

Southern California CSU DNP Consortium

California State University, Fullerton
California State University, Long Beach
California State University, Los Angeles

INCREASING NURSE COMPLIANCE TO HYPOGLYCEMIA PROTOCOL

A DOCTORAL PROJECT

Submitted in Partial Fulfillment of the Requirements

For the degree of

DOCTOR OF NURSING PRACTICE

By


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May 2023

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DOI 10.5281/zenodo.10548094
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ABSTRACT

The American Diabetes Association published a set of evidence-based practice standards for treating hypoglycemia in hospitalized patients, which outlined the use of the 15/15 rule. The 15/15 rule is standard practice for all hypoglycemic patients; however, it is not widely used by inpatient nurses. As a result, hospital length of stay, incidences of hypoglycemia are both increased when hospitalized patients experience a hypoglycemic event. Non-compliance with the hypoglycemia protocol is costly and impacts patient outcomes. Methods: Using the Iowa model as a framework. The project included creating, implementing, and evaluating the effectiveness of diabetes staff education utilizing simulation training. The simulation was based on evidence-based practices designed to increase compliance with the hypoglycemia protocol. The project took place in a direct observation unit at a local hospital with unit nurses. Results: Baseline data showed that multiple patients admitted to the unit with Diabetes Mellitus experienced hypoglycemic episodes. Data also showed that nurses were non-compliant with hypoglycemic protocol at baseline. Following the implementation of the simulation, results showed that there was a slight increase in nurse compliance with the protocol. Implications: The results showed that Simulation training was practical for increasing nurse compliance.

Keywords: diabetes, hypoglycemia, education, training, simulation, inpatient, blood glucose

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ACKNOWLEDGEMENTS

I am grateful to everyone I had the pleasure of working with on this project. Each member of my team has provided me with extensive personal and professional guidance, as well as teaching me a great deal about research and life in general. Words cannot express how grateful I am to my DNP Consortium's director for her invaluable patience and feedback. I'm also grateful to my classmates and cohort members for their constructive criticism and moral support. Thanks also to the librarians and writing coach who influenced and inspired me.

Finally, I would be remiss if I did not acknowledge my family and friends, without whom I could not have embarked on this journey. Their confidence in me has kept my spirits and motivation high throughout the process.

Background

A common complication of Diabetes Mellitus management is hypoglycemia. The American Diabetes Association (ADA) defines hypoglycemia as blood glucose (BG) levels that are below 70mg/dL (ADA, 2021). If a hypoglycemic event is sustained over a period, it is a dangerous situation which requires attention as patients are at risk of becoming critically ill or dying (ADA, 2021). Hypoglycemia during hospital admission is categorized as primary hypoglycemia or secondary hypoglycemia. Primary hypoglycemia indicates that this is the primary purpose of the current hospitalization. The literature described Secondary hypoglycemia as the hypoglycemic event occurred while the patient was admitted.

Patients experience hypoglycemia for various reasons such as inadequate nutritional intake, fasting, increase in stress due to admission, improper glucose monitoring, or medication reactions (ADA, 2021). If hypoglycemia occurs while patients are admitted, nurses and providers must correct it promptly to minimize complications. The ADA (2021) outlines the effective treatment of hypoglycemia through the 15–15 rules (see Figure 1). This guideline recommends that patients with BG levels below 70mg/dL receive 15 grams of carbohydrates to raise their blood glucose level, then recheck the BG level again in 15 minutes to determine if the BG level increases above 70mg/dL. If BG levels are sustained at or below 70mg/dL, the ADA recommends providing another 15 grams of carbohydrates. Knowledge of this rule and hospital protocols are imperative in treating hypoglycemia while patients are admitted.

Diabetes is the eight-leading cause of death in the United States and accounts for over 100,000 deaths annually Centers for Disease Control and Prevention (CDC) in 2021. A recent study stated that more than 8 million hospital stays related to diabetes (Type 1 and Type 2) in 2018. Fifty percent of the hospital stays were between the ages of 65 to 84, and 39% of the eight million stays were African Americans. In general, the most common complication of diabetes among admitted hospital patients is hypoglycemia. Hypoglycemia can lead to severe complications such as cardiovascular disorders, cerebrovascular disorders, and an increased mortality rate. Hypoglycemia causes physiologic effects, which can induce cardiac arrhythmias and increase the risk of ischemic brain damage (Yun et al., 2019). A recent study conducted on diabetic patients found that patients who experienced hypoglycemia during a hospital admission had an increase in healthcare costs of over 30%. Also, patients experienced an increase in average length of stay of 3 days (Pratiwi et al., 2022). Severe hypoglycemia is classified as BG levels of 50mg/dl or below and is associated with an increased mortality and increased hospital readmissions (Kadayakkara et al., 2019).

