can travel to critical parts of the brain or they can stop the flow of oxygen to the brain, both of which can lead to a stroke.
- Chronic kidney disease
    - Someone's risk of chronic kidney disease is even higher if they have hypertension along with diabetes, since this places extra strain on the kidneys.
- Diabetic eye disease
    - These are a set of eye-related conditions that can impact those with diabetes. Diabetic eye diseases can develop as a result of tissue swelling, changes in eye fluid levels, and damaged blood vessels within the eyes. Conditions include diabetic macular edema, diabetic retinopathy, glaucoma, and cataracts. If any diabetic eye disease is not managed, blindness can result.
- Diabetic neuropathy
    - While neuropathy is most known for its impact on the sensation and skin of the feet, it can also impact internal structures such as the sexual organs, sweat glands, gastrointestinal tract, heart, and bladder or other parts of the urinary tract.
- Foot complications
    - Due to decreased blood flow and nerve damage to structures in the feet, individuals with unmanaged diabetes are at risk of cracked and dry skin, calluses, corns, ingrown toenails, fungal infections,

hammertoe, and bunions. In addition, it is common for those with diabetes to experience slow-healing cuts, blisters, burns, and pressure ulcers. If any of the above foot-related concerns is not actively managed, they can lead to infections, gangrene, Charcot foot, and foot amputations.

- Gestational diabetes complications
    - Babies of mothers who have gestational diabetes can grow abnormally large in size, which can cause difficulties during delivery. These babies may also experience low blood glucose levels immediately after birth and can even die if these concerns are not managed quickly or properly. Mothers who have untreated gestational diabetes while pregnant are likely to develop preeclampsia, which causes high blood pressure and an excess of protein in the urine.
    - In addition, mothers who develop gestational diabetes during their pregnancy are at an increased risk of developing the same condition during subsequent pregnancies.
- Hearing loss
    - Unmanaged diabetes can damage the transmission of nerve signals from the brain to the inner ear.
- Myocardial infarction
    - Those with untreated diabetes can experience greater amounts of atherosclerotic plaque formation and thromboses, which both can cause myocardial infarctions. In addition, diabetic individuals with neuropathy are at an even greater risk of myocardial infarction. This

is because atypical neuropathy symptoms may lead to differential diagnoses and delay intervention that could prevent an infarction.

- Oral complications
    - Excess sugar is known to cause cavities on the surface of teeth, and high blood sugar levels are just as detrimental to other aspects of oral health. Diabetes increases the amount of harmful bacteria present in the mouth, which can cause increased plaque, bad breath, cavities, tooth decay, gum disease, and even tooth loss. Individuals who develop gum disease and have diabetes are known to have more severe and slow-healing conditions.
- Sexual dysfunction
    - Diabetes is associated with erectile dysfunction and low testosterone levels in men. The latter is attributed to the relationship between low testosterone and insulin resistance, which develops since testosterone aids tissues in moving blood glucose when insulin is produced. Men may also experience a diabetes complication called Peyronie's disease, which results from a buildup of scar tissue inside the penis.
    - Women with diabetes are more likely to experience urinary tract infections and yeast infections, which can cause pain, discomfort, and low arousal during sex.
    - Diabetes-related sexual concerns in all genders are typically attributed to poor nerve connections between the sexual organs and the brain as well as decreased blood flow and impaired sensation.
- Skin conditions

- High blood glucose levels and poor circulation over extended periods of time can lead to a host of skin conditions. These include cellulitis, diabetic dermopathy (also known as shin spots), acanthosis nigricans (common with those who are obese and have diabetes, as it leads to velvety dark patches in skin creases), necrobiosis lipoidica (a rare condition that causes yellow, itchy spots on the skin), bullosis diabeticorum (diabetic blisters), eruptive xanthomatosis (small, sensitive, and itchy bumps often on the hands and feet), and digital sclerosis (thick, waxy, stiff skin that begins on the fingers but can become inflamed and spread to the rest of the body as the condition worsens).
- People with diabetes can also experience fungal infections more frequently than others do. These can include athlete's foot, candidiasis (yeast infections), onychomycosis (nail infections), ringworm, jock itch, and vaginal infections.

There are also several medical conditions comorbid with diabetes mellitus. You will notice there is some crossover between diabetes complications and comorbidities, which is typical. The main difference between the two is that diabetes comorbidities exist alongside the condition and can be rather insidious. Diabetes complications, on the other hand, occur as a direct result of severe or worsening diabetes so they more notably impact someone's function and overall health. It is important to note that diabetes comorbidities do, however, occur with a greater likelihood due to diabetes itself and should be managed to prevent complications.

Research shows that almost 30% of individuals with type 2 diabetes have three or more comorbidities. The most common conditions that are comorbid with

diabetes are hypertension (37%) and ischemic heart disease (10%). Other diabetes comorbidities include:

- Alström syndrome
    - This is a very rare recessive genetic disorder that causes multiple organ systems to fail at a very early age. As a result, Alström syndrome leads children to be short of stature, obese, progressively lose vision and hearing, and develop early-onset type 2 diabetes along with cardiomyopathy.
- Alzheimer's disease
    - Abnormally high blood glucose levels are shown to increase the beta-amyloid protein, which contributes to the development of Alzheimer's disease. This demonstrates a particular connection between type 2 diabetes and Alzheimer's disease since hyperglycemia is most common with that form. In addition, high blood glucose levels cause inflammation, which is another marker for Alzheimer's disease and similar types of dementia.
    - Alzheimer's is also associated with type 3c diabetes, which results when insulin signals in the brain are not functioning well enough. This can lead to brain dysfunction in other areas, and can contribute to Alzheimer's. In fact, those with type 3c diabetes are at a significantly higher risk of Alzheimer's than others are.
- Cancer
    - Diabetes has been linked to a higher risk of pancreatic cancer, which is understandable due to the role the pancreas plays in the development of diabetes. In addition, diabetes is associated with a greater risk of breast, bladder, colon, and liver cancer.

    - Someone's cancer risk often rises due to overstimulated cell growth, specifically in those who have type 2 diabetes, along with high levels of inflammation.

- Chronic obstructive pulmonary disease (COPD)
    - Underlying processes such as inflammation, metabolic changes, and high levels of oxidative stress can cause and worsen diabetes as well as lead to COPD.

- Depression
    - Those with diabetes are two to three times as likely to experience depression as those who do not have diabetes. This risk is most heightened in those who have type 1 or type 2 diabetes.

- Dyslipidemia
- Hyperlipidemia
- Osteoarthritis
    - Inflammation, nerve damage, and limited blood flow can impact all parts of the musculoskeletal system, which can increase destruction of the protective joint capsule and, eventually, the joint itself.

- Osteoporosis
    - The risk of osteoporosis is highest in those who have type 1 and type 2 diabetes because each of these conditions increase the function of osteoclasts and decrease that of osteoblasts. This means that bone cells are dying off at a higher rate (either due to damage or simply being too old) and too few new bone cells are being produced. This

causes bone loss at an accelerated rate, which inevitably leads to conditions such as osteoporosis and osteopenia.

- Pneumonia
    - Diabetes causes an increased risk of infections, which can lead to acute pneumonia. If someone has other lung conditions, such as asthma or COPD, this can further complicate and prolong the illness.
- Sleep disorders and disturbances
    - Specifically, diabetes is associated with more frequent nighttime urination (nocturia) and waking up more frequently during the night.
    - However, specific sleep disorders connected with diabetes include sleep apnea, insomnia, and restless leg syndrome. All types of sleep disturbances connected with diabetes typically arise due to unstable blood sugar levels, so diabetes management helps lower someone's risk of these concerns.
- Thyroid conditions
    - High thyroid hormone levels are linked to the development of type 2 diabetes. In addition, a dysfunctional thyroid gland is typically associated with insulin resistance, which raises someone's risk of type 2 diabetes.
    - The link between thyroid conditions and diabetes stems from changes in the body's metabolic rate as well as the rate at which glucose is produced by the liver and absorbed through the digestive system. The thyroid gland also impacts cortisol production through the hormones it secretes, which can upset the regulation of thyroid hormone and insulin and exacerbate diabetes symptoms.

- Wolfram syndrome
    - A rare recessive genetic disorder that causes children to develop significant vision changes (specifically progressive optic atrophy) and early-onset type 2 diabetes. Children with this condition also experience hearing loss and nervous system degeneration.

