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Pharmacological Management of the Diabetic Patient: A Staff Education Project

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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Abstract

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MS, Saint Joseph's College of Maine, 2015

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Project Submitted in Partial Fulfillment

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Abstract

Diabetes is a common chronic illness that affects millions of people in the United States. Poorly controlled diabetes can lead to health complications that impact quality of life, increase healthcare costs, and create a negative impact on communities. Pharmacological management of diabetes was identified by stakeholders as a gap in practice at a clinic in the southeastern United States. The purpose of this project was to develop staff education based on American Diabetes Association (ADA) and American Association of Clinical Endocrinologists (AACE) standards of care, deliver education to primary care nurse practitioners (NPs), and evaluate their learning and confidence levels. The primary framework for this project was the chronic care model. An expert panel, including 2 board-certified endocrinologists and a registered nurse diabetic educator, reviewed the educational materials and agreed the presentation was clinically appropriate for the intended audience and the content was current and accurate. Seven NPs participated in the preassessment survey and education program, and six NPs completed the postassessment survey. Preassessment and postassessment surveys asked 13 questions rated on a Likert-type scale from 5 (very comfortable) to 1 (very uncomfortable). Participant responses showed an increase to comfortable and very comfortable on 12 survey items. Posteducation survey items showed that 100% of participants were very comfortable in adjusting premixed insulin, treatment guidelines, and classes of medication and their effectiveness. Implications for positive social change related to this doctoral project include increased staff knowledge, improved patient outcomes, decreased healthcare costs, and a decrease in the community burden of diabetes.

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Dedication

I would like to dedicate this project to the memory of my loving father who instilled excellence and education. I would also like to thank and my amazing wife Vangie for patiently supported me throughout this process.

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Section 1: Nature of the Project

Diabetes is an increasingly common chronic illness. According to the Centers for Disease Control and Prevention (CDC, 2016), more than 30.3 million people in the United States are currently affected by this chronic illness. In the state of Georgia, 10.7% of the population currently suffer from diabetes (CDC, 2016). Poorly controlled diabetes can lead to diabetic complications. Patients with diabetes account for more than 30% of all noncritical hospitalized patients. The average age of those admitted was 65 years old (Ables et al., 2016). The costs of diabetes management, complications, and hospitalizations are currently more than 245 billion dollars. The estimated per-person cost for diabetes care and associated complications can reach more than $10,000 over 8 years. One fourth of that amount can be spent within the first year following diagnosis (Rosella et al., 2016). However, many complications and hospitalizations can be decreased or prevented starting at the outpatient primary care level.

Current literature shows that blood glucose control is a critical part of obtaining and maintaining long-term health (American Association of Diabetic Educators, 2017). Prevention of hyperglycemia in the non-critically ill patient helps to decrease infection, complication, morbidity, mortality, and hospital admission (Corsino et al., 2017). Metabolic and hormonal changes experienced by patients living with diabetes often lead to hyperglycemia, which in turn can lead to immune dysfunction; hemodynamic effects, such as dehydration and electrolyte loss; and tissues effects, including inflammation, oxidative stress, and endothelial dysfunction (Umiperrez & Lansang, 2016).

The gap in practice addressed by this doctoral project was the lack of confidence in knowledge of nurse practitioners (NPs) to treat their patients with diabetes. This staff education program was created with the intention of increasing provider knowledge in pharmacological management of diabetic patients using evidence-based practice. This project can lead to positive social change by helping providers at the project site increase their knowledge and confidence. In turn these providers can use this knowledge to help improve patients' quality of life and long-term health and decrease complications and overall diabetes-related healthcare costs (Spruce, 2015)

Problem Statement

People with diabetes are three times more likely to be hospitalized than people without diabetes. Uncontrolled and recurrent hyperglycemia is a common condition but is often preventable with appropriate management (Umiperrez & Pasquel, 2017). The healthcare effectiveness data and information set (HEDIS) is a method adopted by Medicare and other private payers to determine clinicians' performance levels. Clinicians can be held accountable and receive a decrease in compensation for a failure to meet HEDIS measures. HEDIS measures for diabetes are (a) a hemoglobin (A1C) less than 8%, (b) low-density lipoprotein cholesterol (LDL-C) of less than 100 mg/dL, (c) blood pressure (BP) less than 140/90 mmHg, and (d) aspirin therapy in the presence of ischemic vascular disease (McCoy et al., 2017). Failure to meet these measures can have dire consequences on the patients and the providers. Consequences to the patients include poor health outcomes and diabetic complications, such as nephropathy, loss of income and financial burden. Primary care providers like those associated with the project site

can experience negative scoring that follows their reimbursement rates under CMS for the next year. The project site has experienced a decrease in revenue due to the adjusted reimbursement percentage (McCoy et al., 2017). Administrators at the project site stated to me that they have not been meeting all their HEDIS measures for diabetes. Many patients at the project site are not meeting their A1C goals. There has been an increase in patients being admitted to the hospital with diabetic-related complications. Some factors, such as patient compliance and ability to afford their medications, are beyond provider control. Provider knowledge in pharmacological management of diabetes and confidence in that knowledge was the component I sought to address in this DNP project.

The small private practice in which the project took place is unique in nature. The practice provides all aspects of primary care and more to homebound patients. Homebound criteria are defined by and set forth by Medicare (Cigna Government Services, 2017). Each patient has a different level of physical, mental, emotional, and financial ability to see specialists, such as endocrinologists. All project site patients are managed by NPs. Several of the providers expressed limited knowledge in the management of diabetes, including pharmacological choices and the associated pharmacokinetics. I sought to address this important component of patient care in this DNP project to help improve patients' abilities to maintain safe and adequate glucose control.

Purpose Statement

The purpose of this project was to develop staff education based on American Diabetes Association (ADA) and American Association of Clinical Endocrinologists

(AACE) standards of care, deliver the education to primary care NPs, and evaluate their learning and confidence levels. I used the standards of care to create an educational program that provided detailed information regarding diabetic pharmacology, considerations, mechanism of actions, and a treatment algorithm. The gap in practice addressed in this DNP project was the lack of adequate knowledge of pharmacological management of diabetic patients by new NPs.

The practice-focused question that guided this project was: Will an educational program presented to primary care NPs on the pharmacological management of diabetic patient increase the nurse practitioners perceived confidence and knowledge in treating and managing diabetic patients? According to the ADA, each person living with diabetes requires individualized treatment plans that best fit each person's complex needs. The goal of this project was to develop a staff education that would help to increase the confidence of each provider to properly select the appropriate medications for their diabetic patients based on evidence-based practice.

Overview of the Doctoral Project

The project site where this staff education project took place is a small primary care in-home practice in a major city in southeastern Georgia. Most of the providers are new NPs who do not feel they have enough knowledge and experience to properly care for and treat diabetic patients. During my tenure as a provider there, I had conversations with several of these NPs over the years. These conversations served as a contributing factor in creating this DNP project. To answer the practice-focused question, I provided a 30-minute program using a PowerPoint presentation through a real-time virtual platform.

The goal of this DNP project was to increase the confidence and knowledge among NPs in a small primary care practice who make house calls to homebound patients. The expected outcome was that, following a short but intensive staff education program on pharmacological management of diabetic patients, NPs would report a perceived sense of increased confidence and knowledge to make timely and appropriate decisions on medication management while partnering with their patients. The virtual platform was selected as a presentation method due to continued concerns regarding the COVID-19 global pandemic. The project site continues to provide telehealth services and is conducting all meetings virtually. The content of the staff education program provided current treatment guidelines, pharmacokinetics, considerations, and contraindications to medication therapy and management in the diabetic patient. A pretest survey and a posttest survey were given to assess participants' perceived knowledge and confidence in pharmacological management of diabetic patients. A 13-question Likert scale survey I created was used to complete the assessment of the participants both before and after the staff education intervention. The survey questions were rated on a scale from 0–10 to assess the NPs' level of comfort both before the presentation and after. Descriptive statistics were used to analyze the data from the pretest survey and posttest survey.

The literature review on diabetes was completed using the following key search terms: *diabetes, nurse practitioner, new provider, confidence, diabetes management, insulin, basal, prandial, bolus, glycemic control, hyperglycemia, hypoglycemia,* and *outcomes*. Exclusion criteria includes pediatric and gestational diabetes articles and non-English articles. I used information found in databases, such as CINAHL, Medline,

PubMed, NIH, and Embassy. Other sources of evidence included guidelines from the ADA and AACE. The search focused on sources written between 2014 and 2020. All articles used were peer-reviewed and published within the past 6 years. Exceptions were made for appropriate historical articles. Input and opinions from an expert panel consisting of two endocrinologists and one registered nurse educator also served as an additional source of evidence.

Significance

There are 166 endocrinologists in the state of Georgia (Elflein, 2019), which makes referrals difficult and accompanied by long wait times. Many patients cannot and will not go to a specialist due to an inability to afford medical transport. While working as a provider at the project site several patients cited transportation costs to be between 300 dollars and 700 dollars each way or roundtrip. Many of these patients have associated diabetic complications, such as chronic kidney disease, and many have been hospitalized due to these complications. It is essential that primary care providers have confidence in understanding how to best manage their diabetic patients.

In this practice, most of the care and pharmacological management of diabetic patients is provided by NPs. Therefore, it is essential that these NPs feel confident and able to provide evidence-based care that is individualized. Many providers in the primary care setting take a one-size-fits-all approach to diabetes management (Rushforth et al., 2016), which does not incorporate individual patient needs. In-depth training on clinical guidelines and the pharmacokinetics of various medications will help practitioners feel better equipped and experience increased confidence in their ability to create an

individualized treatment plan for diabetic patients. This project aligns with DNP Essentials I, II, III, and VIII, which address the scientific underpinnings for practice and information systems/technology for the improvement and transformation of health care (American Association of Colleges of Nursing, 2006).

The stakeholders for this project include all physicians, NPs, administrators, and diabetic patients of the project site. Both physicians and nurses may benefit by increasing knowledge on managing these complex patients. The education program supports the positive impact of increasing provider confidence in selecting appropriate pharmacological management for patients, thereby obtaining better patient outcomes and satisfaction. The administrative staff may benefit by seeing an increase in reimbursement for services due to meeting HEDIS measures and keeping patients out of the hospital. Patients may benefit by experiencing increased quality of life, better outcomes, and fewer complications. These benefits illustrate the potential for positive social change.

Summary

In Section 1, I provided the introduction to this DNP capstone project. The purpose of the project was to provide evidence-based staff education to primary care NPs on pharmacological management of patients living with diabetes. Section 1 included an overview of the nature of the DNP project, the problem statement, purpose, practice-focused question, and significance of the project. Section 2 will include a discussion of the chronic care model (CCM) as a framework for the DNP project, relevance of the DNP project to nursing practice, local background, context, and my role in this project as the DNP student.

Section 2: Background and Context

Millions of people are affected by diabetes, a complex chronic disease. I have focused this DNP capstone project on a staff education project to provide pharmacological diabetic management education to a group of primary care NPs. In this section, I discuss the concepts and models that served as frameworks for this DNP project. In addition, I discuss the project's relevance to nursing, the local background and context, and my role as the DNP student. This project was important to the local primary care practice. The NPs within the group provide over 97% of all diabetic management for their patients. The ADA (2019) standards of care state that treatment modalities in the management of diabetes should be timely, based on evidence, and utilize a collaborative approach taking into consideration the patients' prognoses, preferences, and comorbidities. The treatment plan should be aligned with the CCM. Primary care providers should ensure that treatment plans take into consideration socioeconomic factors and use a team–community approach whenever possible (ADA, 2019).

The purpose of this project was to develop staff education based on ADA and AACE standards of care, deliver the education to primary care NPs, and evaluate their learning and confidence levels. With this project, I aimed to address an important knowledge gap and increase NPs' confidence in managing their patients by answering the practice-focused question. The practice-focused question that guided this project was: Will an educational program presented to primary care NPs on the pharmacological management of diabetic patient increase the practitioner's perceived confidence and knowledge in treating and managing diabetic patients? In this section, I discuss the CCM

as the major framework for this project. In addition, I discuss the project's relevance to nursing practice, local background and context, my role as the DNP student, and the role of the project team.

