12-2022

Optimizing Diabetes Self-Management Using Continuous Glucose Monitoring and Improving the Transition of Care for Adult Patients Discharged From the Hospital

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OPTIMIZING DIABETES SELF-MANAGEMENT USING CONTINUOUS GLUCOSE MONITORING AND IMPROVING THE TRANSITION OF CARE FOR ADULT PATIENTS DISCHARGED FROM THE HOSPITAL

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Presented to the Faculty of the University of the Incarnate Word
in partial fulfillment of the requirements
for the degree of

DOCTOR OF NURSING PRACTICE

UNIVERSITY OF THE INCARNATE WORD

December 2022

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to Dr. Holly A. DiLeo for her patient guidance, gentle support, and constructive criticism throughout my journey to complete this DNP project. My heartfelt thanks to you for keeping me grounded and helping put everything into perspective. I am thankful to the University of the Incarnate Word faculty that have helped me with my academic growth through this doctoral program.

I am grateful to all of those I had the pleasure of working with. I especially would like to thank my mentor, Dr. Rebecca Miller, for supporting my project ideas and providing the willingness of her time and guidance throughout this project.

Additionally, this endeavor would not have been possible without my children. Rachel Nicole Angeles and Ryan Christian Angeles, your patience and love kept me motivated and focused on my goals. Lastly I would be remiss in not mentioning my family and friends near and far. Your unwavering support and belief in me will always be remembered.

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Abstract

Background: Diabetes mellitus is a chronic medical condition that affects more than 34 million Americans (Centers for Disease Control and Prevention, 2020). The financial impact of diabetes is significant. Americans spend $327 billion on direct medical costs to treat the disease and its associated complications (American Diabetes Association, 2018). The management of diabetes requires a multidisciplinary approach that involves healthcare providers, diabetes self-management support resources, and a high level of commitment from the patient. Patients with diabetes discharged from the hospital often receive fragmented and inconsistent information about managing their health issues. As they transition from hospital to home, their care is often inefficient and lacks proper coordination. Many patients simply fail to follow up with a primary care provider.

Purpose and Objectives: The purpose of this project was to introduce continuous glucose monitoring during a patient's transition from hospital to home, thereby improving diabetes self-management. The objectives were to educate patients on adapting their diet and lifestyle in response to real-time glucose readings and to enable healthcare providers to adjust treatment based on trends retrospectively. A long-term goal was to reduce the financial burden of type 2 diabetes by decreasing re-admissions.

Interventions & Evaluation: Patients received comprehensive diabetic education and continuous glucose monitoring devices. Follow-up appointments were made for patients before discharge, and the follow-up communication was conducted with each patient. Each intervention was measured on its effectiveness.

Outcomes: Results were as follows: ($N = 46$)

- Continuous glucose monitoring increased from 0 to 70%

- One hundred percent (100%) of patients who were provided a continuous glucose monitor received diabetic education and support on diabetes management
- One hundred percent (100%) of patients who received a continuous glucose monitor reported awareness of glycemic trends
- Fifty percent (50%) of patients were scheduled for a follow-up appointment upon discharge
- No patients were readmitted within 30 days for diabetes-related complications

Implications for Practice: Nurse Practitioners are at the forefront of providing clinical advances that improve the patient's well-being. By utilizing continuous glucose monitoring in primary care settings, Nurse Practitioners can reduce the incidence of hospitalizations by effectively treating patients with type 2 diabetes.

Keywords: Type 2 diabetes, continuous glucose monitoring, self-management, transition of care

Optimizing Diabetes Self-Management Using Continuous Glucose Monitor and Improving the Transition of Care for Adult Patients Discharged from the Hospital

Poorly controlled diabetes increases morbidity and mortality. The Centers for Disease Control and Prevention (CDC) reported that in 2018 there was an estimated 34.2 million people (10.5%) in the United States with diabetes (CDC, 2020). Furthermore, of those, 2.8% were unaware that they had diabetes (CDC, 2020). The risk factors for poor control of diabetes include lifestyle, length of diabetes diagnosis, socioeconomic status, family history, co-morbidities, and physical inactivity (American Diabetes Association, 2021). These risk factors also lead to inadequate glycemic control. Glycemic control is defined as the individualized clinical glucose target range that is therapeutic for a person with diabetes's overall health status (Grunberger et al., 2021). The measurement of glycemic control is a major factor in the self-management of diabetes care. Traditionally, many people with diabetes check their blood sugar with a glucose monitor, which gives them a measurement at one point in time. The process of checking blood sugar many times throughout the day can be cumbersome and painful, especially for those with type 2 diabetes (Ong et al., 2014).

The American Association of Clinical Endocrinology (Grunberger et al., 2021) published guidelines supporting the use of continuous glucose monitoring to improve the management of type 1 and type 2 diabetes. Patients often do not seek treatment until they are severely ill from co-morbidities and complications associated with diabetes (American Diabetes Association, 2018). Providing a means to check blood sugar levels that are convenient and incorporate the use of technology will be conducive to patients' self-management of diabetes.

Several issues surround the increasing number of people who have difficulty managing this chronic disease. Currently, there are advances in diabetic technology that need more

widespread use (Grunberger et al., 2021). Healthcare providers, including primary care providers, advanced nurse practitioners, certified diabetic educators, and nurses must actively improve collaborative efforts to support and improve diabetic chronic disease management by following the Chronic Care Model (CCM) (American Diabetes Association, 2021). The transition of care for patients with diabetes must be addressed as a core measure requiring intervention-based goals that address patient risk factors for re-admission and diabetic education that is individualized to patient needs and concerns (Garnica, 2017).

Patients admitted to the hospital with poorly controlled diabetes need a consistent and reliable support system of family and ambulatory resources when discharged home (Garnica, 2017). The healthcare industry should concentrate resources on high-risk populations, such as newly diagnosed diabetics, the elderly, and those who lack a primary care provider. Patients who fail to follow up with their primary care providers may be unaware of the complications that uncontrolled diabetes can cause. Continuous glucose monitoring and improvement in the transition of care can help improve patient outcomes and reduce the risk of re-admissions (Grunberger et al., 2021).

Continuous blood glucose monitoring systems measure patients' blood glucose levels indirectly. Interstitial fluid glucose is measured by a subcutaneous sensor located on the patient's body (either the abdomen or arm). Blood glucose monitoring alone does not lower blood glucose levels. Communicating blood glucose results to the patient and the healthcare team is essential. Communication of blood glucose results improves patient self-management of glycemic activity. Continuous glucose monitoring has been shown to improve the glycemic control of patients with uncontrolled type 2 diabetes (Beck et al., 2017; Grunberger et al., 2021; Magny-Normilus et al.,

2019; Martens et al., 2021). Effective diabetes management requires a comprehensive blend of education, behavioral modification, and tools to assist patients with diabetic self-management.

The American Diabetes Association (2018) stated that the prevalence of poorly controlled type 2 diabetes is increasing and has become a healthcare burden, costing the nation approximately $327 million annually. Lack of appropriate treatment can result in chronic periods of hyperglycemia, which increases the risk of developing microvascular complications such as neuropathy, chronic kidney disease, foot ulcers, and amputations, and increased macrovascular complications such as cardiovascular disease and stroke (American Diabetes Association, 2021). San Antonio Metropolitan Health District (2021) reports that, from 2018 to 2019, San Antonio's diabetes hospitalization rates were higher than in all of Texas. Additionally, there were higher diabetes cases in the central parts of Bexar County (San Antonio Metropolitan Health District, 2021). In Bexar County, diabetes disproportionally affects ethnic minority populations. Non-Hispanic Black individuals and Hispanics had higher hospitalizations than Non-Hispanic White individuals (San Antonio Metropolitan Health District, 2021).

Acute Care Facility Needs Assessment

One acute care hospital in Bexar County services a community where there is an immediate need for a redesign of diabetic education and improvement in the transition of care for patients with diabetes. This acute care facility is nestled in the city of Live Oak, Texas. Live Oak is located 25 minutes northeast of San Antonio. It is part of Bexar County and has a population of 18,000 (City of Live Oak, n.d.). The city has seen a 10.4% population increase since 2017, and the average income is $77,088 (City of Live Oak, n.d.). The facility is located within walking distance of residential homes. Medical offices are adjacent to and directly across the street from the hospital.

This acute care facility has seen a dramatic increase in patients in the past 3 years. It has recently expanded from a 20-bed emergency department to an over 50-bed emergency department with a 10-bed triage area. Most recently, a new 30-bed intermediate care unit has opened. Currently, the hospital is a 230-bed facility that services an adult population. The setting of this project was on the medical/surgical unit of this acute care facility, a 45-bed unit that has seen an increase in staff turnover due to the COVID-19 pandemic. At the start of this project, this unit had 24 full-time staff nurses, five contracted travel nurses, five charge nurses, a unit director, and one unit manager. The facility's previous part-time diabetic educator resigned at the height of the COVID-19 pandemic. They have not since had another diabetic educator. The procedure for discharging patients has also seen many changes. Previously, patients were discharged by designated discharge nurses in a specialized lounge area. The process entailed the physician entering discharge orders and completing the medication reconciliation in the hospital's electronic health record, and the discharge nursing staff then completed the discharge assessment. However, discharge teaching was often rushed and unclear due to limited staffing and the demands to streamline throughput.