Studies suggest that diabetes comorbidities are more likely to arise in individuals with diabetes who are also of advanced age, female, and live in areas with less access to medical care. However, the risk of experiencing both diabetes complications and comorbidities goes down if someone adopts a healthy lifestyle.

Section 1 Personal Reflection

What is the role occupational therapists play in diabetes comorbidities and complications?

Section 1 Key Words

Differential diagnosis - A list of potential health concerns that may be at the root of a patient's signs and symptoms; this term may also refer to the process of ruling out certain conditions based on this list; the list itself may not necessarily contain the final diagnosis, but does help doctors look into various possibilities during the diagnostic process

Disability-adjusted life year - A measurement tool created by the World Health Organization (WHO) that is used to gauge years of a person's life based on their health status; one DALY equals the loss of an entire year of health due to medical conditions; DALYs are calculated by adding together years of life lost as a result of premature mortality and the number of years someone has lived with a disability

Hyperglycemia - A medical event where someone experiences high levels of blood glucose (also known as blood sugar); this occurs when the body misuses insulin or the pancreas makes too little insulin, and can become a medical emergency called diabetic ketoacidosis if it is left untreated

Hypoglycemia - A medical event where someone experiences low levels of blood glucose; hypoglycemia happens when someone takes too much insulin or does not balance the amount of carbohydrates they consume with their insulin dosage; untreated hypoglycemia can lead to neurological events such as seizures and acquired brain injuries, and may even be fatal

Insulin resistance - A health concern that results when liver, muscle, and fat cells poorly respond to insulin; this causes the cells difficulty taking glucose from the blood and utilizing it, so the pancreas continues making insulin to help, which leads to a heightened tolerance (or resistance)

Section 2: Diabetes Impact on Occupational Performance

References: 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35

Diabetes can have a major impact on someone's occupational performance, well-being, and quality-of-life. Understandably, the negative effects associated with diabetes are greater when the condition is not being managed effectively due to the compounded risk of complications. Diabetes has the potential to impact individuals in some of the following ways:

- Cognitive decline
    - A systematic review looked at the cognitive function of adolescents with type 1 diabetes and retinopathy over several years. Results

showed a modest decline in cognition over time, with those demonstrating the most cognitive impairments also having more comorbidities (specifically those that also influence the body's vascular system). Any noted decline was found to be concentrated in one or two cognitive domains.

- In a study that looked at the impact of severe hypoglycemia on cognition from childhood through adulthood, individuals with any type of diabetes who have severe hypoglycemia scored lower on cognitive function tests. In particular, individuals whose first severe hypoglycemic episode was before the age of 6 performed the poorest. When the same markers were measured 16 years later, those with severe hypoglycemia were found to have minimal additional cognitive changes compared to the control group.
- A large longitudinal study showed that adolescents and adults between the ages of 19 and 39 who have type 1 diabetes demonstrated modest changes in information recall, psychomotor efficiency, and visuospatial skills. Yet, there was no comparison to healthy subjects, so these results are considered somewhat unreliable.
- Older adults with type 1 diabetes, lifetime occurrences of severe hypoglycemia, and recent severe hypoglycemic episodes were found to have more severe cognitive deficits compared to diabetic adults without severe hypoglycemia. Recent hypoglycemic episodes were also linked to impairments in global cognition.

- Decreased productivity at work

    - If someone has difficulty managing their blood glucose levels, they may need to frequently take planned or unplanned time off work, and they may be less productive while at work due to management of their condition. Those with diabetes are also at a greater risk of work-related injuries such as carpal tunnel syndrome, lower back strains, and other cumulative overuse injuries than people without diabetes due to nerve damage and poor circulation.
    - Abnormal blood glucose levels can also cause poor concentration, impaired judgment, memory loss, slower information processing, difficulty with word finding, and excessive fatigue. These symptoms may be persistent if diabetes is poorly managed.
    - If diabetes causes continually low productivity and difficulty fulfilling job requirements, this can impact someone's ability to hold employment.
- Difficulty with self-management
    - Some individuals with diabetes may struggle with the many aspects of disease management, including maintaining a healthy diet, regularly and safely exercising, and administering insulin and other prescription medications to assist with blood glucose regulation. People with diabetes may have difficulty beginning these tasks, carrying them out, and remaining consistent with their habits and routines surrounding diabetes management.
- Exercise tolerance limitations
    - Research looking at exercise tolerance found that, when individuals with type 2 diabetes completed similar aerobic activities back-to-back, they performed better. When performing a cognitive task while

recovering from physical exercise, subjects with type 2 diabetes demonstrated slower reaction times than they did when completing these tasks separately. Their performance on challenging cognitive tasks was modulated for subjects who expressed positive reactions to physical exercise.

    - Even in the early stages of type 2 diabetes, individuals with the condition are known to experience some degree of impaired exercise tolerance. This takes place at a similar rate regardless of if someone has asymptomatic, well-controlled, or unmanaged type 2 diabetes. Research has shown those with type 2 diabetes exeperience a reduction in several aspects of exercise tolerance, including peak workload, peak oxygen consumption, ventilatory efficiency, and oxygen pulse. Since exercise tolerance is a strong indicator of health status as a whole, this limitation can be linked to other health concerns for individuals with the condition – even those who do not have cardiac or pulmonary dysfunction.

- Increased frailty

    - A systematic review looked at the relationship between frailty, diabetes, and other factors impacting well-being. 93% of included studies showed a link between frailty, diabetes, and mortality; 100% of included studies connected frailty to greater diabetes-related hospital admissions; and 100% of included studies found a relationship between frailty, diabetes, and disability. This same review also determined that frailty was associated with hypoglycemic events in only 1% of included studies; vascular complications in 82% of studies; and impaired cognition and lower quality of life in 100% of cases.

- Higher burden of functional disability
    - Studies show that people with diabetes have a higher burden of functional disability compared to those without diabetes. This may mean they have greater difficulty carrying and moving items, managing stairs, dressing, and performing other daily tasks.
    - Much of this functional disability is specific to self-care tasks. One study found that type 2 diabetes affects around 60% of a person's ADLs if they have diabetes and are over the age of 65. This is compared to limitations in just 34% of all adults over the age of 65.
- Impaired mental health
    - Diabetes is proven to be comorbid with major depressive disorder, but can also lead to mental health impairments as a result of their emotional responses to the condition. These include feelings of anxiety, frustration, overwhelm, hopelessness, and helplessness. Individuals who have lived with diabetes for many years may also experience burnout due to emotional exhaustion from difficulty coping with the condition.
    - Metabolic changes stemming from variations in blood glucose levels often leads to irritability, fatigue, and confusion. If someone experiences these fluctuations frequently, this can impact their short- and long-term mental health.
    - It's common for low blood glucose levels and anxiety to have a similar physiological response, so this may cause a sense of panic in those trying to manage their condition.
- Increased time in hospital and longer recovery times after procedures

    - One study found that people with diabetes experienced more complications and required additional operations after an ankle fracture than those who did not have diabetes.
    - Other research found that individuals who sustained brain hemorrhages and also had diabetes experienced poorer long-term functional outcomes in those who did not have diabetes.

- Limited health education
    - Some individuals with diabetes may not have a solid grasp on the mechanics of their condition, what symptoms to expect, their prognosis, prevention methods to avoid complications, and more. This may moreso apply to individuals with unmanaged or undiagnosed diabetes, but can also impact people who have experienced fragmented care over the years or have changed doctors multiple times.
- Limited mobility
    - Diabetes may lead to increased difficulties with functional ambulation. This can complicate ADL and IADL completion, especially related to other tasks that are difficult such as meal preparation and nutritional intake.
- Poor postural instability
    - Circulatory changes caused by diabetes can lead someone to experience postural instability. Someone's postural control may be even more impaired if they have diabetes along with diabetic neuropathy, particularly when it impacts the lower extremities. This increases someone's fall risk and also makes ADL completion more difficult, time-consuming, and unsafe.