Concepts, Models, and Theories

Chronic Care Model

The CCM is an evidence-based practice model designed to encourage care teams to manage chronic illness using a variety of approaches (Baptista et al., 2016; Stellefson et al., 2013). The CCM consists of six components that help guide providers into a systematic approach to managing chronic conditions such as diabetes. CCM encourages providers to use all resources to manage patients with chronic diseases such as diabetes (Baptista et al., 2016; Stellefson et al., 2013). The six components of the CCM are purposed to make all resources available through the organization of heath care, while minimizing barriers to access to care. The six components include: (a) self-management support; (b) decision support and guidance for evidence-based care implementation; (c) delivery system design, used for coordinating care processes; (d) clinical information systems, used to track progress and to report patient outcomes; (e) community information systems, also used to track progress and report outcomes; and (f) community resources and polices, which involves use of community-based resources.

This model is relative to the DNP project because it is used to address the importance of support from healthcare organizational leaders. In this project, the organizational leadership includes the administrator and medical director. In their support of this project, they are promoting a culture of quality care, facilitating communication,

and managing quality control issues (Baptista et al., 2016; Stellefson et al., 2013). The CCM encourages partnership between the provider and the patient to identify issues, set goals, set priorities, and develop plans of care (Baptista et al., 2016). The CCM is the primary model of consideration for the ADA. The ADA standards of care are evidence-based guidelines for primary care providers caring for patients affected by diabetes. The primary component of the CCM that is the focus of this project is providing training to help create a decision support model for medical practitioners to apply evidence-based treatment modalities for diabetic patients. In this case, the primary team members are the patient and the provider. The PowerPoint presentation used for the training incorporated the ADA standards of care regarding pharmacological management of latent autoimmune diabetes in adults (LADA) and Type 2 diabetes mellitus.

The use of scientifically based clinical guidelines in decision making fosters a treatment delivery system that promotes clinical excellence. The CCM is appropriate for use in this project as it promotes the support of organization leaders, such as the medical director, collaborative physicians, and administration, in identifying necessary resources and reducing barriers to practice change that should be evidence based.

Definition of Terms

Clinical Inertia: The failure to initiate or intensify treatment when clinically indicated (Smith, 2019).

Socioeconomic Status: A combination of income and occupation used to classify the social standing of an individual or group.

Certified Diabetes Care and Education Specialist (CDCES): A licensed professional with extended knowledge in diabetes management (CBDCE.org, 2020).

HbA1C: Hemoglobin A1C blood laboratory tests provide the average blood glucose levels over 3 months, which is the period that represents the life of the red blood cell (ADA, 2019).

Microvascular: Involving small blood vessels, such as capillaries, includes retinopathy, nephropathy, and neuropathy and results in organ and tissue damage (Chawla et al., 2016).

Macrovascular: Involving large blood vessels, such as arteries and veins, includes ischemic heart disease, peripheral vascular disease, and cerebrovascular disease. These complications result in organ and tissue damage (Chawla et al., 2016).

Sodium Glucose Cotransporter 2 Inhibitors (SGLT-I): Oral antidiabetic medication that decreases reabsorption of glucose by the kidneys (Hsia et al., 2017).

Dipeptidyl Peptidase 4 Inhibitors (DPP4): Oral antidiabetic medication that inhibits dipeptidyl peptidase (DPP) on the surface of most cells. DPP4 deactivates peptides such as GLP-1. DPP4 decreases insulin secretion associated with meals, delays gastric emptying, and decreases postmeal glucagon (Dungan & DeSantis, 2020).

Glucagon Like Peptide 1 Receptor Agonist (GLP-1 RA): Works on GLP-1, which is a gastrointestinal peptide that releases glucose in the setting of meals. GLP-1-RA is an injectable antidiabetic therapy that works to stimulate insulin synthesis, delays gastric emptying, and decreases postmeal glucagon (Dungan & DeSantis, 2020).

Relevance to Nursing Practice

Primary care NPs are often the first line providers in the management of diabetes. Continuing education, clinical competence, and evidence-based practice are the cornerstones of quality patient care provided by NPs (Black et al., 2015). The ADA (2019) promotes evidence-based treatment plans individualized to each patient. NPs who are aware of how each medication works and of considerations for each medication are better able to meet this goal.

Types of Diabetes

There are multiple types of diabetes. This project focused on medical management of LADA and Type 2 diabetes. LADA and Type 2 are the two most common forms of diabetes encountered at the project site. Type 2 diabetes is a results of cumulative insulin resistance and hyperglycemia, which cause insulin secretion deficiencies (ADA, 2018). Type 2 diabetes is one of the most common types of diabetes encountered in primary care (Seidu et al., 2020). LADA is a common autoimmune disease like Type 1 diabetes in which a patient's pancreas stops producing adequate insulin due to some sort of insult that damages the beta cells of the pancreas (ADA, 2018).

LADA is often mistaken for Type 2 diabetes, especially among older adults. Because of this, my project did not focus on Type 2 diabetes alone. LADA patients are often started on oral agents due to misperception that they have Type 2 diabetes. But oral agents will not work for patients with LADA because LADA is an autoimmune form of

the disease process; LADA patients require insulin and management as though they have Type 1 diabetes (Carlsson, 2019).

Treatment Guidelines

ADA Standards of Care

ADA standards of care provide evidence-based guidelines in the treatment and management of diabetes. The ADA Professional Practice Committee is comprised of healthcare professionals of all types and levels. The Professional Practice Committee completes systematic literature searches for new evidence and grade the evidence using a rating system. The committee receives feedback during the year and generates the standards of care (Chamberlain et al., 2016). These standards of care address (a) diagnosis of diabetes, (b) recommendations for glycemic targets, (c) medical management of diabetes, (d) risk management for cardiovascular disease, (e) microvascular disease management, and (f) diabetic care in hospital (Chamberlain et al., 2016). In this project I focused on Standard 9 regarding pharmacological approaches to glycemic treatment (ADA, 2019). This standard addresses recommendations of initiation of treatment.

The ADA standards of care have developed a treatment algorithm to help guide providers in selecting appropriate interventions and medications for diabetic patients. This includes lifestyle management as well as the initiation of pharmacological therapy. The ADA standards of care provide fundamental guidance for the appropriate selection of each medication, which medications can be used in combination, when to titrate up, add

an addition category of medication and considerations for each. This guideline will be the used as the foundational basis of this project.

The ADA treatment algorithm recommends metformin and comprehensive lifestyle changes are as first steps in the treatment of Type 2 diabetes (ADA, 2019). If the identified A1C targets are still not met after 3- months providers should consider adding a second or third agent. If the patient has a history of atherosclerotic cardiovascular disease, chronic kidney disease or heart failure then a Sodium Glucose Cotransporter 2 Inhibitors (SGLT-2i), Glucagon like peptide 1 receptor agonist (GLP-1 RA) should be considered. If Atherosclerotic Cardiovascular (ASCVD) is the dominate condition, then a GLP-1 RA should be fist consideration if not contraindicated or an SGLT2i. If chronic kidney disease (CKD) or heart failure (HF) are dominate then an SGLT2i should be considered if not contraindicated or an GLP-1 RA (ADA, 2019). It is important that providers understand the maximum benefits and effects on A1C of each category of medication. While the ADA standards of care will be the primary treatment algorithm utilized for this project, I will briefly address the AACE treatment algorithm as well. The AACE treatment algorithm is not much different than the ADA treatment algorithm. The information provided in the algorithm are easy to follow guidelines which providers can use to help obtain glycemic control when treating the Type 2 diabetic patient. It gives easy to follow numerical A1C recommendations for the initiation of monotherapy, dual therapy, triple therapy, and initiation of insulin (American Association of Clinical Endocrinologists (AACE, 2015).

There are subtle differences between the guidance provided in the ADA algorithm and that of the AACE algorithm. The AACE recommends an A1C of 6.5% for most patients without elevated risk of hypoglycemia. Monotherapy pharmacological intervention is recommended for A1C of less than 7.5% (AACE, 2015). The medications are listed in order of suggested hierarchy. This hierarchy is further recommended for dual and triple therapy. If a patient has an A1C of 7.5% to 9.0% the AACE recommends initiating dual or triple therapy initially. This differs from the ADA algorithm which suggest starting dual therapy at greater than 9% (ADA, 2019) and triple therapy or initiating insulin at 11%. The ADA table is not in order of recommended hierarchy.

Blood Glucose Levels Related to Pharmacological Management

The ADA has identified glycemic targets for patients with diabetes. Glycemic targets should be individualized for each patient. HgA1C values should be between 6 – 8 %. The majority of nonpregnant adults should have A1C goals less than 7%. Pregnant women should have their A1C maintained less than 6.5%. Those with multiple comorbidities, high risk of hypoglycemia, falls, and short life expectancy can have their A1C targets relaxed to 8% (ADA, 2019). Daily glycemic values should be kept between 70 -180 mg/dL with fasting levels kept less than 100 mg/dL for most people (ADA, 2019). Type 2 diabetes mellitus patients have a variety of pharmacological modalities available to treat their diabetes. Each category of medication works on a different mechanism, has contraindications, and variable costs. Each category has a maximum expected effect on A1C values. It is essential that primary care providers understand: what medications are available, how each works, and considerations as well as

recommendations for use for each medication. Lifestyle management and the initiation of oral agents are first steps in the management of diabetes.

Lifestyle Management

Lifestyle management is the first step in diabetes management. In previous years it was recommended that lifestyle management be initiated for Type 2 diabetics at diagnosis prior to starting medications. Current guidance is that lifestyle management should be initiated at diagnosis along with monotherapy such as Metformin. Lifestyle management includes adhering to a low carbohydrate diet which is appropriate diabetics, physical activity, smoking cessation, and mental health support. For the purposes of this project the focus for lifestyle management will be on medical nutrition therapy and physical activity.

Medical nutrition should be implemented at diagnosis. Medication nutrition therapy is nutrition therapy that is provided by registered dietician (Franz et al, 2014). Medical nutrition can decrease A1C values by as much as 3%. Utilizing medical nutrition therapy provided by a qualified nutritionist can help diabetics to achieve weight loss goals, improve glycemic control, improve blood pressure control, improve lipid levels, and prevent diabetic complications (Franz et al., 2014). Physical activity is another component that can aid in improving overall health, decreasing diabetic complications and improving A1C values. For most diabetics, it is recommended to add or increase aerobic physical activity to 150 minutes of moderate to vigorous activity weekly. This should be achieved over more at least 3 days a week with no more than 2 days off in between (ADA, 2019).

Anti-Diabetic Agents

Most medications can be used as monotherapy or adjunctive therapy. Metformin (Glucophage) is the initial recommendation for treatment for most diabetic patients (Buse et al., 2019). However, some patients are unable to either initiate metformin or they cannot tolerate the side effects. In that instance other medications can be used to include, Glucagon-like peptide-1 receptor agonists (GLP1-RA), sodium-glucose cotransporter 2 inhibitors (SGLT2i), dipeptidyl peptidase 4 inhibitors (DPP-4i), thiazolidinediones (TZDs), sulfonylureas, and insulin. If an A1C is greater than 9.0% and they have symptoms of hyperglycemia, insulin should be initiated either as a stand-alone therapy or with other agents (ADA, 2019). Each anti-diabetic agent works on a different component of the body.

Metformin

Metformin is a biguanide. It is an antidiabetic oral medication used as first line treatment in the management of Type 2 diabetes. It works by decreasing hepatic output of glucose. Metformin can lower A1C levels by 1-2%. It is a very inexpensive medication. Therefore, it is a great consideration for patients that have no insurance or limited income. Metformin has been approved for use in pediatric patient older than 10 years. Additional benefits to the use of Metformin include cholesterol lowering, no hypoglycemia and no weight gain. It cannot be used in those with severely diminished kidney function with a GFR less than 45 or creatinine greater than 1.4 (Avramidis et al., 2020).

Sulfonylureas

Sulfonylureas are another class of oral diabetic medications. These medications stimulate the pancreas to make and release insulin. Medications in this class include glyburide, glipizide, and glimepiride. Sulfonylureas can lower A1C levels by 1.0-2.0%. They are a very low cost and are another good choice for those with no insurance or limited incomes. They can cause hypoglycemia and weight gain so they should be used with caution in the elderly and very obese (Avramidis et al., 2020).