Thorough diabetic education plays a significant role in achieving good outcomes. The director of professional nursing practice identified an existing education gap for people with diabetes being discharged from their facility and understood the need for increased evidence-based interventions that would improve the community's diabetic health outcomes and reduce the overall incidence of re-admission to their facility related to poorly controlled diabetes (see Appendix A).

Purpose, Aims, and Objectives

The purpose of this project was to introduce continuous glucose monitoring during a patient's transition from hospital to home, thereby improving diabetes self-management. Patients were introduced to and educated about utilizing a continuous glucose monitoring system (CGM) upon discharge from the acute care setting. This monitoring system was to aid the patients in keeping their blood glucose within the target range agreed upon between them and their providers. For individuals who used CGMs, the time in range was the amount of time a person was in the target blood sugar range, which is between 70 and 180 mg/dL for most people diagnosed with diabetes (American Diabetes Association, n.d.; Battelino et al., 2019; Grunberger et al., 2021). The American Association of Clinical Endocrinology has developed guidelines supporting CGM use for type 1 and 2 diabetes. Grunberger et al. (2021) established priority metrics for using advanced diabetic technology in their guidelines. They stated that patients newly diagnosed with diabetes with difficulty with glycemic control and persons ≥ 65 years who are required to administer insulin utilize a CGM to improve their quality of life and reduce the incidence of hypoglycemic events. Moreover, CGM use would aid in a patient's transition of care from hospital to home. Furthermore, CGM is a convenient method of allowing patients to check their glucose levels at a glance and review changes over time.

The primary aim of this project was to improve diabetes self-management through better glycemic control of patients with type 2 diabetes with a hemoglobin A1C ≥ 8% discharged on an insulin regimen who would benefit from a CGM. The project also aimed to improve diabetes self-management in elderly patients who needed substantial support from outside resources and family, patients in need of detailed diabetic education such as patients newly diagnosed with type

2 diabetes, and poorly controlled patients in need of intensive follow-up and more efficient care transition.

An additional aim of the project was to improve the quality of care for patients with diabetes by incorporating elements of the Chronic Care Model in supporting behaviors for efficient self-management through thorough diabetic education. The American Diabetes Association's (2021) position statement promotes diabetes self-management education to help establish a foundation of knowledge and to sustain an ongoing lifestyle that facilitates improved awareness that addresses the patient's concerns, is culturally sensitive, and acknowledges anticipated challenges.

Lastly, this project also aimed to reduce the burden of diabetes by identifying patients at high risk for re-admission within 30 days of discharge. This final aim was addressed by improving the transition of care and providing post-discharge support. As patients were discharged from the acute care facility, there were essential objectives to complete as a part of a discharge checklist (see Appendix B).

Objectives

1. Continuous glucose monitoring would be initiated on 80% of adult patients discharged on insulin.
2. Of the patients discharged with a CGM, 100% would be educated on using the CGM, including how to interpret and respond to CGM data.
3. 90% of patients prescribed CGM at discharge would be provided/reviewed a copy of the Diabetic Education Handbook before discharge.
4. Of the patients discharged on CGM, 100% would have a follow-up appointment with either their primary care provider or endocrinologist before discharge.

5. 80% of patients with a scheduled follow-up appointment would attend their scheduled appointment.
6. 80% of patients discharged with a CGM would have a follow-up phone call after discharge to ask questions, voice concerns, and be provided additional community resources for their diabetic management needs.

Summary of the Evidence

The burden of diabetes and diabetes-related disabilities is rising in America (American Diabetes Association, 2021). Complications of diabetes are a late sign and an indicator of poor disease management. Poorly controlled diabetes is likely when patients are unaware that their disease is progressing due to several factors, such as obesity, living a sedentary lifestyle, failing to follow up with their primary care providers, and not obtaining blood work to check on how well they have been managing glycemic control (American Diabetes Association, 2021). Although hemoglobin A1C has been used to measure how well a patient controls their diabetes, the lab result is a 2 to 3 month average. Hemoglobin A1C levels lack information on acute events such as hypoglycemia and hyperglycemia (Battelino et al., 2019). Also, hemoglobin A1C levels fail to show the everyday fluctuations of glucose changes. Beck et al. (2017) reported that accuracy could be affected by specific chronic issues such as anemia or iron deficiency. Diabetic glycemic control can be better managed with CGM, compared to using hemoglobin A1C and self-monitored blood glucose monitoring alone. There is evidence from several studies that the use of CGM as a way of keeping patients in their target range improves hemoglobin A1C and self-management of diabetes and strengthens the relationship a patient has with their healthcare providers (Beck et al., 2017, Magny-Normilus et al., 2019; Martens et al., 2021; Yoo et al., 2008).

CGM can also be used for patients with diabetes who are not on an insulin regimen. Vigersky et al. (2012) studied 100 adults on CGM with type 2 diabetes who were not on insulin and found a decrease in A1C levels between 0.8% and 1.2% during the active intervention sustained during the 40-week follow-up. Additionally, analyses utilizing data from four random control trials with 547 patients showed improved management of diabetes by using CGM, compared to self-monitoring with a blood glucose monitor (American Diabetes Association, 2021).

It is recommended that all healthcare providers develop processes to guarantee that all patients with type 2 diabetes receive diabetes education-related services and ensure that adequate resources are available in their respective communities to support these services (Powers et al., 2015). Optimizing the transition of care by improving discharge instructions and providing care coordination post-discharge would result in better patient outcomes and quality of care. Finally, reducing re-admission rates by effectively managing diabetes through education and using advanced technology such as CGM would provide patients with awareness of how their lifestyle decisions affect their glycemic trends.

Safe and effective transition of care from hospital to home are crucial elements to ensure positive outcomes. Acute care facilities that promote self-management and have established care transition processes at discharge can positively affect outcomes. The American Diabetes Association's *Standards of Medical Care in Diabetes* (2021) state that effective transitions of care and continued patient engagement after discharge can reduce risk and improve patient self-management. The American Diabetes Association also recommends aligning diabetes management with the CCM (2021). Outpatient care that integrates elements of the CCM work well with self-management goals to achieving good glycemic control (American Diabetes

Association, 2021). The involvement of advanced practice nurses in assessing and managing chronic disease has been shown to improve outcomes by promoting the collaboration of a multidisciplinary team of healthcare providers (Naylor et al., 2018). By establishing goals through the transition of care process, healthcare providers can prevent adverse events post-discharge.

The Plan-Do-Study-Act Change Model

The Plan-Do-Study-Act (PDSA) change model was selected to develop this quality improvement (QI) project. The PDSA change model is a widely used and effective change model that originates from Walter Shewhart and Edward Deming's teachings, which were first used in the automobile industry in Japan (Taylor et al., 2014). PDSA change models are commonly used in healthcare for QI projects. The repetitive cycle of the change implementations gives opportunities to adjust and curtail the process for maximized outcomes. This change model is supported by organizations that support improving patient safety and outcomes, such as the Institute for Healthcare Improvement and the Agency for Healthcare Research and Quality.

The Plan-Do-Study-Act is a four-step process that begins with the "plan." The plan is to identify the aims of the project. During the planning stage of the change model, key questions are important to address, such as, What are you trying to achieve? What is the problem? and What is the evidence that proves this is a problem? The "do" stage is where the implementation is carried out. During the doing stage, a record of what is happening is documented, and measurements of the data are recorded over the implementation's duration. The third step is to "study" the outcomes of the implemented interventions and to analyze whether they met the objectives. Lastly is the "act" stage, where decisions can be made to refine the process better from what was

learned in the previous stages, and a plan for the next cycle can be made. The PDSA cycle is an iterative process to carry out a change to improve processes (Taylor et al., 2014).

For each step of the implementation process, application of the PDSA cycle was applied. For this improvement process, the acute care facility's identified needs included concerns surrounding the 30-day re-admission rates for patients who return with complications from poorly controlled diabetes. Furthermore, the lack of thorough diabetic education and ineffective transition of care when patients were discharged was an identified gap in care. As previously presented, the acute care facility acknowledged a need for improvement in these areas. Planned interventions included the involvement of stakeholders who ultimately influenced the success of this QI project. The involvement of patients, providers, nurses, educators, pharmacy, and community resources collaborated to improve patient safety and outcomes. The stakeholders were also integral to the CCM, a proactive approach to managing chronic diseases such as diabetes. The CCM lists six elements: self-management support, delivery system design, decision support, clinical information systems, health system / organizational support, and community resources (Baptista et al., 2016).

Through the implementation of this QI project, patients benefited from an added means to monitor glycemic trends immediately post-discharge and improved education regarding the self-management of diabetes. Overall, these interventions decreased the risk of patient re-admission to an acute care facility.

Improvement Process Changes

Physician Involvement and Patient Selection

In the initial stages of implementation for this project (see Figure 1), one of the first steps was notifying the physicians that CGM would be available to a limited number of patients upon

discharge. The initiation of the QI project and the availability of CGMs to patients who would be prescribed insulin upon discharge were communicated through conversations with the unit's hospitalist group. The physicians were instructed on how to order the CGM devices and instructed that the devices were only to be prescribed when the patient was discharged from the facility. The expectation was that the physicians would inform their patients that they would be discharged home with a glucose monitoring device to help glycemic control and keep them within an optimal target range.