There are several medical professionals who are equipped to help people with diabetes manage the above concerns. For this reason, an interdisciplinary team is the best way to manage this condition in a well-rounded manner. A person with diabetes may seek standard treatment from their primary care physician. However, an endocrinologist is the specialty doctor who manages diabetes and other conditions caused by hormonal irregularities. Due to the impact diabetes has on the vasculature in the lower body, many people with this condition also regularly see podiatrists for foot health. Advanced registered nurse practitioners (ARNPs) and diabetes specialist nurses (DSNs) work closely with doctors to offer medical management of diabetes. In some cases, ARNPs specializing in diabetes may take the place of endocrinologists and primary care physicians depending on provider availability and professional specialization. People with diabetes also rely on pharmacists to dispense prescriptions from doctors for insulin and oral medications that help manage the condition. Dietitians or nutritionists may also be part of the care team if other members feel their patient is having difficulty adopting a healthy diet to manage diabetes. Optometrists are also typically involved in diabetes care, as vision changes and conditions commonly intersect with the condition. Individuals who have depression and cooccurring depressive or anxiety disorders may also be referred to psychologists.

People with diabetes typically see healthcare professionals who have a lot of experience in treating this condition, and some may be credentialed as a Certified Diabetes Care and Education Specialist or a CDCES (this credential used to be referred to more simply as a CDE, or Certified Diabetes Educator). There are several disciplines that qualify for this designation: psychologists, optometrists, podiatrists, physicians of any kind, pharmacists, registered nurses of any kind, occupational therapists, and physical therapists. In addition to having board certification in one of the above disciplines, a CDCES-certified professional must also have at least 2 years of practice experience and a minimum of 1,000 hours

implementing diabetes interventions and educating patients on the condition. This is inclusive of training patients in diabetes self-management and offering education about the mechanisms, symptoms, prognosis, and complications associated with diabetes. This education varies between professionals based on their discipline's scope of practice.

Section 2 Personal Reflection

What secondary health outcomes may arise from the aforementioned negative effects of diabetes mellitus?

Section 2 Key Words

Frailty - A medical concern - most often used to describe older adults - that refers to a decline in both cognitive and physical function, which raises someone's risk of other health concerns; frailty is associated with health events such as hospital admissions, falls, long-term care, disability, slowed recovery from health events, and death

Functional disability - Generalized difficulty with basic daily tasks (ADLs) or more complex tasks (IADLs) that are required for someone to live independently; there are a variety of reasons for functional disability, including chronic and acute health conditions along with factors such as socioeconomic status and age

Oxygen pulse - How much oxygen someone uses per heart beat while they are at rest

Peak oxygen consumption - The most oxygen someone can utilize during vigorous exercise

Peak workload - The highest amount of work someone can tolerate during exercise

Ventilatory efficiency - The ratio of breath to carbon dioxide production

Section 3: Occupational Therapy Interventions for Diabetes

References: 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65

Occupational therapists are well positioned to assist individuals with diabetes mellitus. As with many conditions, the exact treatment plan for someone with diabetes varies based on how severe their condition is, how much they know about diabetes, and the ways in which their symptoms impact their functional performance. The treatment approaches an OT uses to address diabetes skill areas may also differ depending on the practice setting where the patient is seen. For example, if a therapist sees a patient who was recently diagnosed with diabetes after being hospitalized for cellulitis in the lower extremities, an integral part of OT intervention will likely be education and training. This should focus on the importance of skin checks, how often to perform skin checks, steps to follow, and other hygiene routines that can help with skin care. This will help prevent a recurrence that may lead to another hospitalization or similarly severe complications. Therapists who treat patients with diabetes in outpatient clinics and home health settings may focus more on sensation, skill building, and other management strategies.

There are several areas that not only should be part of an occupational therapy evaluation for someone with diabetes, but are also typically addressed during treatment. These include, but are not limited to:

- Assistive devices
    - There are several types of assistive devices (ADs) helpful to those with diabetes, but the most commonly relied upon ADs are those that help with managing blood glucose levels. There are two main types of glucose monitors: traditional blood glucose monitors (BGMs) require a small amount of blood via a fingerstick to determine blood glucose levels at the present time; continuous glucose monitors (CGMs) use sensors to take ongoing readings that offer more time-sensitive prevention for any type of glycemic episode.
    - Other ADs for diabetes management include insulin pumps, smart insulin pens, ketone monitors, flash glucose monitors, internet-based applications to help with self-management, large-print keyboards, large-print reading materials, text scanners, screen magnification software, voice recorders, alternative keyboards, and alternative mice. These devices may also include mobility aids such as walkers, wheelchairs, canes, and power scooters.
    - Patients with diabetes may need help obtaining and learning how and when to use these devices to manage their condition.
- Exercise routines
    - Physical activity – specifically aerobic exercise and strength training – are at the center of diabetes management. Patients with diabetes may not only need help learning the exercises that are best for them, but also incorporating these activities into their daily schedule, allowing for proper rest periods, remaining sufficiently hydrated, wearing proper footwear, using gym equipment safely, maintaining proper body mechanics, and avoiding falls.

    - The American Diabetes Association recommends that people with diabetes get at least 150 minutes of moderate to vigorous aerobic activity each week. Suitable aerobic activities for those with diabetes include walking, swimming, biking, water aerobics, tennis, basketball, climbing stairs, and hiking. Anyone who is new to this type of exercise is advised to start slowly (no more than 10 minutes of activity with breaks included) and gradually increase the frequency and duration of their exercise.
    - Aerobic exercise greatly benefits the heart and vascular system while assisting with weight management, which in turn regulates insulin sensitivity and blood glucose levels. Strength training is another category of exercise that helps build muscle mass, which serves to stabilize blood glucose levels and the body's insulin sensitivity. Strength training is quite accessible, as it can be done using body weights, free weights, or more advanced equipment based on someone's personal preferences and resources. Another advantage of strength training is that it entails weight-bearing activity, which raises bone density levels and is doubly beneficial for those with co-occurring osteoporosis or osteopenia.
    - Exercises such as tai chi, Pilates, and yoga help improve balance, coordination, flexibility, and strength. These skill areas not only reduce someone's risk of falls and subsequent injuries, but also manage short-term blood glucose levels, A1C levels, and mental stress.
- Food selection
    - When someone with diabetes is selecting foods, they should pick ones with sufficient fiber, protein, and omega-3 fatty acids. Food

selection should also take glycemic index (GI) into account, as low GI foods prevent excessive blood sugar spikes. Healthy foods that meet these criteria include fruits and vegetables, whole grain carbohydrates, lean meats and seafood, and dairy products that are either low in fat or nonfat.

    - People with diabetes should be mindful of additives that can make the above foods unhealthy. For example, fresh or frozen vegetables and fruits should not have added sauces, fats, sodium, or sugar and can instead be consumed with herbs and spices, if added flavor is needed. Whole grains such as whole oats, quinoa, barley, and brown rice can be prepared with avocado oil or extra virgin olive oil instead of butter or margarine. Poultry should be lean, and can be paired with other protein sources such as lentils, nuts, legumes, tofu, and eggs. When consuming fish, opt for those with higher amounts of heart healthy omega-3 fatty acids, such as tuna, salmon, sardines, and mackerel.

    - As with exercise routines, therapists may need to assist patients not only with selecting the proper foods, but planning meals out ahead of time, eating the right amount of meals each day, and snacking in a healthy manner.

- Medication management

    - Medication management can be complex with any chronic condition, but those with diabetes especially need support since they may require insulin injections as well as oral medications to manage their condition.

    - OTs can focus on improving a patient's ability to organize their medications and functionally administer them on their own. Another potential goal area specific to medications can be health literacy, as OTs can target a patient's knowledge of each medication's purpose and instructions on how to take them. Medication adherence is another skill area within medication management, and OTs can help with the formation of routines, schedules, habits, and plans surrounding most occupations. OTs can also use medication management interventions alongside those for symptom management to keep track of the personal health benefit for each medication.

- Mood management and other aspects of psychosocial adjustment
    - Since several mental health conditions are comorbid with diabetes, it is important for OTs to address psychosocial well-being. In addition, there are certain emotions that may arise when someone is newly diagnosed with any chronic condition. Therapists should discuss any relevant emotions with their patients, as they have the potential to impact motivation, performance, and other aspects of the therapy process.
    - Some evidence-based interventions OTs can use to address psychosocial health in those with diabetes include acceptance and committment therapy (ACT), mindfulness-based stress reduction (MBSR), and resilience training.
    - One dated study showed positive results when ACT was implemented with adults who have unmanaged type 1 diabetes. A recent systematic review by Sakamoto et al. (2021) used ACT with adults who have type 2 diabetes. Results showed that ACT programs were

connected with a decrease in A1C levels, an increase in self-care skills, and improvement in acceptance of their condition.