Sodium-Glucose Cotransporter 2 Inhibitors

Sodium-glucose cotransporter 2 inhibitors (SGLT2) are a class of oral antidiabetic medications that decrease reabsorption of glucose by the kidneys. They have an A1C lowering capability of 0.6 – 1.5%. These medications are able to inhibit the very high - capacity transporter SLGT2i which is most prevalent in the kidney. SGLT binds to sodium and glucose and is responsible for 90% of the glucose reabsorption in the kidney. These medications also have cardioprotective benefits and reduce risk of cardiovascular death, heart failure and are also renal protective. The benefits include that the patient does not experience side effects of hypoglycemia and weight gain. In fact, SGLT2i medications often aid in weight loss. Common side effects of SGLT2i drugs include hypotension, UTIs, mycotic infections, and ketoacidosis (Shahady & Leahy, 2010).

Glucagon-Like Peptide-1 (GLP-1) Receptor Agonists

Glucagon-like peptide-1 (GLP-1) receptor agonists are an antidiabetic injectable therapy. They are incretin-based therapies that increase the release of insulin during meals, slow gastric emptying, promotes early satiety and decreases glucagon release with

food. They can lower A1C levels 0.5 – 1.6%. Most side effects are gastrointestinal and generally subside. This category of medication should not be used in patients with a familial history of medullary thyroid cancer. GLP-1RAs also reduce risk of cardiovascular death, myocardial infarction, stroke, and can aid in weight loss of 1.6 – 6.0 kg (Almandoz et al., 2020).

Dipeptidyl Peptidase 4 Inhibitors

DPP-4i or dipeptidyl peptidase 4 inhibitors are another class or oral antidiabetic medication. These medications also work in the incretin hormone. Like the GLP-1, DPP-4i medications work to increase insulin secretion with food, delay gastric emptying, and prolong action of gut hormones. They can lower A1C levels 0.6 – 0.8%. These medications do not cause hypoglycemia or weight gain. They have been associated with disabling joint pain. This adverse effect will generally subside upon discontinuation of the medication.

Thiazolidinediones

Thiazolidinediones (TZDs) are a class of oral antidiabetic medication that increase insulin sensitivity. They can lower A1C 0.5 – 1.0%. One TZD has been in the media over the last few years with a black box warning that it caused bladder cancer. This warning has since been redacted and replaced with a warning of increased risk for bladder cancer. TZDs may also cause or worsen congestive heart failure as it causes the body to retain fluid (Avramidis et al, 2020).

Insulins

There are a variety of insulins on the market. Insulin therapy is required for Type 1 DM and LADA. Basal or long- acting insulin is meant to mimic a body's natural release of daily insulin. There are 2 types of basal insulin which are long-acting and Intermediate. The difference is in the dosing, manufacturer, duration, and costs. Basal insulins last 6-42 hours. Prandial or mealtime insulin come as rapid-acting insulting and short-acting insulin. Like basal insulin the difference is onset, duration, costs, and manufacturer. Onset is anywhere from 2.5 minutes to 60 minutes and duration of 3-8 hours (Avrammidis et al, 2020).

Complications

According to the CDC 1 in every 10 people have diabetes. This represents approximately 30.3 million people (CDC, 2016). Decreased mortality combined with the increased prevalence of diabetes means that there are more people living longer with diabetes (Green et al., 2016). The incidence of age-related factors such as dementia increase with the duration of diabetes. This increases the risk of associated diabetic complications. These complications include macro-vascular complications such as coronary artery disease (CAD), stroke and peripheral arterial disease as well as microvascular complication such as end stage renal disease, retinopathy, and neuropathy (Harding et al, 2019). According to Harding et al., (2019), the two most common micro-vascular complications associated with diabetes are retinopathy (23%) and nephropathy (13%).

Uncontrolled hyperglycemia is the most common cause of microvasculopathy as well as macrovasculopathy (Chawla et al, 2016). The importance of glucose control cannot be diminished. Early implementation of glucose control through lifestyle and pharmacological management as well as continued maintenance greatly contribute to minimizing diabetic complications. Poor glucose control contributes to extracellular matrix protein synthesis, oxidative stress, and capillary membrane thickening (Chawla et al., 2016). These are changes to microvascular and macrovascular complications of diabetes. Identification of glycemic targets, meeting those targets and maintaining those targets is important in both primary and secondary prevention of complications which can lead to blindness, renal failure, myocardial infarction, stroke and increased mortality (Zhu et al., 2017). Early management often occurs in the primary care setting. This makes this DNP project timely and relevant. The ADA Standards of Care are the most cited and utilized guidelines for management of diabetes. Therefore, this will be the primary guideline utilized for this training. The ADA Standards of Care have guided the management of diabetes in the primary care setting since 1989 (Chamberlain et al., 2016).

Local Background and Context

In the state of Georgia, the number of elderly peoples affected by LADA and Type 2 diabetes has grown significantly. According to the Georgia department of Public Health, deaths related to diabetes are 8 % higher than the national average (Georgia Department of Public Health, 2015). Georgia ranks 38th in the nation for diabetes management. (United Health Foundation, 2019). Despite major advancement in the study

of diabetes, there continues to be vast number of patients that are not reaching their identified glycemic goals (ADA, 2019). The estimated per-person costs for diabetes care and associated complication were >$10,000 over the course of eight years (Rosella et al., 2016). Decreasing costs, decreasing negative health outcomes, and increasing positive outcomes, as well as increasing provider knowledge and confidence are important factors which drove the decision to conduct this DNP project.

As previously stated, this is a small privately owned primary care practice. The owner is an internal medicine MD and as such is a major stakeholder in this project. He is a major stakeholder because meeting HEDIS measure, getting the best outcomes for the clinic's patients, helping the NPs feel empowered and supported are positives outcomes that will build and enhance this practice. The seven NPs that participated in this education project have a variety of experience from new graduate to those with years of experience. All patients are seen in their homes or facilities such as assisted living Many patients are home bound, therefore have a difficult time seeing specialists due to physical issues and the challenges of medical transport. Cost often prohibits special transportation to a clinic appointment and there is not access to an endocrinologist. The NPs, as providers in this practice, often manage all aspects of their patients' care. These NPs are bridging a gap by providing care to this underserved population. They help to decrease cost of care by providing frequent visits, improving access to care, and providing a quick response to need (Jones et al, 2017).

The majority of patients treated by this project site are over 60 years of age. Over 60% of diabetes related healthcare costs are spent on those over the age of 65 (Rosella et

al, 2016). During internal audits, the Administrator of the practice noticed that many patients are not meeting their A1C goals. NPs also self-identified limited knowledge regarding some categories of diabetes medications and therefore do not commonly prescribe them. This staff education may help to improve NP ability to create individualized EBP care plans utilizing a combination of pharmacological approaches. Safe and appropriate treatment aimed at adequate glycemic control in diabetes is essential in decreasing both individual and societal disease burden (Leon et al., 2015).

Role of the DNP Student

I am a master's prepared registered advanced practice registered nurse with 10 years of experience. I currently work as a NP and certified diabetic educator in an outpatient endocrinology office in a hospital setting. Many primary care physicians, NPs and physician assistants refer their diabetic patients to us for consultation and management. Through these consults it is evident the lack of knowledge and confidence in managing these patients beyond one or two medications. The practice in which this project will be completed is a former employer. During my tenure there I saw firsthand the complexity of the diabetic patients of the practice as well the limited knowledge, confidence, and experience of the providers. The role of a doctoral prepared nurse is to improve clinical outcomes for patients through education and example in clinical leadership (Richardson et al., 2014).

I served as the leader of this DNP capstone project. This project was created utilizing the treatment guidelines from the ADA and AACE. No personal opinions or conjecture were added. I also served as facilitator for the expert panel discussion.

Steps in the Development of a Staff Education Project

The diabetes staff education project began with a discussion with the director for advance practice providers and the medical director. A current need was identified related to NP education on the medical management of diabetic patients. The medical director determined that this education program would be a positive tool to help strengthen diabetes management for the NPs within the practice. The project was implemented during plan is to implement a regularly schedule staff meeting. This staff education project followed Walden University's DNP Manual for Staff Education. I reviewed the ADA standards of care, materials from The Association of Diabetes Care & Education Specialists (ADCES), and the AACE guidelines to prepare the presentation. I obtained Walden University Institutional Review Board (IRB) number 11-16-20-0676748 approval prior to starting the project.

Role of the Project Team

Expert Panel

Content for the project presentation was reviewed by an expert panel made up of two endocrinologists and one registered nurse educator who is also a certified diabetes care and education specialist (CBDCES). The panel of experts were presented the power-point content via email and then provided recommendations for feedback. Endocrinologist 1 signed off on the presentation stating he felt it was thorough and appropriate for the clinical setting and audience identified. Endocrinologist 2 suggested made the following suggestions: "Add that Type 2 diabetes mellitus is usually overweight while LADA and T1DM typically have normal BMI, Different forms of GLP1 weekly

and the daily. Add Rybelsus as we want advocate that GLP1 and SGLT2i provide weight loss and cardiovascular benefit so these medications should be on top of list after metformin. Add a slide on lifestyle change: exercise 150 minutes per week, weight loss of 5% can have significant impact and limit carbohydrate intake to 60 grams per meal." The Registered nurse educator echoed Endocrinologist 2 input.

I then incorporated the changes into the presentation. The team assembled in our clinic meeting room for a review and final discussion of the presentation. The panel agreed the presentation was appropriate and ready for dissemination. As leader of this DNP project I assumed responsibility for the presentation and sent a finalized copy to the medical director of the project site and requested for any input. The only concerns he voiced were regarding time management. Originally, a time frame of 45 minutes was allotted to complete the presentation. However, due to clinic time constraints he requested the information be presented within a 30- minute time slot. I agreed to the 30-minute period and moved forward with scheduling the presentation with clinic administration.

Summary

In Section 2 of the DNP capstone project I discussed the CCM which served as the framework to support this project. The need for the project and relevance to nursing practice, local context, and the role of the DNP student are explained. In section 3 I will discuss sources of evidence, collecting and analyzing sources of evidence, and project results.

Section 3: Collection and Analysis of Evidence

Section 3 includes the sources of evidence, project design, data collection, and survey tool for evaluation of the project. Evidence-based education on pharmacological management of the Type 2 diabetic and LADA patient can improve provider confidence, knowledge, ability and improve patient outcomes. Several NPs in the practice have voiced their lack of confidence in pharmacologic management of these diabetic patients. The practice management and physician collaborators are providing the support for the project and recognize the need to educate the NPs to provide evidence-based patient care and medical management. Section 3 will include discussions of the sources of evidence, project design, and the analysis and synthesis of project results.

Practice-Focused Question

Diabetes is a global health issue and a local practice problem. This DNP project was designed to address the local practice problem within a small primary care practice in southeastern Georgia. The practice-focused question that guided this project was: Will an educational program presented to primary care NPs on the pharmacological management of diabetic patients increase the practitioners' perceived confidence and knowledge in treating and managing diabetic patients? The purpose of this project was to develop staff education based on ADA and AACE standards of care, deliver the education to primary care NPs, and evaluate their learning and confidence levels. The evaluation of learning was completed by providing participants with a Likert-style survey prior to the education intervention. The same survey was again given after the educational intervention. The

presurvey and postsurvey were collected and the differences between the two assessments were recorded.

The practice problem is related to the prevalence of diabetes in the state of Georgia, burden of cost of care, increase in mortality, and the need for primary care NP education to manage the condition. The practice where this project was implemented has a high percentage of diabetic patients; approximately one of every four patients are living with diabetes. I worked for this practice for 3 years and helped begin implementation of a diabetes management program. In my current role working as an endocrinology NP with a focus on diabetes, I have been able to observe the knowledge deficit with management of diabetic patients in the primary care setting. The NPs at this practice have varying degrees of competency regarding pharmacological management of these patients. This DNP project was centered around educating NPs on the ADA and AACE guidelines for pharmacological management of Type 2 and LADA diabetic patients.