Once a physician entered the order within the facility's electronic medical record, a notification was sent to the case managers for durable medical equipment. A case manager would then notify the primary nurse that the patient needed education on the CGM application at least 90 minutes before discharge. A daily report from the laboratory of patients with A1C levels ≥ 8% was also generated to provide the project lead with the names of patients who had the potential of being discharged with a CGM. A variety of people provided diabetic education during the project, including the primary nursing staff, the project lead, the charge nurses, and the discharge nursing staff.

Bedside Nurse In-Service Training

Another step in the implementation process was the in-service training plan developed in coordination with the education department, the medical/surgical director, clinical managers, and charge nurses to provide education on the application and use of the CGM system when patients were discharged. Hands-on training and visual aid on how to place a CGM onto the patients were provided. Training sessions took place twice per day during the staff huddles before the start of the day and night shifts. These sessions occurred for 3 weeks and were conducted by the project lead and the acute care facility staff educator.

CGM Application and Diabetes Education

The CGM system that this facility uses is the Abbott Freestyle Libre 2. The acute care facility and Abbott agreed that 30 systems would be provided monthly. This CGM system allows patients to monitor their glucose levels without painful finger sticks. The system uses a disk sensor applied on the day of the patient's discharge. One disk is used for 14 days. The system comes with a portable reader to monitor glucose readings, or the patient can use their smartphone.

Smartphone use in the United States has become a regular part of everyday life. Nearly two-thirds of Americans use a smartphone to navigate important life events (Poushter, 2016). Ryan et al. (2016) have shown that smartphones have been a convenient method of monitoring diabetes and have improved patient outcomes. Patients were encouraged to use their smartphones for ease of use and convenience; patients could scan their glucose readings at their leisure. Instead of the time it took for standard self-monitoring of blood sugar through finger sticks on a traditional glucose monitor, a patient could open the Libre 2 app and scan their sensor within seconds. The use of mobile health technology in preventing and managing diabetes has shown improvements in quality of life and in a patient's ability to adhere to self-management practices (Hartz et al., 2016).

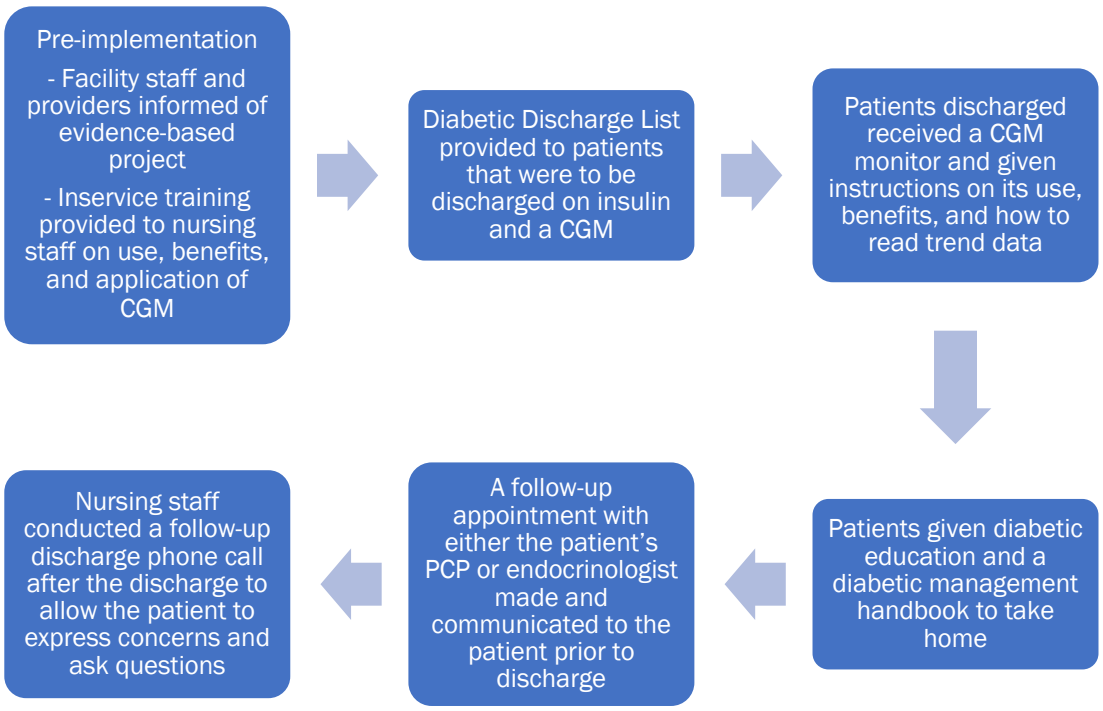
Patients enrolled in the project were educated on the purpose and benefits of the CGM and were shown their target glycemic settings and how to share their data through an app. They were further shown how their data could help their healthcare provider see how their medication regimen, diet, activity, and lifestyle affected their glycemic variability throughout the day for up to 2 weeks. While the Libre 2 was preparing to take the first glycemic readings, the nurses educating the patient had at least 1 hour to provide patient-centered diabetic education with a

facility-created diabetic handbook that was last revised in 2016. Every diabetic patient was allowed to keep this educational handbook at the end of the education session. The handbook includes information about meal planning, sick day management, medications, glycemic monitoring, and the importance of diabetic self-management.

Planning for a method that provides patient-centered, comprehensive diabetic education improves outcomes and adherence, despite existing barriers (Hirschman et al., 2015). As of this study, there were no formal diabetic education processes at this facility. From the gap analysis, due to staffing constraints and multiple changes in the facility's discharge process, diabetes education lacked consistency, was provided in a fragmented fashion and was often rushed—this QI project aimed to improve the quality of care and reduce 30-day re-admission.

Figure 1

Type 2 Diabetes Optimizing Intervention Process



Optimize Transition of Care

People with diabetes can self-manage their chronic disease with structured outpatient care. Providing them with a solid foundation of community resources and an integrated medical team of healthcare professionals from the start will assist them in their commitment to achieving glycemic control and better outcomes. Keeping appointments and following through with healthy diet choices and an active lifestyle contributes to their overall health and increased quality of life (American Diabetes Association, 2021). Optimal follow-up care after discharge reduces the incidence of re-admission within 30 days of discharge (Ostling et al., 2017). A smooth and integrated transition of care is an essential aspect of outpatient care and is a factor that improves patient outcomes. A diabetic discharge checklist (see Appendix B) created by Janssen Pharmaceuticals (2014) for people with type 2 diabetes was added to the discharge teaching to standardize a portion of the transition process. Within the checklist were aspects that must be addressed upon discharge, as supported by the American Diabetes Association.

The CCM is a proven framework used in chronic disease management in the primary care setting, which promotes communication and collaboration between the healthcare provider and patient to achieve better outcomes through chronic disease self-management, evidenced-based guideline use, utilization of community resources, and promotion of smooth and transparent discharge processes. Just as the CCM can provide a framework for optimizing the transition of care from the clinical setting to home, a number of this model's elements were used to help patients transition from the hospital to home. It also laid the foundation for patients' self-management of their diabetes by beginning the process of helping them see how making better choices can help control their blood sugar and even contribute to a reduction in re-admissions to the hospital. The elements used to attain efficiency in the transition of care included:

- Clinical Information Systems
    - Verification if the patient's provider had the means to receive the CGM data
- Delivery System Design
    - Primary care provider or endocrinologist notified that the patient would be discharged with a continuous GCM
    - Follow-up appointment booked for the patient 2 weeks after discharge
    - Follow-up discharge phone calls to patients conducted by nursing staff
- Decision Support
    - Diabetic education with the support of a diabetic handbook
- Self-Management Support
    - Application of the CGM device with education on the optimal target range
- Community Resources
    - Partnership with Abbott to obtain CGM for facility
    - Patients were informed about a weekly diabetes self-management program offered in Bexar County

Setting/Population

The project's setting was an acute care facility in Bexar County, Texas. The facility is a 230-bed hospital servicing an adult population aged 18 years and older. The specific unit where the implementation took place was a 45-bed medical/surgical unit. The target population was adults admitted to the unit diagnosed with type 2 diabetes mellitus who had a hemoglobin A1C drawn during admission. Any patient with a hemoglobin A1C $\geq$ 8% was defined as poorly controlled and considered a candidate for a continuous glucose monitor, if discharged on an insulin regimen.

Organizational Barriers

An organizational barrier identified early in the project was the lack of a diabetic educator. The facility had not employed a certified diabetic educator for over a year and could not fill this part-time position. It remained vacant throughout the implementation of the project. Another barrier impacting this project included an increased turnover of full-time bedside registered nurses, unit secretaries, and patient care technicians. The majority of these changes in the structure of the medical/surgical unit occurred due to the COVID-19 pandemic. Shah et al. (2021) reported that hospitals have been experiencing staffing shortages from staff burnout related to the increasing demand and responsibilities associated with caring for patients with COVID-19. The mental strain on the workforce has resulted in nurses leaving the profession entirely. These shortages have been compounded by the additional challenges hospitals face due to a shrinking recruitment pool, an inability of the facility to compete with staffing agency salaries, and increased staff-to-patient ratios (Shah et al., 2021). The medical/surgical unit staff proved to be no different as they were primarily contract nurses who rotated to their next assignment during the QI project and staff nurses with less than 3 years of experience.