    - Qona'ah et al. (2023) performed a systematic review showing that MBSR can yield a significant reduction in fasting blood glucose levels and A1C levels in those who have type 2 diabetes. MBSR was also linked to improved psychological well-being, less symptoms of depression and anxiety, heightened resilience, and enhanced overall emotional health.

    - Dubois et al. (2022) developed a program called Resilience-Based Diabetes Self-Management Education (RB-DSME), which is based on diabetes education with resilience resources woven into the framework. Resilience training in this program includes emotion regulation, setting intentions, finding one's positive purpose, and managing discrimination. Developed for patients with low socioeconomic statuses and racial and ethnic minorities with type 2d diabetes, this program showed an improvement in health outcomes, resilience, and self-management capabilities.

    - OTs should also perform regular screening for symptoms of depression and anxiety, refer patients to behavioral health professionals when there is a demonstrated need, collaborate with all diabetes care specialists to ensure fluid communication and action on urgent concerns,

- Energy conservation

    - This set of strategies can be beneficial to anyone with chronic conditions that result in ongoing fatigue and low endurance. When paired with activity analysis and task modification, energy

conservation can be very helpful for those with diabetes. Research from Hernandez et al. (2024) used NASA's Task Load Index to measure and accordingly adjust the workload of people with type 1 diabetes. There are not many diabetes-specific tools OTs can use and even less for energy conservation and planning efforts, so this can be a guiding protocol in structuring OT interventions for those with diabetes.

- Self-care skills
    - Therapists should not only address the execution of self-care tasks, but also incorporate skill-based training for problem-solving and self-monitoring related to ADL function. Studies show that, when addressed from an occupation-based lens, problem-solving skills encourage participation in those who have diabetes along with self-efficacy, healthy coping, and overall well-being.
    - In particular, OTs must address skin inspection and care, hygiene, and nail care with all individuals who have diabetes. This is because they are at risk of a range of conditions from skin-related injuries and the presence of foreign objects.
    - Rest- and sleep-based interventions are also recommended for most people with chronic conditions. Interventions under the heading of this occupation should include nutrition, sleep hygiene, relaxation strategies, and physical activity, as these are all focal points in getting good rest and sleep.
    - Studies that addressed self-care and self-management in children assessed and intervened in the areas of self-management education

as well as self-management support. Findings suggested patients of this age needed more help transferring their skills into practice.

- Sensory interventions
    - As with much of OT intervention, sensory treatments may either be compensatory or remediatory in nature. Individuals who have severe diabetes often benefit from compensatory strategies to protect their limbs from injury related to poor body awareness. On the other hand, individuals who have well managed diabetes may receive treatment after a medical procedure to help regain their baseline sensation. This is typically referred to as sensory reeducation and may focus on any of the extremities along with functional abilities related to the areas of need, e.g. gait, balance, and coordination.
    - Individuals with diabetes who undergo an amputation or similar procedure need additional attention to their residual limb, scar, and the surrounding tissue. However, it should be noted that OTs cannot restore sensation resulting from vascular damage and severe diabetes. Safety is traditionally considered the ultimate goal for sensory interventions provided to individuals who have diabetes.

The American Journal of Occupational Therapy (AJOT) performed a systematic review on practice guidelines that govern OT treatment for those with chronic conditions, one of which is diabetes. In this review, Fields & Smallfield (2022) found strong efficacy associated with a multimodal approach to long-term self-management strategies, including goal setting, education, and problem-solving. These strategies primarily surrounded the formation of healthy routines and habits with an emphasis on prevention. In a similar vein, a study conducted by Bahadır Ağce & Ekici (2020) found strong results from occupation-based coaching and family-centered health management training for children diagnosed with type

1 diabetes. This proves the distinct value of occupational therapy for individuals with diabetes across the lifespan.

Dated studies discuss development of the REAL Diabetes Program (Resilient, Empowered, Active Living with Diabetes) for young adults with any type of diabetes. This occupational therapy-based program includes objectives focused on improving glycemic control and quality of life. Results not only showed an improvement in A1C levels, but also an increase in diabetes-related quality-of-life, and strength of the habits surrounding glucose monitoring compared to control group participants. With there being a lack of reported adverse effects, this was determined to be a promising intervention targeted at those with diabetes who are of a low socioeconomic status. Another piece of more recent research from Feldhacker et al. (2023) mirrors these findings with positive results from a habit formation intervention. This study looked at the impact of a 10-week habit formation program for adults with type 2 diabetes. Intervention focused on four main areas: medication management, physical activity, nutrition, and blood glucose monitoring. While this was a relatively small study, researchers found that self-care behaviors significantly improved for 75% of participants, which was deemed statistically significant. Habit strength improved for all program areas, with the most results seen in physical activity habits. Routines, habits, and rituals are all central components of the Occupational Therapy Practice Framework, yet habit formation is one area OTs may not understand well. For this reason, such programs can be efficacious in habit formation for the sake of self managing chronic conditions such as diabetes.

There is also support for the use of Lifestyle Redesign to structure intervention for those with diabetes. In particular, one study looked at the efficacy of Lifestyle Redesign implemented via telehealth for young adults with diabetes. Results showed that participants saw significant increases in health management, occupational performance, and occupational satisfaction. Those who took part in

the study also reported high levels of satisfaction with telehealth. Other research from Pyatak et al. (2019) explored the integration of OT intervention using the Lifestyle Redesign protocol within a primary care setting. The intervention was provided to adults with any form of diabetes, and consisted of eight 1-hour sessions focused on management skills related to their condition. Participants who completed the entire program saw improvements in A1C levels, overall health status, and diabetes self-care skills. Researchers also identified some implementation barriers that influenced the success of this program, including a lack of staff and patient education regarding OT's role, the need for an outlined referral process, and not having enough clinic space to provide interventions. Administrative buy-in, shared documentation systems, and colocation benefited this particular program, but may serve as barriers in other cases.

A study by Pavitt et al. (2024) looked into another method that can be used to supplement lifestyle-based interventions for those with diabetes and mental health conditions. This research found that photovoice can help with the subjective management of type 2 diabetes for those with serious mental illness. Photovoice is a health promotion method developed in the 1970s, and involves patients taking pictures of anything that represents the narrative of their health concerns and overall well-being. The photos are then used to encourage reflection and exploration of associated experiences and emotions. When used within an OT framework, photovoice can serve as a foundation for lifestyle change. This particular study found that peer education, community resources, mental health, and self-efficacy all facilitated participants' well-being while mental health symptoms, a lack of agency, homelessness, and chronic stress served as barriers.

Research from Jewell et al. (2022) looked further into the use of telehealth as a method of service delivery for treating those with diabetes. In particular, this study looked at how occupation-based coaching completed via telehealth helps children with type 1 diabetes and their families. Results showed little to

improvement in health outcomes or family quality of life after the intervention. However, findings did show a significant improvement in family-centered goals and parent locus of control.

Section 3 Personal Reflection

What might the focus of an outpatient OT treatment plan be for an 81-year-old female with type 2 diabetes and a history of multiple falls?

Section 3 Key Words

A1C levels - A blood test that relays the percentage of a person's hemoglobin that is coated in glucose; doctors use this test to diagnose and monitor diabetes over time, as it indicates someone's average blood glucose levels over two to three months; normal A1C levels are below 5.7% while levels between 5.7% and 6.4% are indicative of prediabetes and levels over 6.5% are characteristic of diabetes; if someone has diabetes, it is advised they keep their A1C levels below 7% to avoid complications

Gamification - Adding elements of game play to other activities to improve engagement and participation; this term is being used more in the therapy realm, but can apply to other industries such as marketing

Glycemic index (GI) - A scale (0-100) used to measure how food impacts blood glucose levels; high GI foods (above 70) cause sharper increases and decreases in blood glucose levels while low GI foods (below 55) keep blood glucose levels more stable

Locus of control - The amount of autonomy someone feels they have over their own lives; a higher locus of control is synonymous with an internal locus of

control, which means someone feels a greater sense of autonomy and ability to change their own circumstances; a lower locus of control goes hand-in-hand with an external locus of control, which refers to a loss of personal power due to the idea that external forces have a bigger impact on their lives than they do

Section 4: Special Treatment Considerations & Emergency Preparedness

References: 66, 67, 68

Children with Diabetes

A big part of OT treatment with children who have diabetes is family-centered care. Therapists must educate parents about the condition right alongside educating the child. OT intervention with the family should emphasize awareness and carryover of self-management strategies they should instill in their children. In addition, OTs should remain mindful of the impact diabetes has on academic performance, school readiness, socialization, and leisure in educational settings. The best way to do this is to focus on interprofessional collaboration with school-based nurses, primary care physicians, endocrinologists, and other allied health professionals.