Sources of Evidence

Sources of evidence for this project included an exhaustive review of the literature for appropriate and reliable information on diabetes management. I searched databases such as MEDLINE, CINAHL, Pub Med, CINAHL full text, Ovid Nursing Journals, National Institutes of Health (NIH), and EBSCO host. Other sources of evidence included guidelines from the ADA and the AACE. Key search terms used were *diabetes, Type 2, LADA, antidiabetic, medications, SGLT2i, GLP-1 RA, sulfonylurea, metformin, treatment, DPP4i, insulin, basal, prandial, bolus, outpatient, primary care, nurse practitioner, hyperglycemia,* and *glycemic control*. Journal articles must have been

published within the last 6 years, evidence-based, peer-reviewed, and published in English. Guidelines were from the ADA and AACE. Input and opinions from an expert panel also served as a source of evidence. Evidence collected was used to create educational intervention appropriate for NPs in a primary care clinical setting. The collection and analysis of this evidence provides an appropriate method to address the practice-focused question.

Evidence Generated for the Doctoral Project

A data source for this project was evidence obtained during an exhaustive search of the literature regarding management of diabetes in primary care. Other sources of evidence included input and opinions from the expert panel as identified in the previous section as well as data from the ADA and AACE. Due to time constraints identified by the project site medical director, the education program had to be completed in 30 minutes. The program was delivered during an already scheduled staff meeting and completed on their online meeting platform. I created a 13-question Likert-style survey with ratings from 0–5. The surveys asked participants to rate their level of confidence in managing each category of medication reviewed in the presentation.

The preassessment and postassessment surveys were separated by the staff education intervention on the pharmacological management of diabetics. As leader, I conducted the staff education presentation that incorporated the most current evidence-based practice guidelines based on the ADA and AACE guidelines. I provided information on the most common types of diabetes seen in primary care along with treatment algorithms from the ADA and AACE. Common medications were discussed

including mechanism of actions, maximum benefit, dosage recommendations, contraindications, and most common side effects. I encouraged staff participation by asking questions pertaining to medications and responding to questions and concerns related to the NPs' specific patient population.

Six NPs, two medical doctors and two administrative staff of the practice participated in the project. The preassessment survey was emailed to the director of advanced practice providers the day previous. Only the participating NPs were provided with and asked to complete the survey. She assigned each NP that participated a number from 1-7. Those results were collected by her prior to the staff education intervention and emailed back to me with the words provider number and a number from 1-8 placed in the upper right corner. I received seven preassessment surveys prior to the intervention. The staff education was completed by sharing the power point along with an oral presentation of the information included in the slides. Following the presentation, the staff were asked to complete their postassessment surveys and return them. Again, the director collected the post assessment surveys and returned them to me via email. I received six postassessment surveys. Since each of the surveys were randomized, I was uncertain which provider did not return their survey.

The providers of the project site were informed that by completing and returning the pre and post assessment surveys that participation was regarded as consent to participate in the project. They were informed that could change their mind about participation at any time by not completing the assessments. The staff were informed of how their surveys would be sent to them and how they would be collected. They were

provided with the opportunity to voice any concerns regarding the project and collection of survey data. They were assured that identifies would remain anonymous, private, and confidential. There were no further ethical dilemmas anticipated.

Protections

The Site Agreement Form Anonymous Questionnaire was signed by the Administrator of the practice and submitted with Form A to the Walden IRB for approval. The Walden University Institutional Review Board (IRB) approved the project and the staff education was completed under IRB number 11-16-20-0676748. The diabetes staff education project began with a discussion with the medical director regarding the need for provider education on diabetic patient management. The educational program focused on pharmacologic management for this patient population. The aim of the project was to meet an educational need for providers to feel more knowledgeable in the medical management of diabetic patients. The medical director is very supportive of the project after determining that this education program would be a positive tool to help strengthen diabetes management for the NPs within the practice. The project was implemented virtually during a regularly schedule staff meeting. This was at the request of the medical director and follows the COVID-19 guidelines for the clinic.

Analysis and Synthesis

All providers at the clinic were invited to participate in the educational program (Appendix A). Participants were asked to complete a survey to assess pharmacological knowledge prior to the education program. Upon completion of the education intervention, the same anonymous survey was provided to the participants to evaluate the

perceived confidence and knowledge on pharmacological management for diabetic patients. The pre/post survey consist of 13 questions. Each question was answered using a 5-point Likert scale (Appendix B). The Likert scale ranges from *strongly disagree* to *strongly agree*. All survey results are anonymous to me and will remain confidential. The clinical advanced practice director disseminated and collected the surveys, each of which were given random numbers and then she returned all the collected surveys to me in one email. The project site is located over two hours away from my location. Due to Covid-19 concerns and the ability to meet in person, this was most proficient way to allow for anonymity to the writer given that this will all be completed using virtual platforms and email technology I completed a quantitative review of the survey results. The review includes the number of study participants and scores from pre and post survey assessment. The collected data was analyzed by pairing results for each provider and compiling those results in table to compare clinician perceived confidence in their knowledge and ability to manage their patients on the various categories of medications.

Summary

In this section I focused on the collection and analysis of the evidence, project design, and the local practice gap within a small primary care practice in southeastern Georgia. I also addressed the practice-focused question that guided this DNP project. The potential benefits of this project were to increase NP knowledge and confidence in pharmacological management of their diabetic patients. Section 4 includes the evaluation and findings of the project.

Section 4: Findings and Recommendations

Diabetes is currently one of the most common chronic diseases treated in primary care. Understanding evidence-based pharmacological management of these patients is essential to preventing associated complications, decreasing hospitalizations, helping patients achieve better quality of life, and ensuring practitioners meet HEDIS measures that directly affect compensation. During chart reviews, the administrator of the project site noted continued increases in the A1C of their diabetic patients as well as increased hospitalizations with diabetic complications. Many of the wound care patients the project site treats are diabetic, and poor glycemic control greatly contributes to slow wound healing. One possible contributing factor to these outcomes identified was limited provider knowledge on pharmacological management of diabetic patients. This identified gap in practice was addressed through this staff education project.

The practice-focused question that guided this project was: Will an educational program presented to primary care NPs on the pharmacological management of diabetic patients increase the practitioner's perceived confidence and knowledge in treating and managing diabetic patients? The purpose of this project was to develop staff education based on ADA and AACE standards of care, deliver the education to primary care NPs, and evaluate their learning and confidence levels. The sources of evidence used to complete this project included an extensive of clinical databases such as MEDLINE, CINAHL, Pub Med, CINAHL full text, Ovid Nursing Journals, National Institutes of Health (NIH), and EBSCO host. Other sources of evidence included guidelines from the ADA and the AACE as well as expert opinion and input from the panel of experts. In

Section 4, I discuss project findings, recommendation, strengths, and limitations of the project.

Findings

This staff educational program (Appendix A) was successful in attaining the goal of increasing NP confidence in the pharmacological management of diabetic patients. A preassessment survey was provided to the providers of the project site. There were seven NPs and two physicians who participated in the program. The preassessment surveys were collected by the director prior to the presentation. The education program consisted of a PowerPoint presentation and an open question-and-answer session. Instructions were given to the participants regarding the completion of the postassessment surveys. Again, participants were reassured that participation would be completely anonymous and each survey would be returned and reported with a randomly assigned number from 1–9. The education program session lasted approximately 35 minutes. The postassessment surveys were collected by the director and returned to me via email. Each set of preassessment and postassessment surveys were paired with an assigned provider number. The results of each were compiled in a table and the results reviewed and compared to answer the practice-focused question.

Preassessment

Table 1 presents a summary of the data from the preassessment survey (see Appendix B). At the beginning of the presentation, I explained to the providers that the purpose of the presentation was to increase provider knowledge and confidence in the pharmacological management of their diabetic patients. Appendix B was used as a

preintervention self-evaluation of provider knowledge and confidence in the pharmacological management of their diabetic patients. Seven (n = 100%) NPs completed the preassessment evaluation. The MDs reported that they would participate in the presentation but not in the survey. The self-evaluation was presented in a written Likert-scale format. The options were numbered 1–5 for *very comfortable, somewhat comfortable, neutral, somewhat uncomfortable,* and *very uncomfortable*.

The self-assessment questionnaire consists of the following 13 questions: 1) providers were asked what their general levels of comfort was in adjusting basal insulin.; 2) providers were asked what their general level of comfort was in adjusting prandial insulin; 3) providers were asked what their general level of comfort was in adjusting pre-mixed insulin; 4) providers were asked their level of comfort with ADA/AACE treatment recommendations; 5) providers were asked their level of comfort with which oral and injectable therapies could be combined; 6) providers were asked their level of comfort in their knowledge of the maximum effects each class of medication has on A1C values; 7) providers were asked their level of comfort with the metformin; 8) providers were asked their level of comfort with sulfonylureas; 9) providers were asked their level of comfort with DPP4i medications; 10) providers were asked their level of comfort with SGLT2i medications; 11) providers were asked their level of comfort with GLP1RA medications; 12) providers were asked their level of comfort with thiazoldinediones; 13)providers were asked their level of comfort with selecting medications that are cardio and renal protective.

Question 1 Four NPs (57%) selected 3 for both Questions 1 and 2, indicating that they felt neutral about their knowledge and confidence in adjusting basal and prandial insulin. Two NPs (29%) selected 4 for both Questions 1 and 2, indicating they felt somewhat comfortable about their knowledge and confidence in adjusting basal and prandial insulin. One NP (14%) selected 5 for both Questions 1 and 2, indicating they felt very comfortable about their knowledge and confidence in adjusting basal and prandial insulin.

The data showed that two NPs (29%) stated they felt very comfortable with recommending lifestyle management, Question 3, to their patients. Three NPs (43%) selected 4, and two NPs (29%) selected 3 for their response. Three NPs (43%) selected 4 for both Questions 4 and 5, and four NPs (57%) selected 2, reporting they felt very uncomfortable with ADA/AACE treatment recommendations and combining oral and injectable medications. Two NPs (14%) selected 3 for Question 6, and five NPs (71%) selected 2. Question 7 seemed to be the area in which most of the NPs felt most comfortable. Six NPs (86%) selected 1, and one NP (14%) selected 2. Three NPs selected 4 (57%) for Question 8, two NPs (29%) selected 3, and two NPs (29%) selected 2. Two NPs (29%) selected 4 for Question 9, three NPs (43%) selected 3, and two NPs (29%) selected 2. One NP selected 4 for Question 10, three NPs (43%) selected 3, two NPs (29%) selected 2, and one NP (14%) selected 1. Three NPs (43%) selected 3 for Question 11. Two NPs (29%) selected 3, four NPs (57%) selected 2, and one NP (14%) selected 1 for Question 12. Two NPs (29%) selected 4 for Question 13. Three NPs (43%) selected 3, and two NPs (29%) selected number 2 for Question 13.

Table 1

Nurse Practitioner Preassessment Results (N = 7)

	5 (VC) n (%)	4 (SC) n (%)	3 (N) n (%)	2 (SU) n (%)	1 (VU) n (%)
Q1	1 (14)	2 (29	4 (57)		
Q2	1 (14)	2 (29)	4 (57)		
Q3	2 (29(	3 (43)	2 (29)		
Q4		3 (43)	4 (57)		
Q5		3 (43)		4 (57)	
Q6			2 (29)	5 (71)	
Q7	6 (86)	1 (14)			
Q8		3 (43)	2 (29)	2 (29)	
Q9		2 (29)	3 (43)	2 (29)	
Q10		1 (14)	3 (43)	2 (29)	1 (14)
Q11			3 (43)	3 (43)	1 (14)
Q12			2 (29)	4 (57)	1 (14)
Q13		2 (29)	3 (43)	2 (29)	

Note. VC = Very comfortable, SC = Somewhat comfortable, N = Neutral, SU = Somewhat uncomfortable, VU = Very uncomfortable.

Postassessment

After the power-point presentation the providers were given time for a question and answer session. Once the providers exhausted their questions, they were invited to again complete Appendix B as a post-education self-assessment. Table 2 represents the results of the post-education self-assessment survey. Only six NPs returned the post-education self-assessment survey to the director. The assessments were paired with anonymous numbers 1-7. Participant 5 did not return their post-education self-assessment. Therefore, the post-education survey is N=6.