In addition to using contract staff, the facility had to hire a new leadership team for the medical/surgical unit, including a director and a clinical manager. With the addition of a new director and clinical manager, there was noticeable hesitancy regarding the additional responsibility required during the initial discharge phone call to patients. The number of staffing hours was not available for follow-up phone calls. With limited resources to conduct some of the measured variables, lending an extra employee to assist with follow-up phone calls was not feasible. It, therefore, became the responsibility of the project director to complete, with

assistance from the discharge nursing staff and the facility educators, when time permitted in their schedules.

Healthcare is an industry subject to many changes to meet patient needs. However, resistance to change is another barrier when new guidelines and procedures are introduced. There are job-related factors that influence resistance to change. A new culture has been developing in many hospitals, including where this project took place, where nurses are expected to work with lean staffing ratios despite high nurse turnover. During the height of the COVID-19 pandemic, nurses worked in stressful conditions where adding another task to complete at the bedside was not welcomed. New projects and implementation of processes that are not familiar can cause uncertainty and resistance because healthcare workers have their own established individualized workflow, and new information takes time to learn. Introducing new technology requires many steps, including education, staff involvement, and high-level communication. Management and staff needed to be willing to address the increased workload a new process may require. Since there had been several changes in the medical/surgical department and new management hired, the changes this project required caused resistance to change. Other causes of resistance included a lack of responsiveness to initiate the CGM, forgetfulness to support implementation, and resistance to alter routines.

Ethical Considerations

In reviewing the purpose and design of this QI project, care was given to aligning with the Institute of Medicine's (2001) six aims for Quality Improvement. This framework emphasizes the importance of six areas to improve the overall quality of care provided to patients, which include:

- Safety: All the patients provided with CGMs, diabetic education, and thorough transition of care would realize the benefits of a healthcare team proactively addressing possible complications and risk factors after a patient is discharged home from the hospital with diabetes. The aim was to prevent complications such as hypoglycemic events.
- Effectiveness: Utilization of tools such as CGMs have been researched through clinical trials and efficacy documented. Literature supports the use of TCM and CCM as frameworks to ensure structured guidelines on delivering care that meets the standards of medical care set forth by the American Diabetes Association and the American Association of Clinical Endocrinology.
- Timely: Some interventions in this QI project, such as providing each patient with their follow-up appointment before discharge, reduced the time patients used to manage their follow-up care. Providing them with a CGM also reduced the time it took to monitor their glycemic readings and gave them more time to spend on personal priorities.
- Efficiency: As a healthcare team member, providers must be mindful of the cost of diabetes care and the associated costs for supplies, educational materials, and tools during this QI project.
- Equitable: The design of this QI project was to improve the quality of diabetic discharge care and provide information to patients with type 2 diabetes at risk for re-admission to the hospital. Provision of an efficient and effective follow-up plan was provided to patients regardless of gender, ethnicity, or socioeconomic status.

- Patient-centered: The care provided focuses on respecting a patient's preferences and needs.

Data obtained from each CGM for analysis and assessment of patients staying within the target range was de-identified. This project was reviewed and found not to meet federal regulatory requirements for human subject research and did not require approval via the IRB process.

Evaluation Plan

The project took place over 14 weeks, following training and providing the medical/surgical unit staff with the necessary resources, such as the CGMs, diabetes education handbooks, and diabetes discharge checklists. Several outcome variables were monitored throughout the project to evaluate the QI project's outcomes. Table 1 lists the improvement intervention or change, the timing, and the data collection method used.

Data was collected by the charge nurses and bedside nursing staff through the use of the diabetes discharge checklist that had questions about the patient's readiness for discharge and the initiation of diabetic self-management at home (see Appendix B).

Evaluating the effectiveness of continuous glucose monitoring in the self-management of diabetes and in improving the transition of care depended on the impact these interventions had on two interrelated project aims. Two outcome questions were posed based on these aims in addition to the objectives above:

1. For patients with type 2 diabetes on an insulin regimen with a GCM applied at discharge, how many days did they remain in their target glycemic range?
2. How many patients with type 2 diabetes on an insulin regimen with a GCM applied at discharge were readmitted within 30 days?

Table 1

Interventions and Timing of Data Collection

Change/Improvement	Outcome/Variable	Timing of Measurement	Data Collection Method
Increase the number of patients with type 2 diabetes prescribed insulin with a CGM monitor applied at discharge.	Percentage of patients discharged with a continuous glucose monitor.	Weekly and at the end of the project.	Excel spreadsheet of patients who have been discharged with CGM.
Improve patient awareness of glycemic trends and diet, activity, and lifestyle changes.	Percentage of patients discharged with CGM who remained in their target range.	Monthly and at the end of the project.	CGM system tracks data. Information is saved in the CGM app.
Improve the transition of care for patients discharged from the hospital to home.	Percentage of patients discharged with a follow-up appointment within 14 days of discharge.	Begin the first measurement two weeks after the first discharge, and keep weekly results.	Contact the primary care provider or endocrinologist to follow up.
Improve the quality of diabetic education provided to patients who are diabetic naïve.	Percentage of patients who received diabetes handbook during CGM education with an opportunity to ask questions	Weekly and at the end of the project.	Completion of the diabetes discharge checklist with documentation recorded in the excel spreadsheet.
Use a diabetes discharge checklist to ensure that patient's self-management needs and questions are addressed before discharge.	Percentage of patients with diabetes discharge checklist completed.	Weekly and at the end of the project.	Collect checklists from Med/Surg charge nurses weekly and enter data in the excel spreadsheet.
Improve the transition of care	Percentage of patients who attended their follow-up appointment	Weekly	Phone the outpatient providers to determine if the patient attended their follow-up appointment.
Reduce 30-day re-admission risk	Percentage of patients readmitted within 30 days.	At the end of the project.	Collect re-admission data from the unit,
Increase the use of CGM devices to help patients and providers make optimal and timely therapeutic changes.	Percentage of follow-up providers who used the data provided by the CGM and agreed that it helped manage the patient's diabetes	Weekly	Phone the outpatient providers to ask survey questions.
Encourage patient use of CGM monitor to assist in the management of glycemic control.	Percentage of patients who felt the CGM monitor helped keep better control of glycemic variations.	Telephone follow-up with patients within 48 hours of discharge and one week and 2-week post-discharge.	Documented on the post-discharge diabetes checklist.
Follow-up calls to provide support and allow patients to ask questions and express concerns	Percentage of patients who received post-discharge follow-up phone calls within two days.	Daily tally	Documented on the excel spreadsheet.

Data Analysis and Results

Part of the purpose of this project was to improve patients' understanding of their glycemic trends using a CGM system that the facility provided prior to discharge. CGM devices allow patients to evaluate their glycemic trends, also known as their target range or time in range. The project period occurred from February 28, 2022, through May 20, 2022. There were 183 charts reviewed for eligibility, and 67 patients qualified to receive a CGM. Of the 67 patients deemed eligible, 46 were discharged with a CGM. The data showed that 61% (n=28) were male and 39% (n=18) were female. Half of the participants were Hispanic, 29 (63%) were overweight, and 17 (37%) were obese. Further characteristics are listed in Table 2. Figure 2 shows the frequency of each outcome variable tracked throughout the project period.

Objective 1 Outcomes

The first objective was to initiate a CGM device on 80% of adult patients discharged on insulin. Of the 67 patients screened to receive a CGM, 46 were discharged with Abbott's FreeStyle Libre 2 CGM system. All the patients were diagnosed with type 2 diabetes and were sent home on either their preadmission insulin regimen or a new insulin regimen ordered by the discharging physician. This goal was not met since 69% of patients were discharged with a CGM. Fifteen patients were unable to upload the mobile app to their cellular devices. Six patients were uninterested in using the CGM because they felt they could not support the continued use due to the device's cost or did not believe the device would provide accurate results.