Depending on the other health concerns and performance skills a child with diabetes possesses, assistive technology training should begin as soon as possible. Therapists should teach children how to monitor their blood glucose levels as well as build healthy habits surrouding health management. When incorporated with occupation- and interest-based activities along with gamification, children may develop strong motivation for aspects of health management such as tracking their symptoms, blood glucose levels, exercise habits, diet, and more.

Diabetes Comorbidities

Medication management is often a cornerstone treatment for people with diabetes who are living with multiple comorbidities. Executive functioning should be assessed continually with these individuals, since cognitive skills will impact someone's ability to attend various appointments, keep track of relevant information (e.g. care guidelines, medication instructions, emergency contact information), and maintain insight into their condition. In addition, many self-management strategies for diabetes are loosely applicable to all chronic conditions. Therapists can assist patients in making some modifications and thoughtful additions to devise a plan for managing overall well-being.

In particular, depressive disorders, anxiety disorders, and other mental health concerns are closely related to diabetes. Therapists should make adjustments to their treatment to accommodate these conditions if they are present at the start of care. For example, OTs may need to focus on acceptance of one's condition for those who are newly diagnosed and motivation for change in those with poorly managed diabetes. Therapists should use clinical judgment and ongoing screening to monitor mental health in someone with diabetes.

Renal Rehabilitation

As we mentioned earlier, diabetic kidney disease is a possible complication of diabetes mellitus. The main treatment for diabetic kidney disease is often hemodialysis, which involves filtering someone's blood in the same way the kidneys are intended to. Someone who undergoes hemodialysis is connected to a machine that completes this process for them. This procedure is typically performed three times each week, and each session lasts 3-4 hours depending on how much remaining kidney function someone has left and how much waste needs to be filtered out of their body.

Hemodialysis is quite intensive and comes along with side effects that all therapists should be aware of. Hemodialysis side effects include hypotension, hypertension, dry mouth, itching (often around the access site, but this can extend across many parts of the body), sleep disturbances, anemia, muscle cramps, headaches, fluid overload (also known as hypervolemia), restless legs syndrome, chest pain, and back pain. In terms of safety, therapists should monitor the patient's access site for signs of infection and avoid interacting with the area. Hand hygiene is crucial in the event therapists need to inspect the area more closely.

Therapists can also provide patients undergoing renal rehabilitation with education specific to their condition. This education should include the importance of decreasing dietary protein, controlling blood glucose levels and blood pressure, monitoring for signs of urinary tract infection regularly, and swiftly treating urinary tract infections if and when they do arise. All of these management aspects reduce the strain on the kidneys.

Emergency Preparedness

Diabetic Shock

Occupational therapists should be prepared to manage emergency events related to diabetes, if they occur. One such instance is diabetic shock, also known as severe hypoglycemia. Someone experiencing diabetic shock may exhibit some of the following signs and symptoms:

- Incoordination and clumsiness
- Difficulty drinking or eating
- Muscle weakness

- Drowsiness
- Seizures
- Jerky, uncontrolled movements
- Blurred vision or peripheral vision loss
- Slurred speech
- Confusion

Not every instance of diabetic shock causes all of these symptoms, as the clinical presentation varies from person to person and based on how low someone's blood glucose levels are. Time is of the essence, as diabetic shock can lead someone to enter a diabetic coma if it is not addressed. If treating a patient who displays signs of diabetic shock during a session, therapists should take several steps to ensure their safety:

1. If the patient loses consciousness, call 911.
2. If the patient is conscious, follow these steps:
    a. Check and record the patient's blood glucose level.
    b. If their reading is below 70 mg/dL, help the patient consume food or drink that contains some sugar and at least 15 grams of carbohydrates. Some facilities or patients may keep glucose tablets for this purpose. Fruit juice, crackers, and honey are also good options. If there is no food available and the patient has access to medication, help the patient administer a glucagon shot.
    c. Ask the patient to remain seated for 10-15 minutes and to relax.
    d. Retest their blood glucose level.

e. If the reading is still low, repeat steps 2b-2d until their blood glucose level is between 70 and 110 mg/dL.

f. Once blood glucose levels have returned to baseline, advise the patient to eat a healthy, balanced meal.

3. If the patient sustains a fall or other physical injuries as a result of diabetic shock, you may need to fill out an incident report or other documentation according to your organization's protocols. At the very least, it is important to mention the situation in your session note.

Diabetic Ketoacidosis

Diabetic ketoacidosis (DKA) is another diabetes-related medical emergency that therapists should be prepared to manage. Diabetic ketoacidosis results when someone has high blood glucose levels along with low insulin levels. This combination of high blood glucose levels and low insulin may stem from: missing an insulin dose, using alcohol and recreational drugs in excess, being chronically stressed, becoming pregnant, being sick (specifically with infections such as pneumonia or urinary tract infections), and taking new medications (including certain antipsychotics or steroids). The telltale sign of DKA is fruity-smelling breath, as this is an indication that acid is building up in the body. Additonal signs and symptoms of DKA include:

- Dehydration
- Confusion
- Flushed face
- Headache
- Muscle aches or stiffness

- Dry skin and mouth
- Excessive urination
- Loss of consciousness
- Fatigue
- Nausea and vomiting
- Rapid breathing

Diabetic ketoacidosis can develop in under 24 hours, so it should be managed swiftly as it can become severe in a short time. Since DKA causes dehydration and frequent urination, fluid replenishment (specifically with isotonic saline) is a key treatment. Other interventions for diabetic ketoacidosis include provision of insulin and electrolytes along with medications to treat the underlying causes of DKA.

Section 4 Personal Reflection

Is it within an OT's scope of practice to address emergency medical concerns such as diabetic ketoacidosis and diabetic shock? If so, what is an OT qualified to do in such circumstances?

Section 4 Key Words

Hemodialysis - A medical procedure that involves filtering someone's blood mechanically due to low kidney function or failure; these sessions take 3-4 hours each and are usually performed three times per week

Section 5: Case Study #1

A 52-year-old man was recently discharged from the hospital after being admitted for a coronary artery bypass graft (CABG). He is now being seen by home health providers (OT and PT) due to a decline in his functional status. He is deconditioned and is having difficulty with functional mobility throughout his home, endurance, strength in the upper body, and ADLs (specifically dressing and bathing). He reports a strong desire to return to work as a store manager. The patient's medical history includes obesity, coronary artery disease, non-alcoholic fatty liver disease, and hypertension. Upon reviewing the patient's medical records, the OT learns he has a family history of type 2 diabetes, has smoked cigarettes for the past 22 years, and does not regularly engage in physical activity.

1. Is this patient at a high risk of diabetes? If so, what risk factors does this patient posess that increase his chances of developing diabetes?
2. What skill areas should the OT address first?
3. What educational aspects should the therapist include in treatment?

Section 6: Case Study #1 Review

This section will review the case studies that were previously presented. Responses will guide the clinician through a discussion of potential answers as well as encourage reflection.

1. Is this patient at a high risk of diabetes? If so, what risk factors does this patient posess that increase his chances of developing diabetes?

Yes, this patient is at risk of developing diabetes. Smoking, a family history of diabetes, lack of exercise, having hypertension, being over the age of 45, and being obese are all risk factors for diabetes. In addition, the patient has existing vascular conditions (coronary artery disease, recent CABG, and non-alcoholic fatty liver disease), which place him at an even higher risk of the condition.

2. What skill areas should the OT address first?

   Since this patient is deconditioned, the OT should first focus on strength and endurance related to ADLs and functional mobility. As the patient builds strength and demonstrates a greater tolerance for ADLs, the therapist can pivot to other occupational areas. Since the patient expressed a desire to return to work, the therapist can learn more about his job duties to incorporate them into treatment. Performance of job-related tasks can then become a more central part of treatment.