Currently, at a hospital located in Los Angeles County, there has been an increase in non-compliance to a hypoglycemia protocol in the medical-surgical oncology unit. The Director of Staff Education, Diabetic Clinical Nurse Specialist, and Department Administrators have sought to identify reasons for non-compliance to be able to address it. There are five key themes associated with nurse non-compliance, which include workplace environment, staffing, resources, management, and individual nurse factors (ex-confidence, knowledge, experience, education, and self-image). The hospital team believes that nurse factor plays a role in the non-compliance with the hypoglycemia protocol. Thus, the project will utilize escape rooms to educate the nurses on the hypoglycemia protocol, knowledge is one of the nurse factors that will be addressed in the project.

Statement of the Problem

The lack of compliance to the existing protocol has resulted in several events of prolonged patient hypoglycemia, hyperglycemia, and increased hospital stays.

Purpose Statement

The purpose of this Doctor of Nursing Practice (DNP) project is to educate direct observation unit nurse staff on hypoglycemia treatment protocol by utilizing simulation to increase nurse compliance to hypoglycemia protocols.

Supporting Framework

Practice change requires thoughtful planning and adequate preparation. Framework aids us in determining the best technique and strategies to use in a given situation based on what we're seeking to learn. The supporting framework used for this project is the Iowa Model of Evidence Based Practice ([Iowa Model] see Figure 2). The University of Iowa developed the Iowa Model in the early 1990s to provide a guide for nurses to use research findings to improve patient care (Iowa Model Collaborative et al., 2017). In 2017, the Iowa Model Collaborative was formed to improve and revise the Iowa Model (Hanrahan et al., 2019). This widely used framework has been utilized successfully in many hospital quality improvement projects. The Iowa Model promotes implementation of evidence-based practice for improving patient outcomes (Iowa Model et al., 2017).

The Iowa Model framework consisted of seven steps. The initial step was identifying an issue that was either problem focused, or knowledge focused on which a practice change was needed. The 2nd step is to determine if the issue identified is a priority for the organization or unit (Tilter et al., 2001). The 3rd step is to form a team. The team is responsible for evaluating, developing and, implementing the necessary changes for using an evidence-based practice. When forming a team, there should be a multidisciplinary approach to gather stakeholders and healthcare providers from a variety of disciplines. This will ensure that multiple perspectives are integrated into the practice change. The fourth step in the Iowa Model is to develop a research question following the PICO(T) method (Tilter et al., 2001). The team should first collect and appraise articles that are related to the desired change. Next, the team will critique the research to determine if the changes are research based (Titler et al., 2001). The sixth step involves analyzing and deciding if there is enough research to implement a practice change. If yes, then the researcher moves on to step seven. The final step entails implementing a practice change by way of a pilot program. Once the pilot program is completed, results will be evaluated to determine if the practice change can be adopted throughout the hospital (Titler et al., 2001)

Integration of Iowa Model

In this project, there were two triggering issues. The first issue was nurse non-compliance with hypoglycemia protocols. The hospital clinical nurse specialist along with the direct observation unit manager defined non-compliance as not following all the steps of the protocol. The department leaders determined non-compliance was associated with lack of knowledge and staffing shortages based on feedback from the staff nurses. The second issue was an increase in hypoglycemic events occurring on the direct observation unit from January 2021 through January 2022. These issues are considered knowledge-focused triggers since they can be resolved by providing new information to the nurses to increase their knowledge regarding hypoglycemia treatment. The next step is confirming the triggers are a problem for the unit and the medical center. Due to the increase in hypoglycemic events and the inconsistent implementation of treatments for hypoglycemia by the nurses, department leaders identified the need to address this. The department leaders requested assistance in identifying the barriers, and resolutions to increase compliance. Having stakeholders involved is essential to the success of the project. The team involved in this project includes Department Administrator, Diabetic Clinical Nurse Specialist, an informatics Practice Specialist, a research liaison, and a direct

observation unit-based team (UBT). The team will review the current hypoglycemia protocols. Next the team will gather evidence-based practice research related to improving nurse compliance. The team will formulate a PICO(T) question and complete a literature review based on concepts related to hypoglycemia. The PICO(T) question for this project will be, Will educating direct observation unit nurse staff on hypoglycemia treatment by utilizing simulations, increase nurse compliance to hypoglycemia protocols? Following the literature review, the team will critique and synthesize the research gathered. The team will also gather data by completing chart reviews.