The data showed improvement in all areas of the survey. Four NPs (67%) selected number 5 for question 1 and two NPs (33%) selected number 4. The data showed that three NPs (50%) selected number 5 for question 2, 2 NPs (33%) selected number 4 and 1

NP (17%) selected number 3. All six NPs (100%) selected number 5 for questions 3 and 4. Five NPs (83%%) selected number 5 for question 5 and one NP (17%) selected number 4. The data shows that all six NPs (100%) selected number 5 for questions 6, 7, 8, 9, 10, 11 and 12. Five NPs (83%) selected number 5 for question 13 and one NP (17%) selected number 4.

Table 2

Nurse Practitioner Postassessment Results (N = 6)

	5 (VC) n (%)	4 (SC) n (%)	3 (N) n (%)	2 (SU) n (%)	1 (VU) n (%)
Q1	4 (67)	2 (33)			
Q2	3 (50)	2 (33)	1 (17)		
Q3	6 (100)				
Q4	6 (100)				
Q5	5 (83)	1 (17)			
Q6	6 (100)				
Q7	6 (100)				
Q8	6 (100)				
Q9	6 (100)				
Q10	6 (100)				
Q11	6 (100)				
Q12	6 (100)				
Q13	5 (83)	1 (17)			

Note. VC = Very comfortable, SU = Somewhat comfortable, N = Neutral, SC = Somewhat uncomfortable, VU = Very uncomfortable.

This staff education project demonstrated that providing NPs in a small primary care office with education on the pharmacological management of the diabetic patients increases their confidence in their knowledge and ability to manage those patients. The results of this study align with the goals of the CCM which seeks to create systems to enhance diabetes management in the primary care setting by bridging the gap between evidence-based practice and negative patient outcomes (Bongaerts et al., 2017). This

project met the purpose which was to develop staff education based on ADA and AACE standards of care, deliver the education to primary care NPs, and evaluate their learning and confidence levels.

The primary goal is for NPs to utilize this knowledge and confidence to partner with their patients to design individualized treatment plans. This will help to improve patients' quality of life, help the project site to meet HEDIS measures, and decrease the socio-economic cost burden associated with poor diabetic outcomes. Knowledge and confidence will allow each provider to address patient cultural beliefs, financial needs, comorbidities and emotional concerns when generating an individualized treatment plan (Germossa et al., 2018).

Recommendations

Primary care knowledge and confidence in selecting appropriate pharmacological agents for their diabetic patients is an important component is diabetic management. Gerald et al., (2010) proposes that structured nursing education should be conducted through continuous training programs which enhance proficiency and help nurses to keep up to date with current evidence-based practices in the management of diabetes. I recommend that a recurring education program on diabetes management which includes scenarios and perhaps real time case reviews be implemented at the project site. In addition, a regularly scheduled review of HEDIS measures and goals may prove to be beneficial. This will allow the project site providers to better understand how effective the interventions they are selecting for their diabetic patients have been. Another suggestion for the project site is to provide patient encounter visit that focus solely on

diabetic management and care. This will allow the providers to spend quality time not only reviewing labs and medications but to discuss other lifestyle modifications and provide intensive diabetic education to their homebound patients.

Strengths and Limitations of the Project

A major strength to this DNP project was that the medical director and administrative director were supportive of the project. The providers were receptive to the information and felt the information was useful and applicable to their practice. The presentation was easy to follow, evidence-based and up-to-date. A major limitation of this project was the limited sample size. Only 7 NPs participated in the education and only 6 completed both pre and post self-evaluation assessments. The project was completed at a single site. The larger sample size or multiple sites may yield different results. Therefore, it is impossible to generalize the findings. Another limitation was the allotted time. I was given 30 minutes to complete the project. While I was able to complete within the timeframe more time would have allowed for the providers to truly process the information and allotted for a more robust questions and answer session. The way the surveys were dissemination and collected could be considered a limitation.

Section 5: Dissemination Plan

Section 5 is the final phase of the DNP project. The focus of this section is the dissemination of findings. In this section, I include self-reflection and analysis as well as a review of the dissemination plan for the results of the project. The aim of the project was to generalize the education for use in outpatient clinics, hospitals, and other professional in-service training programs. This diabetes education program demonstrates

potential to empower primary care NPs and other providers to create pharmacological care plans individualized to each patient. This improves patient outcomes and enhances quality of life.

Dissemination

This project was created and delivered using evidence-based guidelines from the ADA and AACE. I provided the project site with an emailed copy of the PowerPoint presentation used in the staff education program. Providing the materials helps to promote continuing education by allowing them ease of access to the material. The project site can then use the presentation to conduct refresher training for current staff and initial training for new hires. It will be the responsibility of the directors and each provider to remain up to date with current literature and changes in treatment standards. The project site can also use the information to create handouts for their providers to use as a quick resource. The preassessment and postassessment surveys indicated that the NPs who participated in the education program experienced an increase in knowledge on the pharmacological management of diabetic patients. The participating NPs also experienced an increase in confidence levels to manage and select appropriate medication for patients. All participants were asked to provide feedback on the quality of the presentation.

Analysis of Self

My passion for diabetes began while working as a field NP with this project site a few years ago. It was during my tenure at this practice that I began to understand how important it was to understand every component of diabetes, especially how each

medication could be beneficial to my patients. Many of the patients are on fixed or limited incomes and out-of-pocket costs are a major consideration. It was disheartening to see patients return from the hospital with care plans I knew they would never be able to follow. This inability to adhere to a care plan would often lead to rehospitalizations. These experiences were the driving force behind my passion for helping those living with diabetes experience a good quality of life. I have worked diligently to understand the pharmacodynamics of medications and learned the out-of-pocket costs associated with various insurances. Educating primary care staff and their patients to help improve patient outcomes is my main goal.

As a scholar, I use evidence-based practice to create effective educational interventions for providers. The goal is for those providers to take what they have learned and use the knowledge to treat and educate their patients and other healthcare staff. Healthcare is an ever-changing landscape. It is essential that providers seek educational opportunities to resolve knowledge gaps. The purpose of this project was to develop staff education based on ADA and AACE standards of care, deliver the education to primary care NPs, and evaluate their learning and confidence levels. I met this purpose and achieved my scholarly goals for this DNP project.

As the project leader I was able to effectively lead a team of subject matter experts. During my time as a DNP student and throughout this project I have grown greatly in patience and communication. COVID-19 created some interesting hurdles. Through effective communication and collaboration with the project site leadership I was able to complete the project and achieve my purpose. Completing this staff education

project served as a reminder of the importance of remaining up to date on the literature and research regarding diabetes. Teaching other providers is very rewarding. I intend to put the knowledge and skills developed during the DNP experience to good use. It has enforced my faith in my own leadership abilities which I intend to use to teach and train current and future generations of NPs.

Summary

This DNP project served to educate NPs about the pharmacological management of diabetes patients. Utilizing the ADA and AACE guidelines demonstrated to those that participated how they can use EBP in their own practice when treating their diabetic patients. As society continues to navigate a new normal and learn how to deliver in-services, hold meetings, and continue social distancing, the use of online media and power-point presentations are valuable tools. Based on the findings of this project, the creation of a routine staff education component would be beneficial to the project site. The findings of the pre and post assessment survey show that NPs did indeed increase their knowledge and confidence in managing their diabetic patients.

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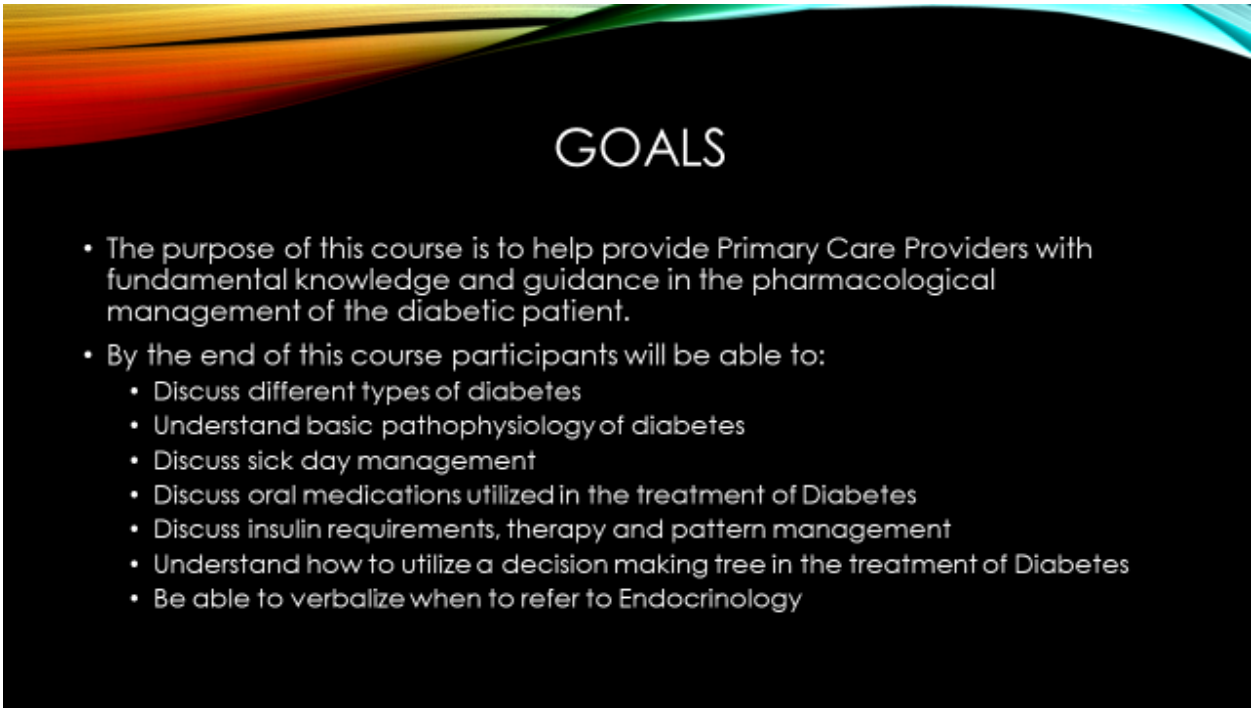
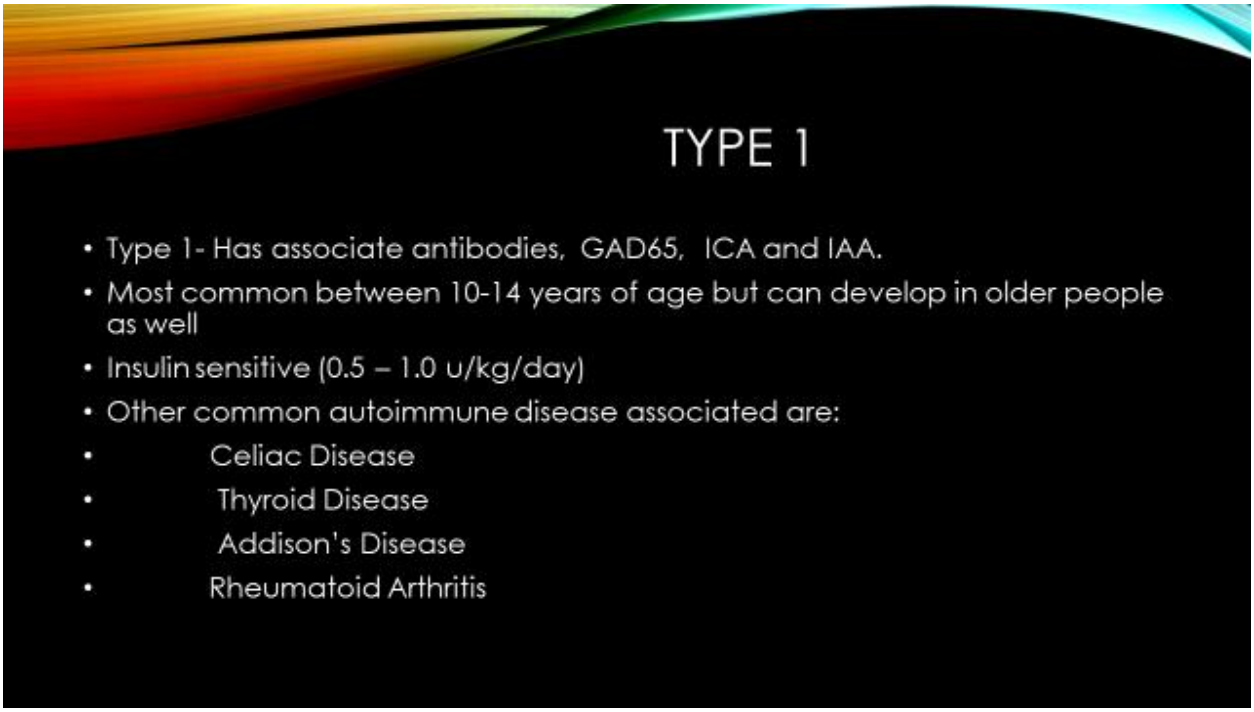
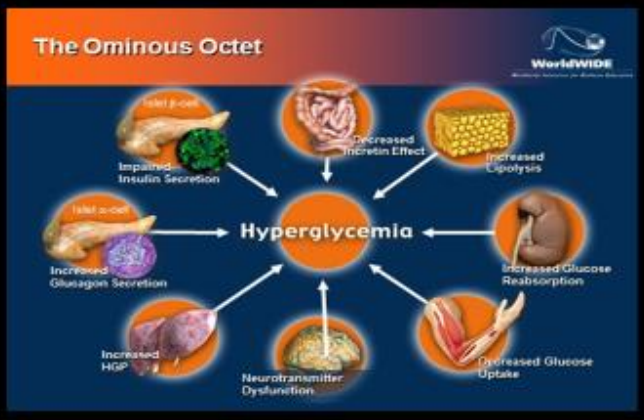
Appendix A: Diabetes Management PowerPoint Presentation