3. What educational aspects should the therapist include in treatment?

   We have already established that this patient's medical history and recent surgical history place him at a high risk of diabetes. Unfortunately, those risk factors are immodifiable, but the patient should be informed that they increase his risk of other conditions. The patient is also a smoker, leads a sedentary lifestyle, and has obesity, all of which are modifiable risk factors. The therapist's treatment plan must incorporate some form of education to help address these concerns. The therapist should not only discuss all of the risk factors with this patient, but they should also discuss ways to build a healthier lifestyle. These include but are not limited to smoking cessation programs, weight reduction techniques, a beginner's exercise program, stress management techniques, and diet recommendations.

Section 7: Case Study #2

A 43-year-old female just got diagnosed with type 2 diabetes after undergoing blood work during her yearly physical. She has not been experiencing any symptoms or health concerns, but met with an OT for a consultation through her primary care physician's practice. The patient's only other medical condition is depression. She reports what she describes as an "on again and off again" diet, where she eats regular and somewhat balanced meals for a week or two, then reverts back to an unhealthy diet primarily consisting of snacks and high-fat comfort foods. When asked how often she exercises, she mentioned she does when she remembers or has the time to, which is not very often. The patient's preferred activities are writing, reading, and organizing/cleaning her home. The OT is scheduled to see this patient for a series of 4 consultations before discharging her or recommending her for direct services.

1. What tips can the OT provide to help improve this patient's adherence to regular exercise?
2. Would this patient qualify for direct services focused on implementing a diet?

Secondary (occ based)

Detect and treat disease early, before symptoms appear, to prevent disease from progressing to a more serious stage

Section 8: Case Study #2 Review

This section will review the case studies that were previously presented. Responses will guide the clinician through a discussion of potential answers as well as encourage reflection.

1. What tips can the OT provide to help improve this patient's adherence to regular exercise?

   In order to keep the OT consultations occupation-based, the therapist should make recommendations that will help the patient's well-being while also incorporating her interests in an effort to boost motivation and adherence to recommendations. The OT can suggest that this patient read a book while walking on the treadmill at the gym or at home. Another alternative may be listening to an audiobook while walking in any setting. To factor in her interests in writing, this patient can try journaling aloud through voice memos while walking outdoors or brainstorming and jotting down ideas for writing while exercising. The OT can also offer some education on MET levels along with the forms of cleaning that raise heart rate and qualify as aerobic exercise. For example, the OT can help this patient plan her cleaning schedule so she completes heavy cleaning (e.g. washing walls, cleaning baseboards, dusting in hard-to-reach places) in one room each morning as her exercise and then follows that up with lighter cleaning and organizing for the rest of those days. This allows her to fulfill her household obligations, participate in tasks of interest to her, and adhere to a regular exercise plan.

2. Would this patient qualify for direct services focused on implementing a diet?

   It depends. If the patient participates in a full OT evaluation and does end up demonstrating functional concerns related to diabetes or depression, direct OT services will be considered medically necessary. If the evaluation shows no functional concerns or diabetes symptoms and the patient simply needs help implementing a diet, direct OT services are likely not

recommended for her. In this case, the OT should refer the patient to a dietitian to assist with creating a diet to help manage her diabetes.

Section 9: Case Study #3

An OT completes a hospital-based evaluation on a 59-year-old male with poorly-managed type 2 diabetes who is recovering from a left below-knee amputation. Upon speaking with the patient, the OT quickly learns that the patient does not monitor his blood glucose levels, does not take medications to manage his diabetes, and drinks alcohol rather heavily on a regular basis. The patient is not open to taking medication in the future or testing his levels, and plans to continue drinking at the same rate. The patient reports a desire to "have his leg back" and get around his home without any help.

1. What type of prevention can and should this OT use when working with this patient?
2. What skill areas should the OT address during treatment?

Section 10: Case Study #3 Review

This section will review the case studies that were previously presented. Responses will guide the clinician through a discussion of potential answers as well as encourage reflection.

1. What type of prevention should this OT use when working with this patient?

   Since this patient has a range of risk factors that make him vulnerable to diabetes complications, prevention is necessary. However, the patient's unwillingness to change means the therapist may not be able to affect his

lifestyle choices and long-term management of the condition. Because of this and the setting where this patient is being seen, tertiary prevention plays the biggest role: the therapist should work to prevent further complications from arising. This includes but is not limited to scar infections, swelling in the residual limb, and poor wound dressing. The therapist should offer education on scar massage, proper dressing techniques, range-of-motion exercises to improve blood flow to the area, and monitoring the residual limb for signs and symptoms of infection.

2. What skill areas should the OT address during treatment?

   Since functional mobility is an area of priority for this patient, the OT should also discuss prosthetic limbs and mobility devices to assist with regaining ambulation and independence. Based on what avenue the patient goes, the therapist should continue to offer relevant education to prevent further health concerns from arising and ensure safe participation in activities of his choosing.

References

(1) National Institute of Diabetes and Digestive and Kidney Diseases. (2024). Diabetes Statistics. Retrieved from https://www.niddk.nih.gov/health-information/health-statistics/diabetes-statistics

(2) Doan, L.V., & Madison, L.D. (2023). Cystic Fibrosis–Related Diabetes. [Updated 2023 Aug 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. Available from: https://www.ncbi.nlm.nih.gov/books/NBK545192/

(3) Centers for Disease Control & Prevention. (2024). About Gestational Diabetes. Retrieved from https://www.cdc.gov/diabetes/about/gestational-diabetes.html

(4) Rajkumar, V., & Levine, S.N. (2024). Latent Autoimmune Diabetes. [Updated 2024 Mar 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. Available from: https://www.ncbi.nlm.nih.gov/books/NBK557897/

(5) Hoffman, L.S., Fox, T.J., Anastasopoulou, C., & Jialal, I. (2023). Maturity Onset Diabetes in the Young. [Updated 2023 Aug 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. Available from: https://www.ncbi.nlm.nih.gov/books/NBK532900/

(6) Beltrand, J., Busiah, K., Vaivre-Douret, L., Fauret, A. L., Berdugo, M., Cavé, H., & Polak, M. (2020). Neonatal diabetes mellitus. *Frontiers in Pediatrics*, *8*, 540718. https://doi.org/10.3389/fped.2020.540718

(7) Hodgens, A., & Sharman, T. (2023). Corticosteroids. [Updated 2023 May 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554612/

(8) Centers for Disease Control & Prevention. (2024). About Type 1 Diabetes. Retrieved from https://www.cdc.gov/diabetes/about/about-type-1-diabetes.html

(9) Medline Plus. (2024). Diabetes Type 2. Retrieved from https://medlineplus.gov/diabetestype2.html

(10) Vonderau, J.S., & Desai, C.S. (2022). Type 3c: Understanding pancreatogenic diabetes. *JAAPA: Official journal of the American Academy of Physician Assistants*, *35*(11), 20–24. https://doi.org/10.1097/01.JAA.0000885140.47709.6f

(11) GBD 2021 Diabetes Collaborators. (2023). Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: A systematic analysis for the Global Burden of Disease Study 2021. *The Lancet*, *402*(10397), 203-234. doi: 10.1016/S0140-6736(23)01301-6

(12) Cui, J., Liu, Y., Li, Y., Xu, F., & Liu, Y. (2021). Type 2 Diabetes and Myocardial Infarction: Recent Clinical Evidence and Perspective. *Frontiers in cardiovascular medicine*, *8*, 644189. https://doi.org/10.3389/fcvm.2021.644189

(13) American Diabetes Association. (n.d.). Foot Complications. Retrieved from https://diabetes.org/about-diabetes/complications/foot-complications

(14) National Institute of Dental and Craniofacial Research. (2024). Diabetes & Oral Health. Retrieved from https://www.nidcr.nih.gov/health-info/diabetes

(15) American Diabetes Association. (n.d.) Sex and Diabetes. Retrieved from https://diabetes.org/health-wellness/sexual-health/sex-diabetes