Team members will be assigned to review charts on all diabetic patients admitted on the direct observation unit for a period of two months. When completing chart reviews, identify if patient experienced hypoglycemia, and document if the nurse treated the patient following the approved protocols. Designing the pilot program will be the next task for the team for the purpose of implementing hypoglycemia treatment protocols. All team members will be utilized to create an in service focused on hypoglycemic protocols. Piloting the practice change will be the next step. The pilot will involve educating staff by way of a simulation. A simulation will be held weekly in the month of September, in order to capture all nurses in the direct observation unit. Lastly, the results of the pilot will be evaluated to determine if staff education on diabetes protocol increased nurse compliance through education. Team members will again complete chart reviews for two months, focusing on hypoglycemia, and nurse compliance of the protocol. The results of the second chart audit will dictate if the simulation education can be adopted in other hospital units.

In conclusion, this quality improvement project will integrate the Iowa model to identify best practices for increasing nursing compliance. The team will design and implement education on the selected participants. The project will evaluate the effectiveness of the simulation.

Review of Literature

Overview

A literature review was conducted to obtain research articles discussing hypoglycemia protocols in an inpatient hospital setting. Conducting a literature review is critical for generating research ideas and determining how research can increase knowledge. The databases utilized to conduct the review of literature included: PubMed, EBSCO, and CINAHL. The search terms included: hypoglycemia, interventions, treatment, therapy and inpatient or hospitalized. Inclusion criteria included peer reviewed articles published from 2017 to 2022, written in English, inpatient settings, and with study participants who were 18 years or older.

A second literature search was conducted to identify the effects of education on nurse compliance of hospital protocols. The databases utilized were CINAHL, EBSCO, PubMed, and Google Scholar. The search was limited to peer-reviewed articles written in the English language, published from 2017 to 2022, adults 18 years or older, and inpatient settings. Key terms included: education, protocols, guidelines, policies, procedures, adherence, and compliance.

To retrieve and identify articles related to the benefits of utilizing simulations in education, a third literature review was conducted. The databases utilized for this search were PubMed and CINAHL. The initial key terms included: nursing, simulation, inpatient, hospital, and education. The initial search resulted in only yielded seven articles. The three articles were not directly related to inpatient nursing. The search was then expanded to include articles outside of nursing where simulation was utilized as a teaching method or reviewing a practice designed to increase adherence. The new search terms were healthcare, simulation, education, and interventions. The search was limited to peer-reviewed articles from 2017 to 2022.

Once completed, the total literature search yielded fifty-six articles, which were filtered to only United States research articles and excluded nursing students. Ten articles were applicable to this project. Three articles were systematic reviews, one was a retrospective study, two were cohort studies, three were cross-sectional studies, and one article was a descriptive study.

Overview of Hypoglycemia

According to research the prevalence of diabetes among adults admitted to hospitals is greater than 30%. The presence of hypoglycemia and diabetes in hospitalized patients is associated with increased risk of mortality, complications, poor patient outcomes, and increased length of stay (Araque et al., 2018). Patients who experience inpatient hypoglycemia have an increased mortality rate of 6.8%, compared to diabetic patients who do not experience hypoglycemia (Yun et al., 2019). Patients with diabetes have an increased LOS up to six times greater than patient without diabetes. When diabetic patients experience inpatient hypoglycemia, their LOS increases by three days (Pratiwi et al., 2022). Hypoglycemia is demonstrated to cause poor health outcomes such as renal impairment, cognitive dysfunction, and cardiovascular disease (CDC, 2020).

Hypoglycemia is characterized by signs and symptoms, which include anxiousness, irritability, confusion, weakness, dizziness, and clamminess (Umpierrez & Pasquel, 2017). A diagnosis of hypoglycemia is confirmed by blood tests, which assess a patient's BG level. A BG result of 70mg/dl or below is considered hypoglycemic. Severe hypoglycemia is BG level below 50mg/dl. A diagnosis of severe hypoglycemia increases the risk of mortality in hospitalized diabetic patients (Kadayakkara et al., 2019). Management of BG levels and reduction of hypoglycemic events has become essential to inpatient quality of care.