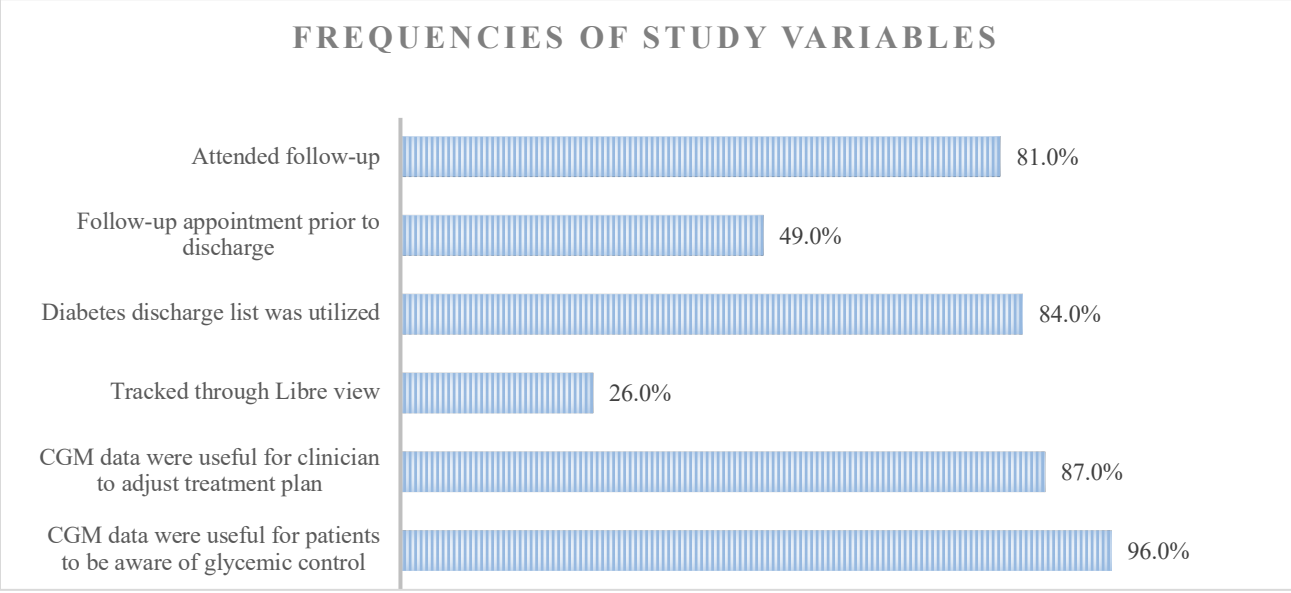
Table 2

Characteristics of Patients with Type 2 Diabetes Selected for CGM Project

Categories		n=46	(%)
Gender			
Male		28	(61)
Female		18	(39)
Age (years)			
18-29		2	(4)
30-39		11	(24)
40-49		16	(35)
50-59		10	(22)
60-69		7	(15)
Race			
Hispanic		23	(50)
Caucasian		17	(37)
African American		5	(11)
Asian		1	(2)
HbA1c			
< 8.0		0	(0)
8.0-9.0		7	(15)
9.1-10.0		10	(22)
10.1-11.0		7	(15)
11.1-12.0		9	(20)
> 12		13	(28)
BMI			
< 18.5	Underweight	0	(0)
18.5 - 24.9	Normal weight	0	(0)
25 – 29.9	Overweight	29	(63)
> 30	Obese	17	(37)
Healthcare Insurance			
Pending Coverage		9	(20)
Medicaid		4	(9)
Medicare		1	(2)
Commercial/Private		32	(70)

Figure 2

Frequencies of Study Variables



Objective 2 Outcomes

The second objective was that all participants would be provided education on CGM devices. This target was met for 100% (n=46) of the patients. Education on the application of the sensor, the length of use (14 days), and the ideal number of times patients would need to scan their sensors was provided. Guided instructions were completed with each patient on uploading the Libre 2 app onto their smartphones. Detailed information was provided on interpreting data, responding to alarms, and managing insulin adjustments their providers ordered.

Objective 3 Outcomes

For the third objective, diabetes education was provided and completed by the project lead, the unit diabetes education liaison, or the primary nurse. The facility provided a diabetic handbook that was reviewed and given to 100% (n=46) of the patients in this project. Post-intervention, there was an increase in diabetic education provided throughout the patient's inpatient stay, including comprehensive instruction on the importance of glucose management,

insulin management, and adherence to following a diabetic management plan. Before this intervention, the facility estimated that approximately 40% of patients received thorough diabetic teaching before discharge.

Objective 4 Outcomes

Objective 4 pertained to patients discharged with a CGM who had a follow-up appointment with their primary care provider or endocrinologist before discharge. The anticipated outcome for this objective was 100%. During the project period, 50% (n=43) of patients were discharged with a follow-up appointment before discharge. The remaining 50% of patients did not receive an appointment before discharge for the following reasons: the patient did not have a primary care provider on admission and could not obtain one before discharge; the staff involved in discharging the patient did not contact the primary care provider for a follow-up appointment, and discharge instructions informed the patient to book a follow-up appointment at their conveniece.

Objective 5 Outcomes

The fifth objective was that 80% of patients who were scheduled for a follow-up attended their follow-up appointment. Of the patients who scheduled a follow-up with either a primary care provider or endocrinologist, scheduled before discharge or booked by the patient after discharge, 83% (n=38) attended their follow-up appointment.

Objective 6 Outcomes

The final objective was that 80% of patients discharged with a CGM would have a follow-up phone call to provide them an opportunity to express concerns about their self-care objectives and voice any problems during this transitional period. One hundred percent (n=46) of the patients discharged with a CGM were contacted by telephone by a hospital nursing staff,

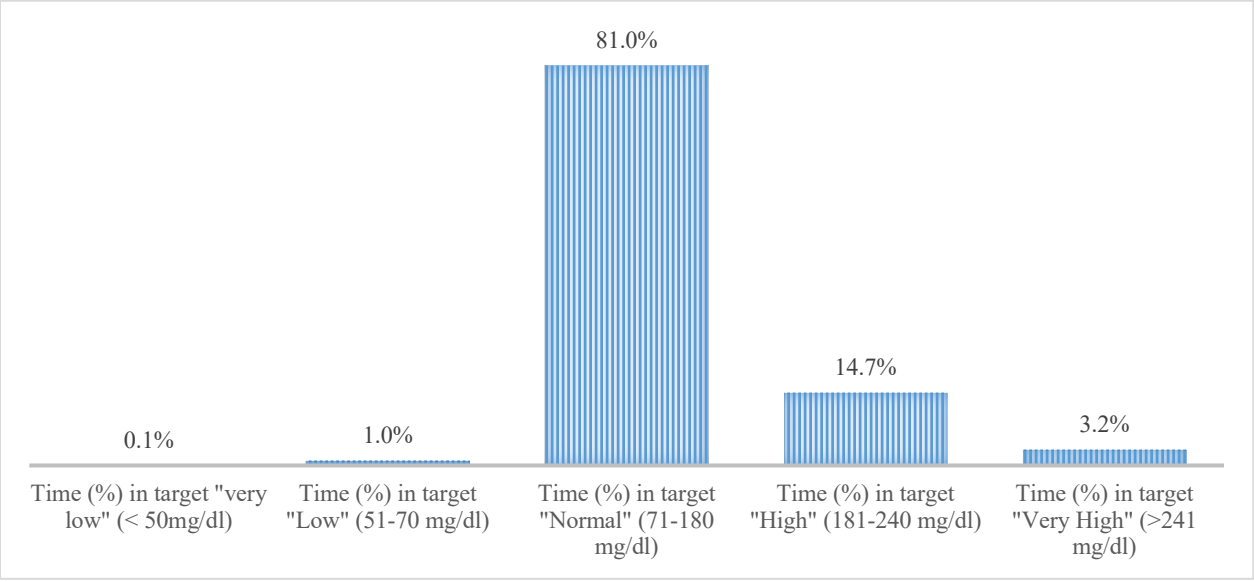
management, or the project lead within 48 hours of discharge. All the participants received two follow-up phone calls; 96% reported that using the CGM helped them become more aware of how diet, exercise, and medications affected glucose readings, and 87% said that their provider found the CGM data helpful in adjusting treatment plans.

Additional Outcomes

CGMs provided glucose data to people with type 2 diabetes mellitus and insulin therapy. The data provided information to the patient and provider about glucose trends and diet, exercise, and medication effects. Figure 3 represents the percentage of time participants were in different glucose ranges throughout CGM use. On average, participants spent significantly more time in normal target range (81.0 ± 17.8 %) than in higher (14.7 ± 13.8 %), very high (3.2 ± 6.6 %), lower (1.0 ± 1.4 %), and very low (0.1 ± 0.4 %) target ranges (F (4) = 499.1, $p < .001$).

Figure 3

Average Proportion of Time Spent in Target Range



Discussion

Patients diagnosed with type 2 diabetes who have been prescribed insulin require an effective way to monitor their glycemic variability, proper education on managing this chronic disease, and adequate resources and support as they discharge from an acute care setting. In this project, discharging patients with a CGM system, in addition to diabetic education and follow-up, decreased the incidence of re-admission to the hospital, provided increased awareness of the importance of diabetes self-management, and offered insight to providers on the convenience and positive impact of using CGM for more patients who are diagnosed with type 2 diabetes. This section will provide an understanding of facilitators and barriers when implementing interventions related to self-management of diabetes as patients are discharged from the hospital.