(16)Pearson-Stuttard, J., Holloway, S., Polya, R., Sloan, R., Zhang, L., Gregg, E.W., Harrison, K., Elvidge, J., Jonsson, P., & Porter, T. (2022). Variations in comorbidity burden in people with type 2 diabetes over disease duration: A population-based analysis of real world evidence. *EClinicalMedicine*, *52*, 101584. https://doi.org/10.1016/j.eclinm.2022.101584

(17)Cicek, M., Buckley, J., Pearson-Stuttard, J., & Gregg, E.W. (2021). Characterizing multimorbidity from type 2 diabetes: Insights from clustering approaches. *Endocrinology and Metabolism Clinics of North America*, *50*(3), 531–558. https://doi.org/10.1016/j.ecl.2021.05.012

(18)Di Martino, G., Di Giovanni, P., Cedrone, F., Michela, D., Meo, F., Scampoli, P., Romano, F., & Staniscia, T. (2022). The impact of COPD on hospitalized patients with diabetes: A propensity score matched analysis on discharge records. *Healthcare (Basel, Switzerland)*, *10*(5), 885. https://doi.org/10.3390/healthcare10050885

(19)Rong, F., Dai, H., Wu, Y., Li, J., Liu, G., Chen, H., & Zhang, X. (2021). Association between thyroid dysfunction and type 2 diabetes: A meta-analysis of prospective observational studies. *BMC Med*, *19*(257). https://doi.org/10.1186/s12916-021-02121-2

(20)Athanasaki, A., Melanis, K., Tsantzali, I., Stefanou, M. I., Ntymenou, S., Paraskevas, S. G., Kalamatianos, T., Boutati, E., Lambadiari, V., Voumvourakis, K. I., Stranjalis, G., Giannopoulos, S., Tsivgoulis, G., & Paraskevas, G. P. (2022). Type 2 diabetes mellitus as a risk factor for Alzheimer's Disease: Review and meta-analysis. *Biomedicines*, *10*(4), 778. https://doi.org/10.3390/biomedicines10040778

(21)Centers for Disease Control and Prevention. (2024). Diabetes and Your Skin. Retrieved from https://www.cdc.gov/diabetes/signs-symptoms/diabetes-and-your-skin.html

(22)Medline Plus. (2022). Wolfram Syndrome. Retrieved from https://medlineplus.gov/genetics/condition/wolfram-syndrome/

(23)Li, A. K., & Nowrouzi-Kia, B. (2017). Impact of Diabetes Mellitus on Occupational Health Outcomes in Canada. *The international journal of occupational and environmental medicine*, *8*(2), 96–108. https://doi.org/10.15171/ijoem.2017.992

(24)Schmidt, T., Simske, N.M., Audet, M.A., Benedick, A., Kim, C.Y., & Vallier, H. A. (2020). Effects of diabetes mellitus on functional outcomes and complications after torsional ankle fracture. *The Journal of the American Academy of Orthopaedic Surgeons*, *28*(16), 661–670. https://doi.org/10.5435/JAAOS-D-19-00545

(25)Tseng, W., Chiu, Y., & Hsiao, M. (2024). Diabetes mellitus is associated with worse long-term functional outcomes in primary intracerebral hemorrhage survivors: A prospective study. *Clinical Neurology and Neurosurgery*, *245*, 108502. https://doi.org/10.1016/j.clineuro.2024.108502.

(26)Khan, K. S., & Andersen, H. (2022). The impact of diabetic neuropathy on activities of daily living, postural balance and risk of falls: A systematic review. *Journal of Diabetes Science and Technology*, *16*(2), 289–294. https://doi.org/10.1177/1932296821997921

(27)Jie, J.H., Li, D., Jia, L.N., Chen, Y., Yang, Y., Zheng, B., Wu, C., Liu, B., Xu, R., Xiang, J., & Zhuang, H.L. (2022). Activities of daily living and its influencing factors for older people with type 2 diabetes mellitus in urban

communities of Fuzhou, China. *Frontiers in Public Health*, *10*, 948533. https://doi.org/10.3389/fpubh.2022.948533

(28)Nikpour, S., Mehrdad, N., Sanjari, M., Aalaa, M., Heshmat, R., Khabaz Mafinejad, M., Larijani, B., Nomali, M., & Najafi Ghezeljeh, T. (2022). Challenges of type 2 diabetes mellitus management from the perspective of patients: Conventional content analysis. *Interactive Journal of Medical Research*, *11*(2), e41933. https://doi.org/10.2196/41933

(29)van Duinkerken, E., & Ryan, C.M. (2020). Diabetes mellitus in the young and the old: Effects on cognitive functioning across the life span. *Neurobiology of Disease*, *134*, 104608. https://doi.org/10.1016/j.nbd.2019.104608.

(30)Jacobson, A.M., Ryan, C.M., Braffett, B.H., Gubitosi-Klug, R.A., Lorenzi, G.M., Luchsinger, J.A., Trapani, V.R., Bebu, I., Chaytor, N., Hitt, S.M., Farrell, K., & Lachin, J.M. (2021). Cognitive performance declines in older adults with type 1 diabetes: results from 32 years of follow-up in the DCCT and EDIC Study. *The Lancet Diabetes & Endocrinology*, *9*(7), 436 - 445. doi: 10.1016/S2213-8587(21)00086-3.

(31)Lacy, M.E., Gilsanz, P., Eng, C., Beeri, M.S., Karter, A.J., & Whitmer, R.A. (2020). Severe hypoglycemia and cognitive function in older adults with type 1 diabetes: The study of longevity in diabetes (SOLID). *Diabetes Care*, *43*(3), 541-548. https://doi.org/10.2337/dc19-0906

(32)Hanlon, P., Faure, I., Corcoran, N., Butterly, E., Lewsey, J., McAllister, D., & Mair, F.S. (2020). Frailty measurement, prevalence, incidence, and clinical implications in people with diabetes: A systematic review and study-level meta-analysis. *The Lancet*, *1*(3), E106-E116. doi: 10.1016/S2666-7568(20)30014-3.

(33)Guicciardi, M., Fadda, D., Fanari, R., Doneddu, A., & Crisafulli, A. (2020). Affective variables and cognitive performances during exercise in a group of adults with type 2 diabetes mellitus. *Frontiers in Psychology*, 11. DOI=10.3389/fpsyg.2020.611558

(34)Nesti, L., Pugliese, N.R., Sciuto, P., & Natali, A. (2020). Type 2 diabetes and reduced exercise tolerance: a review of the literature through an integrated physiology approach. *Cardiovasc Diabetol*, *19*(134). https://doi.org/10.1186/s12933-020-01109-1

(35)Certification Board for Diabetes Care and Education. (2024). CDCES Discipline Requirements. Retrieved from https://www.cbdce.org/discipline-requirement

(36)American Diabetes Association. (2024). Diabetes Technology Guide. Retrieved from https://diabetes.org/living-with-diabetes/treatment-care/diabetes-technology-guide

(37)Zahalka, S.J., Abushamat, L.A., Scalzo, R.L., & Reusch, J.E.B. (2023). The Role of Exercise in Diabetes. [Updated 2023 Jan 6]. In: Feingold KR, Anawalt B, Blackman MR, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK549946/

(38)International Diabetes Federation. (2024). Diabetes and Physical Activity. Retrieved from https://idf.org/about-diabetes/physical-activity/

(39)Kobayashi, Y., Long, J., Dan, S., Johannsen, N. M., Talamoa, R., Raghuram, S., Chung, S., Kent, K., Basina, M., Lamendola, C., Haddad, F., Leonard, M. B., Church, T. S., & Palaniappan, L. (2023). Strength training is more effective than aerobic exercise for improving glycaemic control and body composition in people with normal-weight type 2 diabetes: a randomised

controlled trial. *Diabetologia*, *66*(10), 1897–1907. https://doi.org/10.1007/s00125-023-05958-9

(40)Li, Y., Li, R., Li, X., Liu, L., Zhu, J., & Li, D. (2021). Effects of different aerobic exercise training on glycemia in patients with type 2 diabetes: A protocol for systematic review and meta analysis. *Medicine*, *100*(18), e25615. https://doi.org/10.1097/MD.0000000000025615

(41)Reynolds, A., & Mitri, J. (2024). Dietary Advice For Individuals with Diabetes. [Updated 2024 Apr 28]. In: Feingold KR, Anawalt B, Blackman MR, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK279012/