Hypoglycemia Protocol

Inpatient hypoglycemia is predictable and preventable. Support from hospital leaders and staff to create protocols targeted to provide safe diabetic patient care is essential in decreasing this condition (Cruz et al., 2017). Useful tools to prevent inpatient hypoglycemia include standardized nursing protocols, designated patient meal delivery, standardized insulin medication order sets, and standardized point of care tests (POCT). Implementation and utilization of inpatient hypoglycemic protocols are associated with decreased incidences of hypoglycemia, and improved BG control (Ilcewicz et al., 2019). According to all studies obtained, the key elements of hypoglycemia protocols was first identifying the patient's BG level by utilizing POCT. If a patient has a BG level below 70mg/dl, then the patient is treated with 15g-20g of carbohydrates. The patient should be rechecked for their BG level 15 minutes after providing the carbohydrates. This is known as the "15/15 rule" (ADA, 2020; Destree et al., 2017). The nurse will repeat this cycle until the patient's BG level increases above 80mg/dl. Nurses should seek alternative treatments in the event the patient cannot receive oral medication (ADA, 2020; LeRoith et al., 2019). An example would be intravenous dextrose. Following any hypoglycemic event, nurses are required to document every step of the hypoglycemic event, and the outcome of the event (Destree et al., 2017). This is to ensure that there is documentation for continuity of care.

Nursing Compliance

Non-compliance with hypoglycemia protocols among nurses was a theme identified in the research. According to Abusamaan et al. (2020), there is low compliance to repeat BG level POCT 15 minutes following hypoglycemic events. The study demonstrated the nurse average time to repeat BG level POCT was 49 minutes. Only 14% of nurses adhered to the 15-minute repeat rule documented in the hypoglycemia protocol (Abusamaan et al., 2020). One study showed there was a hyperglycemia protocol created to manage BG levels between 70mg/dl to 180mg/dl (Ilcewicz et al., 2019). The study examined utilization of inpatient nurse hyperglycemia protocol with physician order sets. According to Ilcewicz et al. (2019) implementation of an inpatient protocol, decreased the incidence of hypoglycemia. To improve management response to hypoglycemic events, Araque et al. (2018) investigated the effectiveness of system-based interventions. The results of the study demonstrated that implementation of nurse protocols significantly decreased hypoglycemic events. After implementing the inpatient protocol, the time from hypoglycemic event to normal blood sugar (euglycemia) reduced from 46 minutes to 26 minutes (Araque et al., 2018). These studies demonstrate the importance of nurse compliance with the hypoglycemic protocol in improving BG levels. The methods for delivering education will be discussed in the following section.

Simulation Research

Simulations have been widely used in the medical field since they provide hands-on experience with techniques, procedures, and protocols designed to improve nursing skills. According to a 2017 study by Alanazi et al., healthcare practitioners who employ simulation in the classroom have significantly enhanced students' knowledge, abilities, and self-confidence. Tong et al. (2022) performed a meta-analysis to ascertain the efficacy of high-fidelity simulation among undergraduate nursing students. The findings of this study show that high-fidelity simulation helps develop nursing students' knowledge, abilities, cooperation, and compassion. In a 2017 study, Lutgendorf et al. used simulation-based training to increase participants' understanding of postpartum hemorrhage. The outcomes show that participants feel more confident handling obstetric crises after receiving in-person simulation training. This result

confirms earlier studies that found adult learners recall information better from practical experiences than from listening to lectures.

Summary

The literature review yielded research articles and quality improvement projects focused on diabetes, hypoglycemia, management of inpatient hypoglycemia, and implementation of hypoglycemia nurse protocols (Cruz et al., 2017). The literature review identified the complications of inpatient hypoglycemia. Furthermore, interventions were identified to successfully manage hypoglycemia. Specifically, when nurses adhered to hypoglycemia protocols there was a decrease in time to treat repeat BG POCT and decrease the number of hypoglycemic events (Abusamaan et al., 2020).