Traditional blood glucose monitoring is done through finger sticks and a blood glucose monitor, which the patient performs. This method of checking blood glucose is painful, expensive, and inconvenient. Ong et al. (2014) found that failing to check blood glucose regularly results from a lack of motivation, knowledge, self-efficacy, and frustration related to the stigma of being diagnosed with diabetes. CGM systems provide patients with information about their glycemic variability and avoid incidents of hypoglycemia, especially for type 2 diabetic patients who require basal insulin therapy (Aggarwal et al., 2022; Rodbard, 2017). Through this project, CGM use increased patient awareness of their glycemic trends and influenced their ability to stay in their target range. CGM yields more data showing a patient's glycemic trends, including the percent of time above, below, and within the target range, compared to self-monitoring of glucose (New et al., 2015). Patients acknowledged that the new technology they could utilize on their smartphone devices allowed them to conveniently track glycemic trends and provide data to their healthcare providers. Grunberger et al. (2021) reported

strong evidence supporting CGM in achieving glycemic targets, allowing providers to manage appropriate medication therapies, and encouraging personalized methods of chronic disease management. Hemoglobin A1C levels decreased more with CGM versus home blood glucose monitoring in a 24-week randomized control trial of patients diagnosed with type 2 diabetes on insulin. Mean HbA1c levels decreased by at least 1%, and quality of life measures increased (Beck et al., 2017).

All providers were interested in ordering the CGM for their patients. However, initiation from the nursing staff and project lead was necessary to remind physicians of the availability of CGM. Introduction of the device, uploading the app to the patient's smartphone device, and the required hour of waiting before the initial glycemic reading could be obtained took several hours and was a barrier to more patients getting a CGM. The nursing staff and providers demonstrated an interest in and appreciation for the availability of the CGM device, but there remained concerns about continued use due to cost.

Patient education for type 2 diabetes is essential in ensuring that patients understand how diet, exercise, and medications can improve overall outcomes and reduce the incidence of diabetic complications. Despite the lack of a certified diabetic educator, the care facility's nursing staff assessed the patient's understanding of diabetes. The staff then provided education by providing each patient with the facility-created diabetic handbook. The care facility has since designated a diabetic liaison for each patient care unit, who assists in being a resource and encourages comprehensive diabetic education to all patients with diabetes. Patients with inadequate resources for diabetes management are referred to the San Antonio Metropolitan Health District's Diabetes Prevention and Control program.

Discharge planning for patients with diabetes is an essential component of quality care from the time patients are admitted to an acute care facility through discharge and beyond. Proper diabetes management includes patient-centered education and strategies that implement plans to maintain reasonable glycemic control, establish follow-up appointments before discharge, and identify any barriers that could prevent optimized self-management of diabetes (Cook et al., 2009; Garnica, 2017). Cook et al. (2009) emphasize the importance of a post-discharge follow-up appointment before the patient's discharge. Jackson et al. (2015) report an evidence-based approach that showed follow-up within 7 days of release was associated with lower re-admission rates. Developing a patient-centered approach to discharge planning should include scheduling a follow-up appointment before discharge (American Diabetes Association, 2021).

Limitations

This project was subject to several limitations that needed to be addressed. The number of staff and resources available to complete this project was inconsistent, and the effects of COVID-19 on the availability of full-time core staff affected the consistency and completeness of the project interventions. The bedside nursing staff present at the beginning of this project were contracted laborers and were no longer employed at the facility by the end of the project. The impact of contract labor nurses during the pandemic was decreased motivation and commitment to participate in this DNP project. The COVID-19 pandemic had a negative impact on staff nurses because of the increased workload and a stressful work environment that periodically resulted in poor quality of work (Ardiç et al., 2022). Although the care facility had a team of nurses who assisted with discharging patients, during this DNP project, the discharge lounge was unavailable due to the pandemic. COVID-19 patients were not allowed to be in a

discharge lounge with other patients. However, the project lead found that conducting this project with a core group of nurses who were invested in the facility and had knowledge of the importance of evidence-based practice benefitted the project's outcomes. Forward-thinking and the implementation of products and devices that aided in the improvement of the overall health of patients with diabetes were valued and seen as needed.

Little information has been documented on the study of CGM for patients discharged from a hospital setting. Depczynski & Poynten (2022) began research to determine if CGM use at discharge would reduce hospital re-admissions. However, their study was terminated due to poor recruitment. There has been limited integration of CGM use. CGMs are not new and have been FDA approved and available since 1999 (Olczuk & Priefer, 2018). The physician initiated fewer than 3% of CGM placements during this project. The project lead recommended the use of CGM for many of the participants. The technology of CGMs has improved in the last two decades; the sensors provide providers and patients with real-time information on how diet, exercise, and medication affect glycemic trends (Grunberger et al., 2021). It is up to providers to initiate this type of technology in conjunction with resources such as diabetes prevention programs. Barriers to increased use can be overcome with adequate education, training, and support for providers as they learn how to review and interpret data (Miller, 2020). Since completing this project, the facility has planned possible ways to continue providing CGMs for patients with diabetes upon discharge from the hospital.

Recommendations

CGMs should be made available to patients as they are discharged from an acute care setting. Making these devices more widely used in the healthcare community brings awareness of patients' need to become active participants in the self-management of their diabetes. CGMs

have increased patient glycemic control and allow patients to immediately see the variations in their glycemic trends in relation to behaviors (Miller, 2020). A major advantage of CGM is monitoring glycemic trends without finger sticks, as opposed to traditional blood glucose monitoring. Randomized control trials have supported that CGM reduces glycated hemoglobin A1C (HbA1C) (Beck et al., 2017; Martens et al., 2021; Vigersky et al., 2012). There is an increasing need to educate primary care providers on CGM use to help patients who use insulin regimens reduce dangerous hypoglycemic events and increase the quality of life in relation to activity, diet, and medication regimens.

A process to improve establishing follow-up appointments before discharge and providing outpatient resources is also needed. In a study where a community nurse contacted patients for a post-discharge follow-up, Vernon et al. (2019) saw a reduction in 30-day re-admission rates compared to those who did not receive follow-up contact. Another study of 328 patients provided a diabetic discharge navigator improved glycemic control and increased follow-through, through patients attending follow-up visits and obtaining timely diagnostic laboratory work (Horny et al., 2017). In this project, the follow-up phone calls served a similar purpose. The results from this project showed an improvement in patient engagement with follow-up care.

Implementing the ability for nursing staff to utilize the referral form provided on the diabeteshelpsa.com website (see Appendix C) offers additional low-cost options for patients without health insurance. It allows case managers to advocate for providing more outpatient resources for patients before discharge. A policy must be supported by stakeholders directly impacted by the healthcare outcomes of patients with diabetes. All stakeholders should be aware of and implement the recommendations set forth by the American Diabetes Association. Those

recommendations include a patient-centered discharge plan that consists of a thorough review of medications, an outpatient follow-up appointment preferably within 1 to 2 weeks after discharge and made before the patient leaves the hospital, and a care plan that promotes self-management of the patient's diabetes in preventing hospitalization and re-admission (American Diabetes Association, 2021). Incorporating pharmacy consultation for all patients discharged with an insulin regimen to cover areas about medication management, such as those listed on the discharge checklist, is essential. A medication reconciliation review to prevent adverse drug interactions, allowing time for patients to ask questions before discharging home, and providing clear documentation of the medication administration plan for patients at home, are also important (Lee et al., 2019).

Sustainability

The director of professional nursing practice at the care facility indicated an interest in continuing the application and use of CGMs at this facility. Since the end of this project, the facility has reopened its discharge lounge. This has positively impacted the delivery of diabetic education because diabetic handbooks are now provided to patients when they are admitted, bedside nursing staff have increased reinforcement of diabetes education, and additional resources and information about self-management of diabetes is covered with the patient by the discharge nursing staff.

Implications for Practice

Remarkable advances are being made in treating and monitoring patients diagnosed with type 2 diabetes. Healthcare providers can implement more convenient monitoring of glycemic trends using CGM systems. Through advanced technology, glucose patterns are quickly identified, and treatment interventions can be modified to prevent adverse complications. CGM

data allows the nurse practitioner to monitor a patient's glycemic variability better and to respond to adjustments in their medication regimen. Moreover, advanced nurse practitioners can influence and lead care transitions by educating patients and helping them understand the importance of diabetes control.

The American Association of Colleges of Nursing (2006) encourages and recommends that doctorally prepared nurses utilize their education and training to develop and design evidence-based interventions. By understanding the expanding knowledge base on diabetes technology, doctorally prepared advanced practice nurses can make clinical decisions that improve the quality of care for patients with diabetes. Healthcare has become more complex, and care delivery is sometimes fragmented. Advanced practice nurses are in a pivotal position to promote interprofessional collaboration and are prepared to assume a leadership role in developing and implementing clinical interventions to improve the nation's health (American Association of Colleges of Nursing, 2006). The doctorally prepared family nurse practitioner promotes collaboration with patients, family members, and other health care providers in the continued optimization of diabetic self-management by implementing evidence-based care to ensure consistency and continuity of care during transitional periods.