COMMON TYPES OF DIABETES
•Type 1 Diabetes
•Type 2 Diabetes
•Latent Autoimmune Diabetes in Adults
•Double Diabetes or Diabetes 1.5


TYPE 1
• Type 1- Has associate antibodies, GAD65, ICA and IAA.
• Most common between 10-14 years of age but can develop in older people as well
• Insulin sensitive (0.5 – 1.0 u/kg/day)
• Other common autoimmune disease associated are:
• Celiac Disease
• Thyroid Disease
• Addison's Disease
• Rheumatoid Arthritis

TYPE 2



Cersosimo, Triplett et al. 2018

DIABETES 1.5

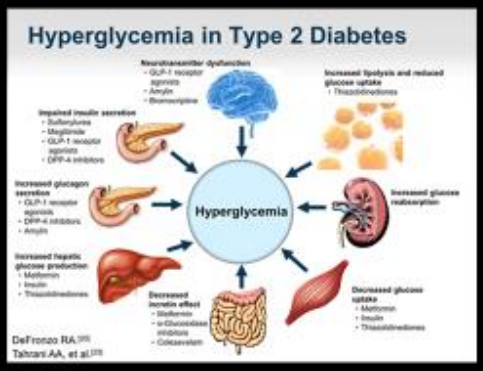
- Those with a combination of Type 1 and Type 2 diabetes

Type 1 that gains significant weight and demonstrates clinical factors of type 2 and Insulin resistance

Type 2 that develops autoantibodies to beta cells and manifest symptoms of type 1

You will often hear these cases referred to as diabetes 1.5

ORAL MEDICATION IN TYPE 2 DM



LADA(LATENT AUTOIMMUNE DIABETES IN ADULTS)

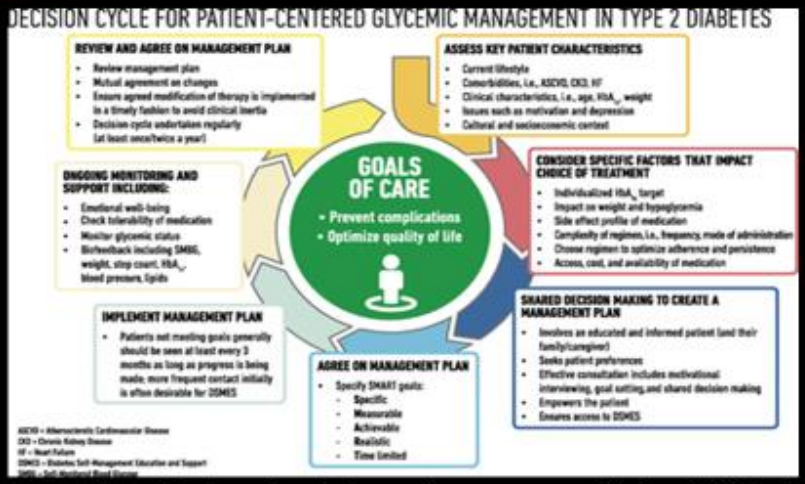
- This is very common
- Consider LADA in older adults that develop diabetes (especially those that do not respond to oral therapy)
- Usually needs insulin within first 6 months of diagnosis
- Initiation of early insulin therapy may preserve beta cell function

GOALS OF TREATMENT

- According to the ADA Glycemic goals for most patients is an A1C of 7% or less The AACE/ACE promote an A1C of 6.5% or less in most patients
- Fasting and pre meal BG < 100 mg/dL
- Absence of hypoglycemia

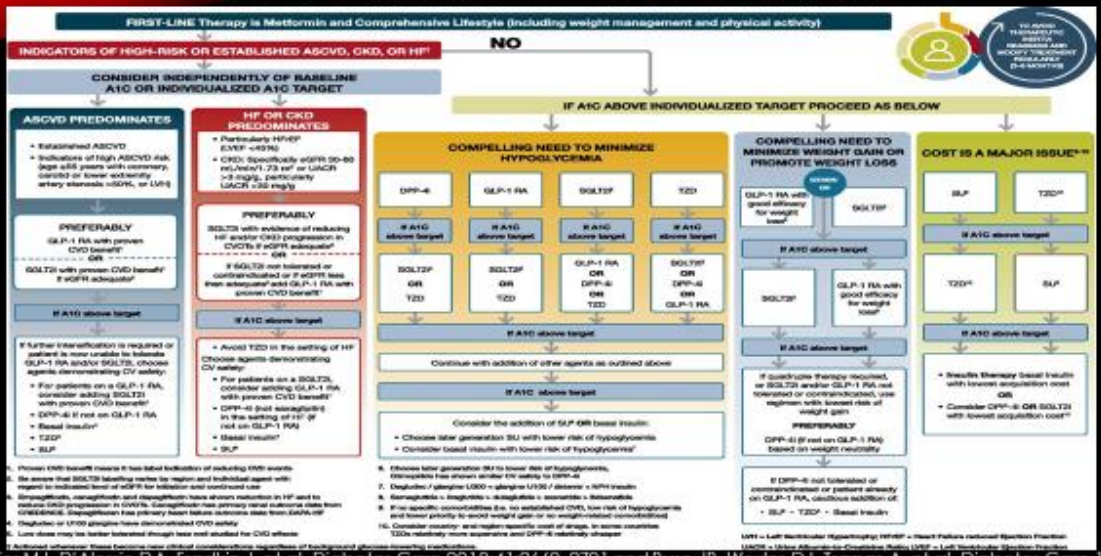
A1C and FBG can be adjusted based on: Age, duration of diabetes, comorbidities, complication and hypoglycemic risk

DECISION CYCLE



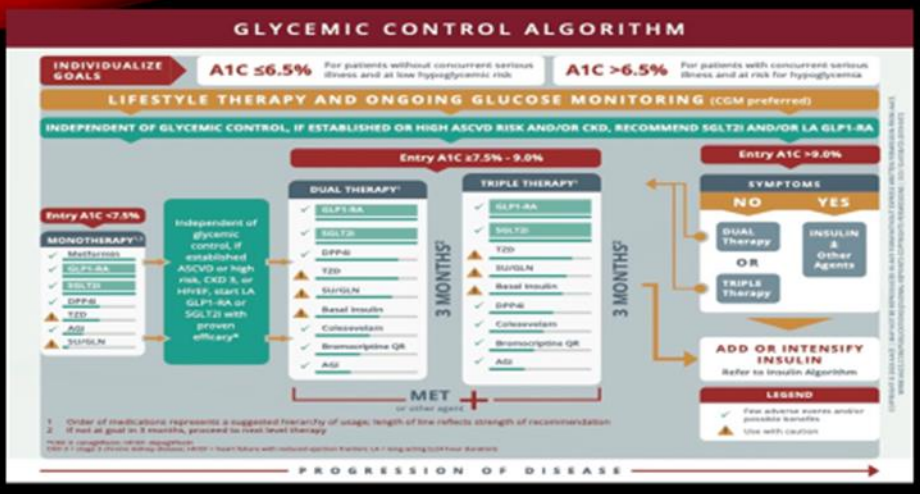
Decision cycle for patient-centered glycemic management in type 2 diabetes. HbA_{1c}, glycated hemoglobin. Reprinted from Davies MJ, D'Alessio DA, Fradkin J, et al. Diabetes Care

ADA TREATMENT ALGORITHM



Davies MJ, D'Alessio DA, Fradkin J, et al. Diabetes Care 2018;41:2669–2701 and Buse JB, Wexler DJ, Tsapas A, et al. Diabetes Care 19 December 2019 [Epub ahead of print]. DOI: 10.2337/dci19-0066.

AACE TREATMENT ALGORITHM



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LIFESTYLE MODIFICATION

Minimum 30 minutes of continuous moderate physical activity daily! 150 minutes weekly.

Weight loss of 5% can have a significant impact!

METFORMIN/BIGUANIDES

- Lowers A1C 1.0 – 2.0 %
- Action: Decrease output of hepatic glucose
- Daily dosage 500-2500 mg usually BID unless XR then once daily dosing
- Benefits: Lowers total cholesterol, No weight gain, no hypoglycemia
- Do NOT use if GFR<30
- Do NOT START if GFR <45
- Most Side effects are GI.
  - Usually subside in 2 weeks
  - Can reduce by taking with food

SULFONYLUREAS

- Lowers A1C by 1.0 – 2.0 %/ Decreases FBG 60-70 mg/dL
- Action: Increases endogenous insulin/tells pancreas to squirt insulin all day
- Dosage depends on which medication used
  - Glyburide 1.25-20 mg
  - Glipizide 2.5-40 mg if XL 2.5-20 mg
  - Glimeperide 1.0 – 8 mg
- Advantage: Low cost, no GI symptoms
- SE: weight gain, Hypoglycemia

SODIUM GLUCOSE COTRANSPORTER 2 SGLT-2 I (GLUCORETICS)

- Lowers A1C by 0.6- 1.5% AND weight reduction by 1-3 lbs
- Glucoretics- Decreases glucose reabsorption in the kidneys
- Daily Dosage: Canagliflozin 100-300 daily
  - Increased risk of amputation
  - Do not sart if GFR <45
- Dapagliflozin 5-10 mg daily
  - Do not start if GFR <45
- Empagliflozin 10-25
  - Do not start if GFR < 45
- Ertugliflozin 5-15 mg daily
  - Do not start if GFR < 45

DIPEPTIDYL PEPTIDASE-4 INHIBITOR DPP-4 I (INCRETIN ENHANCERS)

- Lowers A1C 0.6-0.8%
- Action: Increase insulin release w/ meals * Suppress glucagon*Delays gastric emptying
- Daily Dosing:
  - Sitagliptin 25-100 mg a day
  - Saxagliptin 2.5 – 5 mg daily
  - linagliptin 5mg a day
  - alogliptin 6.25 – 25 mg daily
- SE: headache and flu-like symptoms.
- Risk: Can cause severe, disabling joint pain.
  Increased risk of Pancreatitis
  Saxagliptin and Alogliptin can increase risk of heart failure
- Advantages: Weight Neutral, reduces albuminuria, no hypoglycemia

MEGLITINIDES/THIAZOLINEDIONES

- Meglitinides stimulate rapid insulin burst- They are not commonly used due to increased risk of hypoglycemia and weight gain.
  - Reduce A1C 1-2 %
  - Daily dosage: repaglinide- 0.5- 4 mg w/meals
    nateglinide 60-120 mg w/ meals
- TZDs increase insulin sensitivity.
  - Reduce A1C 0.5-1.0%
  - Daily dosage: pioglitazone 15-45 mg daily (can increase risk of bladder cancer)
    rosiglitazone 4-8 mg daily