The review of literature provided an outline to interventions that increase nurse knowledge using simulation. Current evidence supports the necessity of nurse hypoglycemia protocols, and the use of simulation training to increase knowledge. This project will focus on developing a simulation to increase knowledge of inpatient hypoglycemia protocol, which will lead to an overall increase in nurse compliance.

Methods

This quality improvement project aimed to increase nurse compliance to the hypoglycemic protocol by designing, implementing, and evaluating a simulation. The hypoglycemic protocols were utilized by all nurses on the direct observation unit in the event a patient became hypoglycemic. However, there was no standard education for nurses to teach them how to implement the protocol.

Setting

The project took place at a 218-bed hospital on a direct observation unit, which contained 32 beds located in Los Angeles, California. There were 29 rooms in the unit. Three of the rooms had 2 beds to accommodate double occupancy. The unit averaged 30 patients daily. There were 50 nurses, and 4 charge nurses who worked the direct observation unit. Each shift had seven to eight nurses on the unit, and 1 charge nurse. The department was open 24 hours per day, 7 days per week. Nurses were assigned to work either 12.5-hour day shift from 7:00am to 7:30pm or 12.5 hours night shift from 7:00pm to 7:30am. The education was implemented in the hospital conference room. The conference room was one large room which held up to 50 people.

Participants

The participants for the project were all direct observation unit staff nurses, and charge nurses. Float nurses and traveling nurses were excluded from the project since they did not receive the education. The nurses who participated in the project have bachelor's degrees of science in nursing or master's degrees of science in nursing. The years of work experience ranged from 2 years to 20 years. Eighty two percent of the participants were female, and 18% of the participants were male. The nurses ages varied from 28 years old to 54 years old. The average age of the participants was 41 years old. There were several ethnic groups represented by the participants: Asian, African, Latin, and White. The largest represented group was Asian (80%), with most participants identify as Filipino (96%).

Ethical Considerations

The organization's Chief Nursing Officer, Diabetes Clinical Nurse Specialist, and direct observation unit manager approved the implementation of the project (Appendix A). The project was submitted to the Institutional Review Board at both the hospital and California State University, Los Angeles for approval to ensure the project meets the ethical standards outlined by the respective organization prior to implementation of the project. Consents were not required for this project as there were no patients included in the project and the education was part of the annual competency requirements. Baseline data was collected and identifying patient and staff information was removed.

Design

This quality improvement project utilized pre and post evaluation design guided by the Iowa model to implement the simulation education. Data was collected for two months prior to the simulation. The simulation took place in the unit, in which data was collected for two months. Data was analyzed to determine if project was successful.

Project Implementation

The hospital's diabetes Clinical Nurse Specialist advised on the hypoglycemia protocol education which was based on the previous year's data showing nurse non-compliance, and delayed patient treatment times. The project author submitted a proposal to the direct observation unit manager, and the hospital's Chief Nurse Executive for hypoglycemia protocol education. The proposal included data displaying the current problem, simulation design plans, along with goals of implementation of the education on the direct observation unit. The procedures for

developing, implementing, and evaluating the hypoglycemic protocol education were outlined in the following section.

Step One

The author of this project requested retrospective data from the Data and Analytics Department. The data obtained was for the months of July 2022 and August 2022. Specification for the report included all patients who stayed on the direct observation unit either through inpatient admission or observation. Patients included those who had an active problem list diagnosis of diabetes prior to admission or hospital problem diagnosis of DM during their stay. The aggregate report contained several data points: the number of hypoglycemic events patients experienced during their stay, A1c level, creatinine level, Glomerular Filtration Rate (GFR), POCT, and diet order. Additionally, data was gathered regarding the average time it took for a repeat BG test to be taken after hypoglycemic reading. The target was for the BG test to be taken within 25 minutes of the patient experiencing hypoglycemia. The data was reviewed to identify areas of concern.

Step Two

The author collaborated with the department manager, clinical nurse specialist and the direct observation Unit Based Team (UBT) to design an educational tool, which focused on the hypoglycemia protocol. The team completed a literature search to identify best options for implementing nurse education. The team utilized a simulation to educate nurses on the hypoglycemic protocol. The simulation education was designed to increase nurse knowledge, increase skills, and improve communication (Adams et al., 2018). The team utilized evidence-based practices from previous diabetic training studies to create the simulation for the present project. Eukel et al. (2017) reported a significant increase in knowledge following the completion of an educational training that involved simulations.