References

Aggarwal, A., Pathak, S., & Goyal, R. (2022). Clinical and economic outcomes of continuous glucose monitoring system (CGMS) in patients with diabetes mellitus: A Systematic literature review. *Diabetes Research and Clinical Practice, 186*(109825). https://doi.org/10.1016/j.diabres.2022.109825

American Association of Colleges of Nursing. (2006). *The essentials of doctoral education for advanced nursing practice.* https://www.aacnnursing.org/DNP/DNP-Essentials

American Diabetes Association. (n.d.). *CGM & time in range* https://diabetes.org/tools-support/devices-technology/cgm-time-in-range

American Diabetes Association. (2018). Economic costs of diabetes in the U.S. in 2017. *Diabetes Care*. https://doi.org/10.2337/dci18-0007

American Diabetes Association. (2021). Standards of medical care in diabetes—2021 Abridged for primary care providers. *Clinical Diabetes, 39*(1), 14-43. https://doi.org/10.2337/cd21-as01

Ardiç, M., Ünal, Ö., & Türktemiz, H. (2022). The effect of stress levels of nurses on performance during the COVID-19 pandemic: The mediating role of motivation. *Journal of Research in Nursing, 27*(4), 330-340. https://doi.org/10.1177/17449871211070982

Baptista, D. R., Wiens, A., Pontarolo, R., Regis, L., Reis, W., & Correr, C. J. (2016). *Diabetology & metabolic syndrome, 8*(7), 1-7. https://doi.org/10.1186/s13098-015-0119-z

Battelino, T., Danne, T., Bergenstal, R. M., Amiel, S.A., Beck, R., Biester, T., Bosi, E., Buckingham, B. A., Cefalu, W. T., Close, K.L., Cobelli, C., Dassau, E., DeVries, J. H., Donaghue, K. C., Dovc, K., Doyle III, F. J., Garg, S., Grunberger, G., Heller, S., . . .

Moshe, P. (2019). Clinical targets for continuous glucose monitoring data interpretation: Recommendations from the International Consensus on time in range. *Diabetes Care, 42*, 1593-1603. https://doi.org//102337/dci19-0028

Beck, R. W., Riddlesworth, T. D., Ruedy, K., Ahmann, A., Haller, S., Kruger, D., McGill, J. B. Polonsky, W., Price, D., Aronoff, S., Aronson, R., Toschi, E., Kollman, & Bergenstal, R. (2017). Continuous glucose monitoring versus usual care in patients with type 2 diabetes receiving multiple daily insulin injections: A randomized trial. *Annals of Internal Medicine, 167*(6), 365-374. https://doi.org/10.7326/M16-2855

Centers for Disease Control and Prevention. (2020). National diabetes statistics report 2020: Estimates of diabetes and its burden in the United States. https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf

City of Live Oak, Texas (n.d.). Demographics. https://www.liveoaktx.net/living-in-live-oak/community-data#demographics

City of San Antonio Metropolitan Health District (2021) *Status of diabetes 2018-2019 Bexar County, Texas* https://www.sanantonio.gov/Portals/0/Files/health/News/Reports/Diabetes/AnnualReport2018-2019.pdf

Cook, C.B., Seifer, K.M., Hull, B.P., Hovan, M.J., Charles, J.C., Miller-Cage, V., Boyle, M.E., Harris, J.K., Magallanez, J.M., & Littman, S.D. (2009). Inpatient to Outpatient transfer of diabetes care: Planning for an effective hospital discharge. *Endocrine Practice, 15* (3), 263-269. https://doi.org/10.4158/EP.15.3.263

Depczynski, B., & Poynten, A. (2022). Acceptance and effect of continuous glucose monitoring on discharge from hospital in patients with type 2 diabetes: Open-label, prospective, controlled study. *JMIR Diabetes, 7*(2), e35163. https://doi.org/10.2196/35163

Garnica, P. (2017). Transition of care for patients with diabetes. *Current Diabetes Review, 13*, 263-279. https://doi.org/10.2174/1573399813666161123104407

Grunberger, G., Sherr, J., Allende, M., Blevins, T., Bode, B., Handelsman, Y., Hellman, R., Lajara, R., Roberts, V. L., Rodbard, D., Stec, C., & Unger, J. (2021). American Association of Clinical Endocrinology clinical practice guideline: The use of advanced technology in the management of persons with diabetes mellitus. *Endocrine Practice, 27*, 505-537. https://doi.org/10.1016/jeprac.2021.04.008

Hartz, J., Yingling, L., & Power-Wiley, T. M. (2016). Use of mobile health technology in the prevention and management of diabetes mellitus. *Current Cardiology Reports, 18* (12), 1-11. https://doi.org/10.1007/s11886-016-0796-8

Horny, H., Glover, W., Gupte, G., Saraswat, A., Vimalananda, V., & Rosenzweig, J., (2017). Patient navigation to improve diabetes outpatient care at a safety-net hospital: a retrospective cohort study. *BMC Health Services Research, 17*:759. https://doi.org/10.1186/s12913-017-2700-7

Institute of Medicine. (2001). *Crossing the quality chasm: A new health system for the 21st century.* Washington, D.C.: National Academy Press.

Jackson, C., Shahsahebi, M., Wedlake, T., & DuBard, C.A. (2015). Timeliness of outpatient follow-up: An evidence-based approach for planning after hospital discharge. *Annals of Family Medicine, 13*(2), 115-122. https://doi.org/10.1370/afm.1753

Janssen Pharmaceuticals, Inc. (2014). Discharge planning checklist for patients with type 2 diabetes. https://www.carepathhealthyengagements.com/sites/carepathhealthyengagements.com/files/T2-discharge-planning.pdf

Lee, R., Malfair, S., Schneider, J., Sidhu, S., Lang, C., Bredenkamp, N., Liang S. F., Hou, A., & Virani, A. (2019). Evaluation of pharmacist intervention on discharge medication reconciliation. *Canadian Journal of Hospital Pharmacy, 72*(2), 111-118.

Magny-Normilus, C., Nolido, N., Borges, J. C., Brady, M., Labonville, S., Williams, D., Soukup, J., Lipsitz, S., Hudson, M., & Schnipper, J.L. (2019). Effects of an intensive discharge intervention on medication adherence, glycemic control, and re-admission rates in patients with type 2 diabetes. *Journal of Patient Safety, 17*(2), 73-80.

Martens, T., Beck, R. W., Beck, R. W., Bailey, R., Ruedy, K. J., Calhoun, P., Peters, A. L., Pop-Busui, R., Philis-Tsimikas, A., Boa, S., Umpierrez, G., Davis, G., Kruger, D., Bhargava, A., Young, L., McGill, J. B., Aleppo, G., Nguyen, Q. T., Orozco, I., . . . Bergenstal, R. M. (2021). Effect of continuous glucose monitoring on glycemic control in patients with type 2 diabetes treated with basal insulin: A randomized clinical trial. *Journal of the American Medical Association, 325*(22), 2262-2272. https://doi.org/10.1001/jama.2021.7444

Miller, E. M. (2020). Using Continuous Glucose Monitoring in Clinical Practice. *Clinical Diabetes, 38*(5), 429-438. https://doi.org/10.2337/cd20-0043

Naylor, M. D., Hirschman, K. B., Toles, M. P., Jarrín, O. F., Shaid, E., & Pauly, M. V. (2018). Adaptations of the evidence-based Transitional Care Model in the U.S. *Social Science & Medicine, 213*, 28-36. https://doi.org/10.1016/j.socscimed.2018.07.023

New, J.P., Ajjan, R., Pfeiffer, A.F.H., & Freckmann, G. (2015). Continuous glucose monitoring in people with diabetes: The randomized controlled Glucose Level Awareness in Diabetes Study (GLADIS). Diabetic Medicine, 32(5), 609-617. https://doi.org/10.1111/dme.12713

Olczuk, D. & Priefer, R. (2018). A history of continuous glucose monitors (CGMs) in self-monitoring of diabetes mellitus. Diabetes & Metabolic Syndrome: *Clinical Research & Reviews, 12*, 181-187. https://doi.org/10.1016/j.dsx.2017.09.005

Ong, W. M., Chua, S. S., & Ng, C. J. (2014). Barriers and facilitators to self-monitoring of blood glucose in people with type 2 diabetes using insulin: a qualitative study. *Patient Preference and Adherence, 8*, 237-246. https://doi.org/10.2147/PPA.S57567

Ostling, S., Wyckoff, J., Ciarkowski, S. L., Pai, C., Choe, H.M., Bahl, V., & Gianchandani, R. (2017). The relationship between diabetes mellitus and 30-day re-admission rates. *Clinical Diabetes and Endocrinology, 3*(3), 1-8. https://doi.org/10.1186/s40842-016-0040-x

Poushter, J. (2016). Smartphone ownership and internet usage continues to climb in emerging economies: But advanced economies still have higher rates of technology use. *Pews Research Center.* https://www.diapoimansi.gr/PDF/pew_research%201.pdf

Powers, M. A., Bardsley, J., Cypress, M., Duker, P., Funnell, M. M., Fischl, A. H., Maryniuk, M. D., Siminerio, L., & Vivian, E. (2015). Diabetes self-management education and support in type 2 diabetes: a joint position statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. *Diabetes Care, 38*(7), 1372-1382. https://doi.org/10.2337/dc15-0730

Rodbard, D. (2017). Continuous glucose monitoring: A review of recent studies demonstrating improved glycemic outcomes. *Diabetes Technology & Therapeutic, 19*(3), S25-S27. https://doi.org/10.1089/dia.2017.0035

Ryan, E. A., Holland, J., Stroulia, E., Bazelli, B., Babwik, S. A., Li, H., Senior, P., & Greiner, R. (2016). Improved A1C levels in type 1 diabetes with smartphone app use. *Canadian Journal of Diabetes, 41*(1), 33-40. https://doi.org/10.1016/j.jcjd.2016.06.001