COMBINATION ORAL MEDICATIONS

- Janumet (sitagliptin/metformin) Dose: 50/500 and 50/1000 also Janumet XR
- Prandimet (repaglinide/metformin) Dose: 1/500 and 2/500
- Trijardy XR (empagliflozin/linagliptin/metformin XR) 5-25/2.5-5/1000
- ACTOplus Met (pioglitazone/metformin Dose: 15/500 and 15/850
- Invokamet (canagliflozin/metformin) 50/500 or 50/1000 and 150/500 or 50/100

INJECTABLES

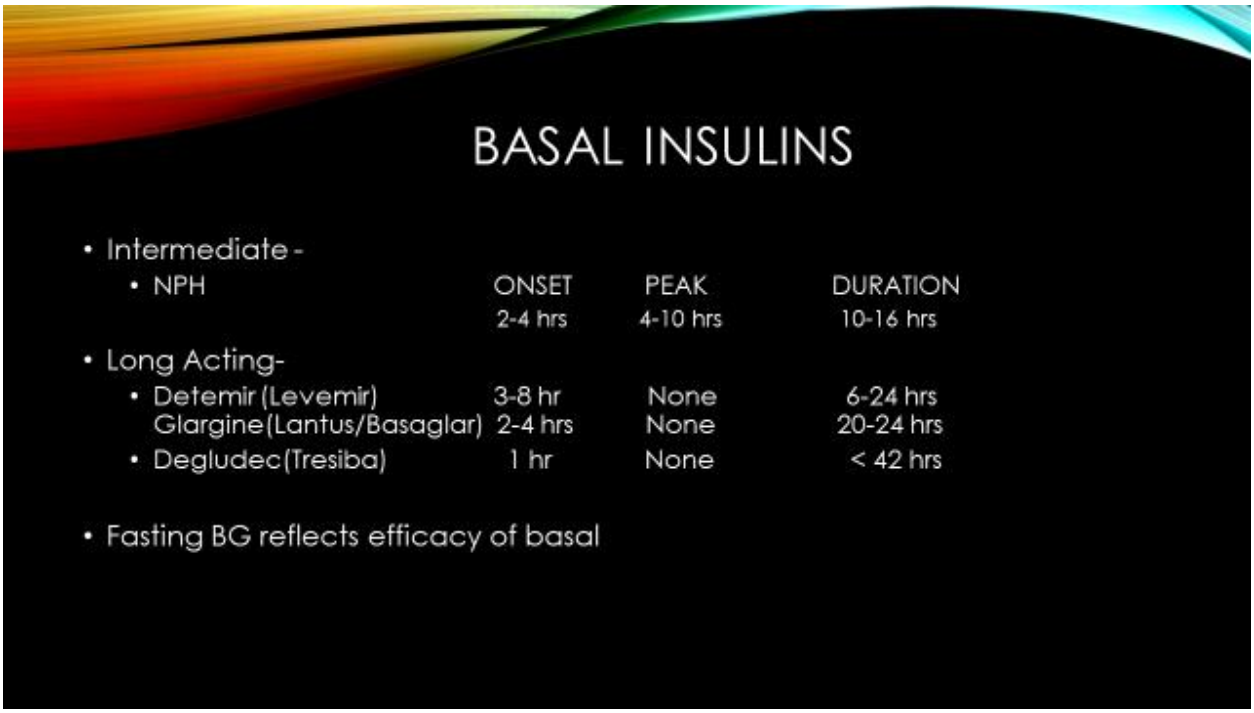
- Amylin Mimetic-slow gastric emptying. Lowers A1C 0.5-1%
  - Daily dose: pramlintide (Symlin) Type 1: 15-60mcg before meals
    Type 2: 60-120 mcg before meals
  - SE: Severe hypoglycemia (if on insulin decrease when starting)
- IglarLixi (Soliqua 100/33)- Lantus + lixisenatide - once daily injection given 1 hr before first meal of day
  - Daily dose: 15-60 units (recommend start 15 unis if not controlled on 30 units basal insulin or GLP-1 or 30 units if not controlled on 30-60 units basal or GLP-1)
- IdegLira (Xultophy 100/3.6)- (Tresiba and Victoza)- Once daily injection
  - Daily dose: 10-50 units (recommend start 16 units. Titrate dose up or down by 2 units every 3-4 day until reach target)

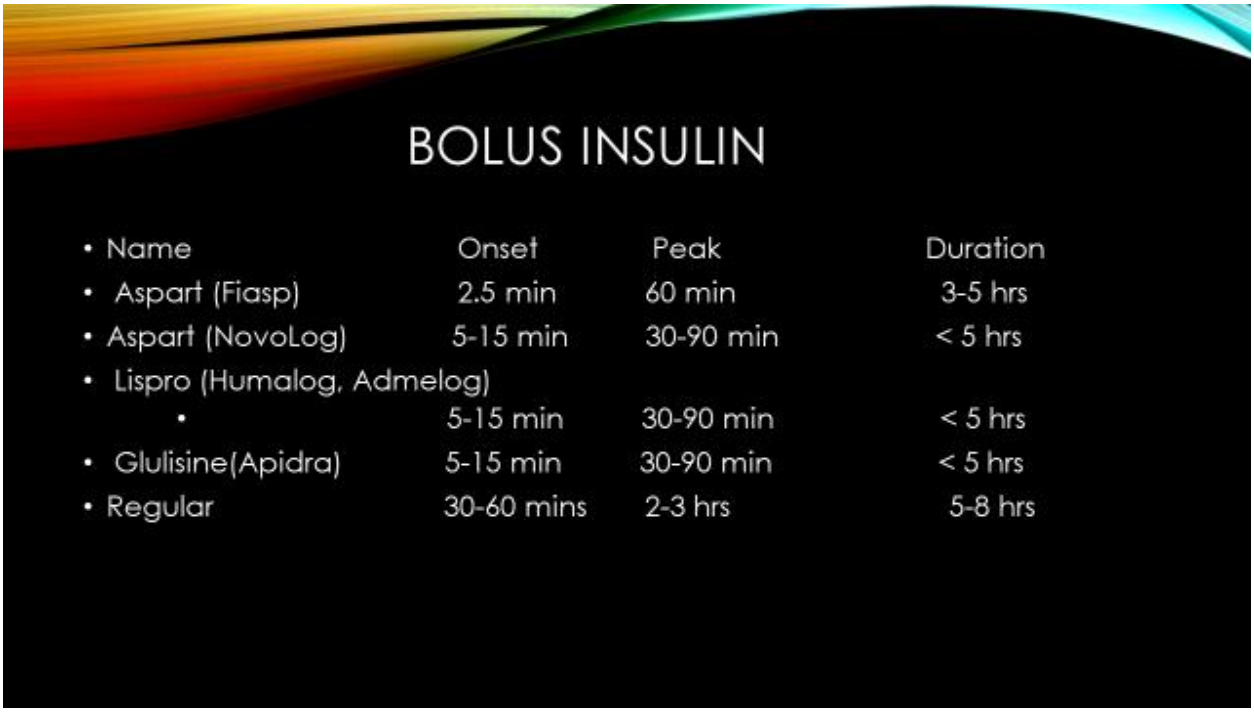
GLUCAGON LIKE PEPTIDE-1 RECEPTOR AGONIST
GLP-1 RA "INCRETIN MIMETIC"

- Lowers A1C 0.5 – 1.6%. Reduces weight
- Action: Insulin release in response to food, Slows gastric emptying, early Satiety, suppresses glucagon
- Daily Dose: (Do not use in GFR <30)
  - Exenatide Dosing: 5-10 mcg BID Exenatide XR - 2mg 1x week
  - Liraglutide - 0.6, 1.2 and 1.8 mg daily (Approved for Pediatrics >10 years
  - Dulaglutide- 0.75, 1.5, 3.0 and 4.5 mg once weekly injection
  - Lixisenatide- 10 mcg once daily for 14 days then 20 mcg daily starting day 15
  - Semaglutide (Ozempic) 0.5 and 1.0 mg once weekly injection
  - Semaglutide (Rybelsus)- only oral form in 3, 7 and 14 mg daily in the am. Must be taken on an empty stomach

GLP-1 RA

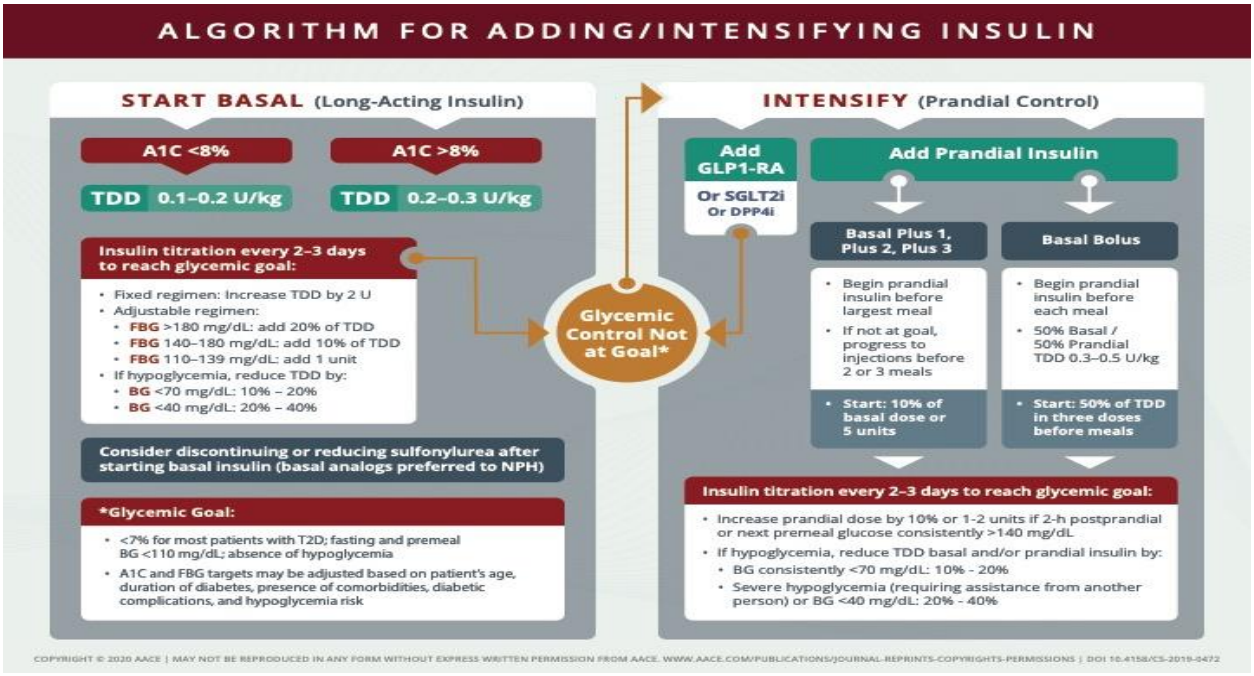
- Advantage: No hypoglycemia, weight loss, renal protection, Cardio protective, reduces CVA risk
- SE: GI, increase risk of pancreatitis, CAN INCREASE RISK OF THYROID CANCER
- Contraindications: DO NOT USE IN THOSE WITH FAMILY HISTORY OF MEDULLARY THYROID TUMOR.