(42)Medline Plus. (2024). Diabetic Diet. Retrieved from https://medlineplus.gov/diabeticdiet.html

(43)American Diabetes Association. (2023). Tips for Eating Well. Retrieved from https://diabetes.org/food-nutrition/eating-healthy

(44)Fields, B., & Smallfield, S. (2022). Occupational therapy practice guidelines for adults with chronic conditions. *Am J Occup Ther*, *76*(2), 7602397010. doi: https://doi.org/10.5014/ajot.2022/762001

(45)Bahadır Ağce, Z.., & Ekici, G. (2020). Person-centred, occupation-based intervention program supported with problem-solving therapy for type 2 diabetes: A randomized controlled trial. *Health Qual Life Outcomes*, *18*, 265. https://doi.org/10.1186/s12955-020-01521-x

(46)Mitchell, S., Sideris, J., Blanchard, J., Granados, G., Díaz, J., & Pyatak, E. (2023). Telehealth lifestyle redesign occupational therapy for diabetes: Preliminary effectiveness, satisfaction, and engagement. *OTJR:*

Occupational Therapy Journal of Research, *43*(3), 426-434. doi:10.1177/15394492231172933

(47) American Occupational Therapy Association. (2019). Helping Occupational Therapy Clients Manage Prediabetes and Diabetes. Retrieved from https://www.aota.org/publications/ot-practice/ot-practice-issues/2019/managing-diabetes

(48) Jewell, V.D., Russell, M., Feiten, B., & Ludwig, E. (2020). Occupation-based coaching: A novel intervention for young children with type 1 diabetes. Retrieved from https://www.aota.org/publications/ot-practice/ot-practice-issues/2020/diabetes-coaching

(49) Thompson, A., Gaynor, H., Huhn, M., Russell, M., Shin, J., & Jewell, V.D. (2023). A novel OT type 1 diabetes assessment: Family-centered health management. Retrieved from https://www.aota.org/publications/ot-practice/ot-practice-issues/2023/a-novel-ot-type-1-diabetes-assessment

(50) American Occupational Therapy Association. (2019). Critically Appraised Topic: Self-management Interventions for People with Diabetes. Retrieved from https://www.aota.org/practice/practice-essentials/evidencebased-practiceknowledge-translation/critically-appraised-topic-selfmanagement-interventions-for-people-with-diabetes

(51) Davis, J., Fischl, A.H., Beck, J., Browning, L., Carter, A., Condon, J.E., Dennison, M., Francis, T., Hughes, P.J., Jaime, S., Lau, K.H.K., McArthur, T., McAvoy, K., Magee, M., Newby, O., Ponder, S.W., Quraishi, U., Rawlings, K., Socke, J., Stancil, M., Uelmen, S., Villalobos, S. (2022). 2022 national standards for diabetes self-management education and support. *The Science of Diabetes Self-Management and Care*, *48*(1), 44-59. doi:10.1177/26350106211072203

(52)Feldhacker, D.R., Ikiugu, M.N., Fritz, H., Schweinle, W.E., & Wang, H. (2023). Habit formation intervention to improve type 2 diabetes self-management behaviors: A feasibility study. *Am J Occup Ther*, *77*(6), 7706205100. doi: https://doi.org/10.5014/ajot.2023.050351

(53)Pyatak, E., King, M., Vigen, C.L.P., Salazar, E., Diaz, J., Schepens Niemiec, S.L., Blanchard, J., Jordan, K., Banerjee, J., & Shukla, J. (2019). Addressing diabetes in primary care: Hybrid effectiveness–Implementation study of lifestyle redesign® occupational therapy. *Am J Occup Ther*, *73*(5), 7305185020p1–7305185020p12. doi: https://doi.org/10.5014/ajot.2019.037317

(54)Smallfield, S., Fang, L., & Kyler, D. (2021). Self-management interventions to improve activities of daily living and rest and sleep for adults with chronic conditions: A systematic review. *Am J Occup Ther*, *75*(4), 7504190010. doi: https://doi.org/10.5014/ajot.2021.046946

(55)Jewell, V., Qi, Y., Knezevich, E., Abbott, A., Shin, J., & Bulleigh, B. (2022). Evaluation of a rural telehealth occupation-based coaching intervention for type 1 diabetes health management. *Am J Occup Ther*, *76*(Supplement_1), 7610510018p1. doi: https://doi.org/10.5014/ajot.2022.76S1-RP18

(56)Hernandez, R., Schneider, S., Jin, H., Hoogendoorn, C., Lee, P., Pham, L., & Pyatak, E.A. (2024). Whole day workload: Evaluation of a new outcome measure in occupational therapy for adults with type 1 diabetes. *Am J Occup Ther*, *78*(5), 7805205120. doi: https://doi.org/10.5014/ajot.2024.050527

(57)Centers for Disease Control & Prevention. (2024). Testing for Diabetes and Prediabetes: A1C. Retrieved from https://www.cdc.gov/diabetes/diabetes-testing/prediabetes-a1c-test.html#

(58)Pavitt, L.N., Wu, C., Tragord, B.S., & Bristow, K. (2024). Managing type 2 diabetes through the lens of people with serious mental illness: A photovoice study. *Am J Occup Ther*, *78*(Supplement_2), 7811500172p1. doi: https://doi.org/10.5014/ajot.2024.78S2-PO172

(59)American Occupational Therapy Association. (2021). Critically Appraised Topic: Interventions to Address Healthcare Transitions and Discharge, Catheter-Acquired Urinary Tract Infections, and Diabetes Management in Post-Acute Care. Retrieved from https://www.aota.org/practice/practice-essentials/evidencebased-practiceknowledge-translation/critically-appraised-topic-interventions-to-address-health-care-transitions-and-discharge-catheter-acquired-urinary-tract-infections-and-diabetes-management-in-post-acute-care

(60)Feldhacker, D.R., & Doll, J.D. (2020). An Interprofessional Approach to Diabetes Management in Primary Care for Older Adults. Retrieved from https://www.aota.org/publications/sis-quarterly/productive-aging-sis/pasis-2-20

(61)Garrison, T. A., Schwartz, J. K., & Moore, E. S. (2023). Effect of occupational therapy in promoting medication adherence in primary care: A randomized controlled trial. *The American Journal of Occupational Therapy*, *77*(3), 7703205040. https://doi.org/10.5014/ajot.2023.050109

(62)de Groot, M. (2023). Diabetes and depression: Strategies to address a common comorbidity within the primary care context. *American Journal of Medicine Open*, *9*, 100039. https://doi.org/10.1016/j.ajmo.2023.100039

(63)Sakamoto, R., Ohtake, Y., Kataoka, Y., Matsuda, Y., Hata, T., Otonari, J., Yamane, A., Matsuoka, H., & Yoshiuchi, K. (2022). Efficacy of acceptance and commitment therapy for people with type 2 diabetes: Systematic

review and meta-analysis. *Journal of Diabetes Investigation*, *13*(2), 262–270. https://doi.org/10.1111/jdi.13658

(64)Qona'ah, A., Rumambo Pandin, M.G., & Nursalam, N. (2023). The effect of mindfulness based stress reduction on glycemic control and psychological well-being of diabetes mellitus patients: A review of experimental studies. medRxiv.12.27.23300572. https://doi.org/10.1101/2023.12.27.23300572

(65)Dubois, S. K., Lehrer, H. M., Whyne, E. Z., & Steinhardt, M. A. (2020). A resilience intervention for adults with type 2 diabetes: Proof-of-concept in community health centers. *International Journal of Behavioral Medicine*, *27*(5), 565–575. https://doi.org/10.1007/s12529-020-09894-5

(66)Lowe, R. N., Williams, B., & Claus, L. W. (2022). Diabetes: How to manage patients experiencing hypoglycaemia. *Drugs in Context*, *11*, 2021-9-11. https://doi.org/10.7573/dic.2021-9-11

(67)InformedHealth.org [Internet]. Cologne, Germany: Institute for Quality and Efficiency in Health Care (IQWiG); Type 2 diabetes: Learn More – Hyperglycemia and hypoglycemia in type 2 diabetes. [Updated 2023 Dec 18]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK279510/

(68)Centers for Disease Control & Prevention. (2024). About Diabetic Ketoacidosis. Retrieved from https://www.cdc.gov/diabetes/about/diabetic-ketoacidosis.html#