Shah, M.K., Gandrakota, N., Cimiotti, J.P., Ghose, N., Moore, M., & Ali, M.K. (2021). Prevalence of and factors associated with nurse burnout in the US. *JAMA Network Open, 4*(2), e2036469. https://doi.org/10.1001/jamanetworkopen.2020.36469

Taylor, M. J., McNicholas, C., Nicolay, C., Darzi, A., Bell, D., & Reed, J. E. (2014). Systematic review of the application of the plan-do-study-act method to improve quality in healthcare. *BMJ Quality & Safety,* 23(4), 290-298. http://dx.doi.or/10.1136/bmjqs-2013-002703

Vernon, D., Brown, J. E., Griffith, E., Nevill, A. M., & Pinkney, M. (2019). Reducing re-admission rates through a discharge follow-up service. *Future Healthcare Journal*, 6(2), 114-117. https://doi.org/10.7861/futurehosp.6-2-114

Vigersky, R.A., Fonda, S.J., Chellapa, M., Walker, M.S., & Ehrhardt, N.M. (2012). Short-and long-term effects of real-time continuous glucose monitoring in patients with type 2 diabetes. *Diabetes Care, 35*(1), 32-38. https://doi.org/10.2337/dc11-1438

Yoo, H. J., An, H. G., Park, S. Y., Ryu, O. H., Kim, H. Y., Seo, J. A., Hong, E. G., Shin, D. H., Kim, Y. H., Kim, S. G., Choi, K. M., Park, I. G., Yu, J. M., & Baik, S. H. (2008). Use of real time continuous glucose monitoring system as a motivational device for poorly controlled type 2 diabetes. *Diabetes Research and Clinical Practice, 82*, 73-79. https://doi.org/10.1016/j.diabres.2008.06.015

Appendix A:

Letter of Support

Glenn Dennis, MSN, RN, ACNS-BC, Chief Nursing Officer
Methodist Hospital | Northeast
12412 Judson
Live Oak, TX 78233
Dec. 7, 2021

To Whom it May Concern:

This letter is to provide support for Nikki Rose Angeles' Doctorate of Nursing Practice project on using Continuous Glucose Monitoring to decrease complications of uncontrolled blood glucose outcomes in our community. Our community experiences a large number of people undergoing amputations, dialysis, adverse heart conditions, strokes, and other comorbidities secondary to uncontrolled diabetes complications as evidenced by the population we serve in our hospitals. The outcomes that will be discovered and interventions suggested in her project will better help our teams to sustain the recommended interventions and support the needs of our diabetic community.

We look forward to working with and mentoring Nikki Rose in this very important project.

Sincerely,

Glenn Dennis

Appendix B:

Diabetic Discharge Checklist (Bedside Nurse Checklist)

DISCHARGE PLANNING CHECKLIST FOR PATIENTS WITH TYPE 2 DIABETES

For healthcare professionals: You may use this discharge planning checklist prior to discharging patients with type 2 diabetes. Many of the areas of discharge noted below are aligned with the National Quality Forum's *Preferred Practices and Performance Measures for Measuring and Reporting Care Coordination*[1] as well as the American Diabetes Association's (ADA) *Standards of Medical Care in Diabetes*.[2]

Patient's Name: _____ **Patient's Phone Number:** _____

Patient's Home Address: _____

Patient's Primary Language: _____ **Patient's Secondary Language:** _____

Insurance Information: _____

Caregiver's Name (if applicable): _____ **Caregiver's Phone Number:** _____

Discharge Planner's Name: _____ **Discharge Planner's Phone Number:** _____

Next Site of Care (if applicable): _____ **Phone Number:** _____

Date of Discharge: _____ **Allergies:** _____

Discharge Item	Specific Steps	Initial Once Completed
Medication Reconciliation[1-3]	○ Ensured that any chronic medications are resumed (as appropriate) and reviewed the safety of all newly prescribed medications	
	○ Discussed, explained, and provided postdischarge medication list (including prescription, OTC, and/or herbal medicines) to patient and/or next site of care	
	○ Involved a clinical pharmacist, if necessary	
Patient/Caregiver Instructions[1-3] (see next page for suggested patient counseling information)	○ Educated patient about self-management of type 2 diabetes during the hospitalization period	
	○ Documented patient education and understanding of patient instructions	
	○ Provided simple, easy-to-understand instructions in the primary language of patient and in a format written specifically for patients and/or caregivers; did not use abbreviations (eg, qd)	
	○ Reminded patient not to stop treatment without talking to his or her doctor first	
	○ Provided a 24/7 telephone support number, if available	

This form is designed to collect personal health information and should be maintained to protect from inadvertent disclosure. This form is for personal use and does not replace the organization's preferred discharge medication list.

(continued on next page)

Discharge Item	Specific Steps	Initial Once Completed
Transition Record[1,3]	○ Completed written transition record/discharge summary according to institution/facility procedures	
	○ Provided written transition record/discharge summary to the patient and/or caregiver within 24 hours of discharge	
	○ Forwarded patient transition record to next site of care (if applicable)	
Medication Management[1-3]	○ Wrote or called in any new prescriptions	
	○ Explained all newly prescribed or changed medications	
	○ Filled prescriptions (if possible)	
	○ Ensured that patient and/or caregiver understand when and where to fill new prescriptions	
	○ Confirmed that medications are available at the patient's pharmacy and covered by their insurance postdischarge	
	○ Discussed the importance of patient adherence to all medication instructions	
Follow-up Care[1,3]	○ Made appointments for patient's follow-up visit with appropriate HCPs	
	○ Provided names, addresses, and phone numbers of HCPs, dates and times of appointments, and reasons for visits in written format that is easy to understand for patient and/or caregiver (if applicable)	
	○ Explained to the patient and/or caregiver that he or she should provide the postdischarge medication list to all HCPs involved in his or her care	

This form is designed to collect personal health information and should be maintained to protect from inadvertent disclosure. This form is for personal use and does not replace the organization's preferred discharge medication list.

PATIENT COUNSELING SUGGESTIONS

The ADA recommends reviewing the following areas of knowledge with patients before hospital discharge[2]:

- Identification of healthcare provider who will provide diabetes care after discharge
- Educational information about diabetes, blood glucose goals, and blood glucose self-monitoring
- Recognizing, treating, and preventing hyperglycemia and hypoglycemia
- Importance of consistent eating patterns
- Knowing when and how to administer blood glucose–lowering medications including insulin
- Sick-day management, including creating a sick-day plan with their healthcare team[4]
- Safe use and disposal of needles and syringes, if applicable

References: 1. National Quality Forum (NQF). Preferred Practices and Performance Measures for Measuring and Reporting Care Coordination: A Consensus Report. Washington, DC: NQF; 2010. http://www.qualityforum.org/Publications/2010/10/Preferred_Practices_and_Performance_Measures_for_Measuring_and_Reporting_Care_Coordination.aspx. Accessed April 24, 2014. **2.** American Diabetes Association. Standards of Medical Care in Diabetes—2013. *Diabetes Care.* 2013;30(Suppl 1):S11-S66. **3.** Society of Hospital Medicine. Ideal discharge for the elderly patient: a hospitalist checklist [downloadable form]. SHM website. http://www.hospitalmedicine.org/AM/Template.cfm?Section=QI_Clinical_Tools&Template=/CM/ContentDisplay.cfm&ContentID=10303. Accessed April 24, 2014. **4.** American Diabetes Association. When you're sick. http://www.diabetes.org/living-with-diabetes/treatment-and-care/who-is-on-your-healthcare-team/when-youre-sick.html. Accessed April 24, 2014.

This information has been developed by Janssen Pharmaceuticals, Inc., and made widely available to support patient and provider education.

Appendix C

Diabetes Prevention and Control Referral Form

FAX REFERRAL FORM

Physician Name: _____

Practice Name: _____

Phone #: _____

Email: _____

Diabetes Prevention and Control Programs

(Please print clearly)

Patient's Name _____

Patient's Phone _____

☐ **Pre-diabetes based on the following criteria** (select all that apply) - **Fax referral form to 210-207-4288**

OA1c: _____ (5.7-6.4%)

OFasting Plasma Glucose: _____ (100-125 mg/dl)

O2-hour (75 gm glucola) Plasma Glucose: _____ (140-199mg/dl)

OI am referring this person based on this diagnosis and their BMI

BMI = _____ (>25, Asian individuals >22)

Metro Health will follow up with your patient.

☐ **Diabetes Self-Management Program - Fax referral form to 210-207-4288**

The Diabetes Self-Management Program is an evidence-based program developed at Stanford University. The program is open to adults with diabetes and/or their family members or caretakers and provides the tools for individuals to better control diabetes and prevent complications. The workshop is 6-weeks long and meets once a week for up to 2.5 hours.

Metro Health will follow up with your patient.

I consent to this referral and understand that Metro Health will contact me.

Patient Signature: _____ **Physician Signature:** _____

DiabetesHelpSA.com

CITY OF SAN ANTONIO
METROPOLITAN HEALTH DISTRICT

For more information: Call 210-207-8802 Or Email maria.ochoa2@sanantonio.gov