BASAL INSULINS
• Intermediate -
• NPH
ONSET
2-4 hrs
PEAK
4-10 hrs
DURATION
10-16 hrs
• Long Acting-
• Detemir (Levemir)
3-8 hr
None
6-24 hrs
Glargine (Lantus/Basaglar)
2-4 hrs
None
20-24 hrs
• Degludec (Tresiba)
1 hr
None
< 42 hrs
• Fasting BG reflects efficacy of basal


BOLUS INSULIN
• Name
Onset
Peak
Duration
• Aspart (Fiasp)
2.5 min
60 min
3-5 hrs
• Aspart (NovoLog)
5-15 min
30-90 min
< 5 hrs
• Lispro (Humalog, Admelog)
•
5-15 min
30-90 min
< 5 hrs
• Glulisine (Apidra)
5-15 min
30-90 min
< 5 hrs
• Regular
30-60 mins
2-3 hrs
5-8 hrs

AFREEZA

- Bolus regular insulin – inhaled before meals
- Dosing: 4, 8 and 12 unit cartridges
- Convert with 1:1 ratio to existing insulin dose
- Lung function test before start (FEV1)
- Not for pts w/ chronic lung issues: Asthma, COPD, history of lung cancer, smokers
- Can cause acute bronchospasm – Black box warning Side effects: Hypoglycemia, sore throat, cough
- Less hypoglycemia than injected insulin



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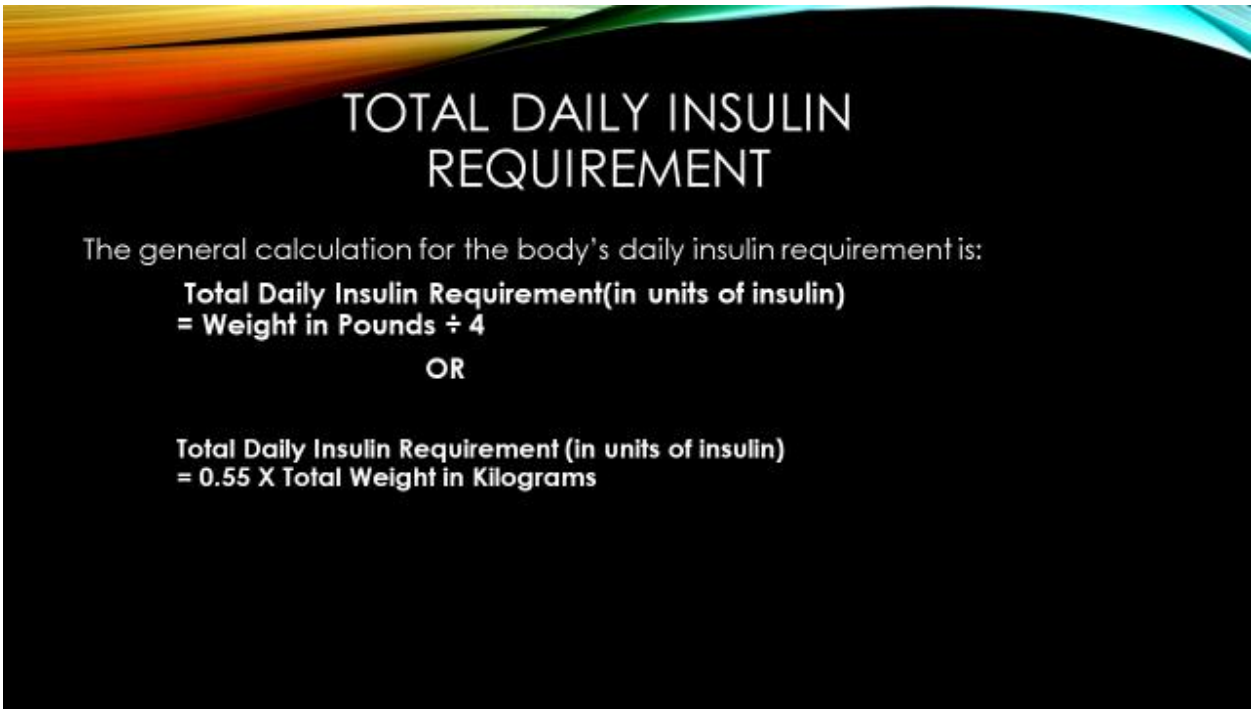
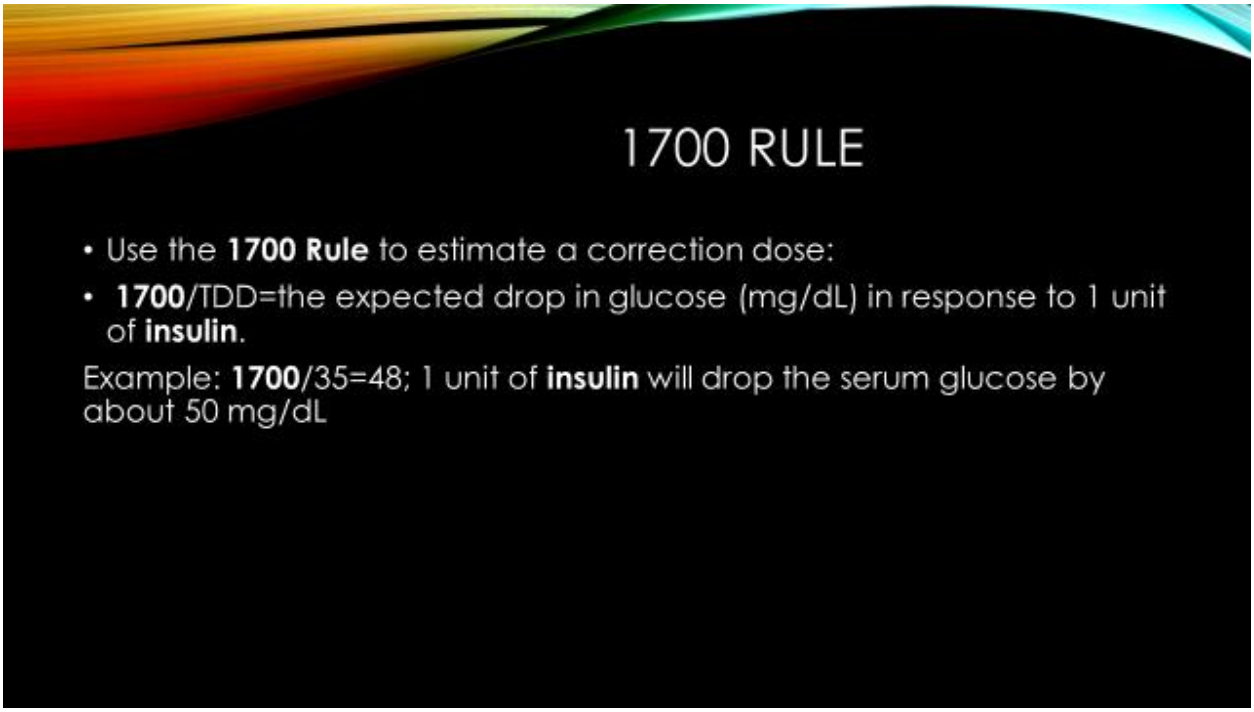
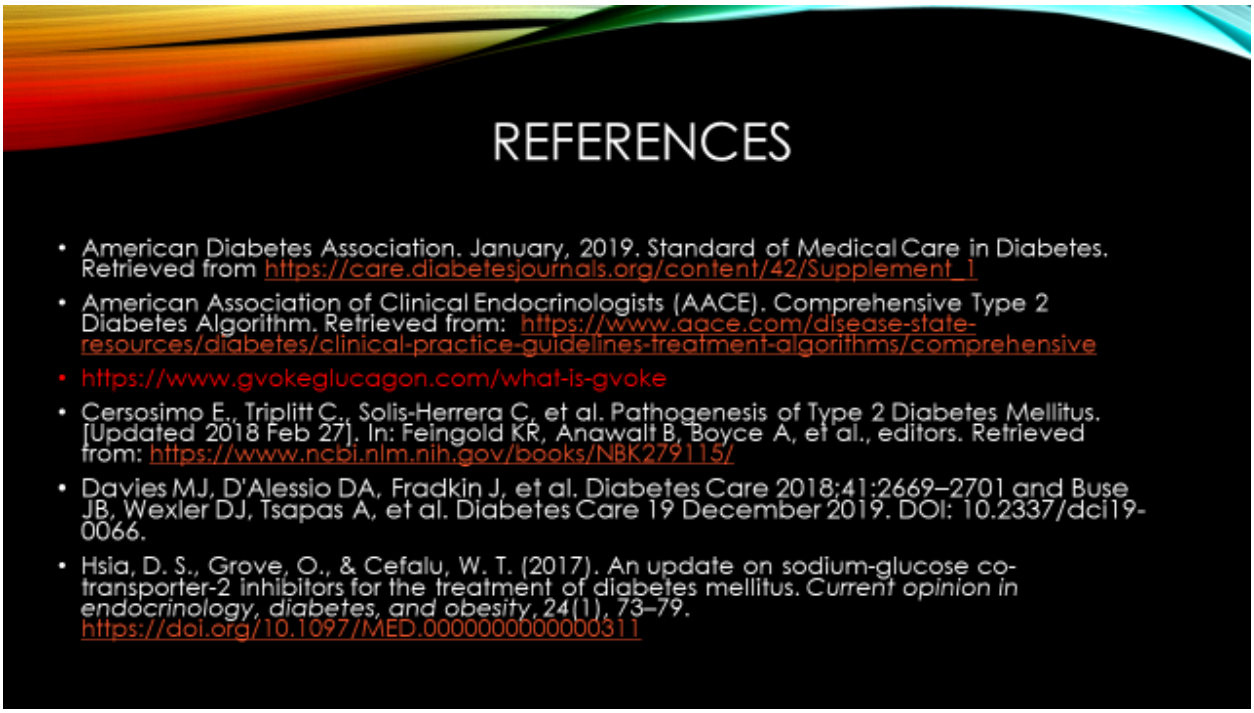

TOTAL DAILY INSULIN REQUIREMENT
The general calculation for the body's daily insulin requirement is:
Total Daily Insulin Requirement(in units of insulin)
= Weight in Pounds ÷ 4
OR
Total Daily Insulin Requirement (in units of insulin)
= 0.55 X Total Weight in Kilograms


1700 RULE
• Use the 1700 Rule to estimate a correction dose:
• 1700/TDD=the expected drop in glucose (mg/dL) in response to 1 unit of insulin.
Example: 1700/35=48; 1 unit of insulin will drop the serum glucose by about 50 mg/dL

HYPOGLYCEMIA MANAGMENT

- 15-20 grams of carbohydrates
- Glucagon tablets or gel
- Glucagon kit- Requires assistance
- Baqsimi- Inhaled glucagon- 3 mg
- Gvok PFS- 1 mg

QUESTIONS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https://www.gvokeglucagon.com/what-is-gvoke
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Davies MJ, D'Alessio DA, Fradkin J, et al. Diabetes Care 2018;41:2669–2701 and Buse JB, Wexler DJ, Tsapas A, et al. Diabetes Care 19 December 2019. DOI: 10.2337/dci19-0066.
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Appendix B: Pre/Post Assessment

I. Self-Assessment: Insulin Therapies

Directions: The following statements assess your comfort with managing insulin therapy in the home. Please rate yourself on a scale from 1-5 with 0 = VERY UNCOMFORTABLE to 5 = VERY COMFORTABLE. Circle the number that BEST describes you. (Comfort is defined as a feeling of ease in performing the following skills).

1. General level of comfort in adjusting subcutaneous basal insulin

0.....1.....2.....3.....4.....5

2. General level of comfort in adjusting subcutaneous prandial insulin

0.....1.....2.....3.....4.....5

3. General level of comfort in adjusting pre-mixed insulin therapy

II. Self-Assessment oral and injectable therapies

Directions: The next series of statements assess your comfort with managing oral and injectable therapies. Please rate yourself on a scale from 1-5 with 0=VERY UNFAMILIAR to 5=VERY FAMILIAR. Comfort is defined as a feeling of ease in performing the following skills).

4. General level of comfort with ADA/AACE treatment recommendations

0.....1.....2.....3.....4.....5

5. General level of comfort with what oral and injectable medications can be combined

0.....1.....2.....3.....4.....5

6. General level of comfort with maximum effects each class of medication has on A1C

0.....1.....2.....3.....4.....5

7. General level of comfort with Metformin

0.....1.....2.....3.....4.....5

8. General level of comfort Sulfonylureas

0.....1.....2.....3.....4.....5

9. General level of comfort with Dipeptidyl peptidase 4 (DPP-4)

0.....1.....2.....3.....4.....5

10. General level of comfort with Sodium Glucose Cotransporters 2 Inhibitors

0.....1.....2.....3.....4.....5

11. General level of comfort with Glucagon Like Peptidyl 1 Receptor Agonists

0.....1.....2.....3.....4.....5

12. General level of comfort Thiazolidinediones

0.....1.....2.....3.....4.....5

13. General level of comfort with selecting medications that are cardio and renal protective (GLP-1RA and SGLT2i)

0.....1.....2.....3.....4.....5