The team prepared for participation by reviewing the current hypoglycemic protocol. The curriculum was designed to meet the learning outcome goals which included decreased hypoglycemic events, increase in POCT orders for patients, and decreased time to next BG reading following hypoglycemic events. After completing the curriculum, the author collaborated with the team to create the scene and setting for the simulation.

The hospital conference room was designated as the space to implement the project. The group of participants individually read the case study and simulated treating the patient based on their understanding of the case study. Participants had 15 minutes to complete the simulation. Afterwards, the participants answered questions related to diabetes and the case study. Based the participants implementation of the case study, if the participant did not complete the protocol within the allotted time, their mannequin patient could potentially succumb to side effects of hypoglycemia such as a diabetic coma, and/or hyperglycemia (ADA, 2021). Supplies utilized in the simulation included patient mannequin, hospital bed, glucometer, nutritional items (orange, apple, and cranberry juice, milk, sugar free jello, sugar packets, sweet and low packets, and diet cola), medication (IV dextrose 50, glucose gel). The Clinical Nurse Specialist assisted by observing staff during simulation.

Step Three

The simulation implementation took place in the hospital conference room (see Appendix B for schematic of the simulation), during the department scheduled annual competency training. All nurses on the direct observation unit attended one education session to meet requirements for their annual competency. The simulation was implemented for two weeks in from September 18, 2022, to September 29, 2022. Educational sessions occurred three days per week, from 9:00am

to 12:00pm each day to capture all direct observation unit staff. Participants had the option to choose their educational session times. These options were included to accommodate all staff including night shift, day shift, full time, and part time employees. All sessions were scheduled for 25 minutes.

Prior to beginning each simulation session, a pre-brief was conducted to explain the simulation, and answer questions the staff may have had. During this time participants were also required to complete an annual glucometer recertification. Standardized educational material were provided to ensure there was no variation in the education provided to the participants. Groups of 5-8 nurses were included in each simulation. Participants were asked to read a case study and were provided the necessary supplies for the simulation. A 15-minute timer was used to track the completion time of the simulation. Once all participants completed the simulation or the time had expired, participants were debriefed to evaluate their experience. The author and department manager monitored direct observation unit staff rosters to ensure all eligible nurses completed the simulation.

Step Four

Following completion of the simulation implementation, the author requested retrospective data from the months of October 2022, November 2022 and December 2022. The author obtained the data from the Data and Analytics department. The author requested a list of direct observation unit nurses who completed the simulation from direct observation unit department manager and Education and Training department Project Manager.

Data Management and Collection

All relevant data for this project was pulled from the Electronic Medical Record (EMR). The EMR was utilized by all nurses when caring for hospitalized patients. The Data and Analytics teams utilized software called Clarity to pull data from the EMR. The author provided the Data and Analytics department a list of requested specifications for this project. The data was exported to an Excel spread sheet. The author filtered the data to review only the data from the direct observation unit. The data was also filtered for the project's pre and post implementation months of the simulation. The hospital Education and Training department managed data detailing nurse completion of the annual competency. The data was collected by project managers who utilized Excel spreadsheets. The author received all requested data and reviewed it with the team. All patient and nurse data were de-identified and stored in a password-protected hospital computer.

Data Analysis

Descriptive data analysis was conducted to examine the prevalence of hypoglycemic events in the Direct Observation Unit. Nurse utilization and compliance with the hypoglycemia protocol was examined as well. The grouping approach was used to evaluate nominal data. The variables were sorted into groups, and the frequency or percentage was determined for each category. To assess the data, the author used a pie chart. A chi-squared test was used to determine the relationship between the pre and post data. The purpose of the chi-squared test was to see if there was a significant discrepancy between the expected and observed frequency of the provided values (Schober & Vetter, 2019). The author utilized an Excel spreadsheet to review the collected data.

Evaluation

Following the implementation of the simulation a complete evaluation of its efficacy was conducted. The main purpose of the simulation was to increase adherence to the hypoglycemic protocol. Failure to follow the protocol increased the risk of persistent hypoglycemia in the patients. Three months of pre and post intervention data were collected. All data relating to hypoglycemia was obtained and de-identified from the hospital's EMR. Data on the completion of the simulation by staff nurses were collected.

The quality improvement project was implemented in the direct observation unit to increase nurse compliance to the hypoglycemia protocol. Simulation was utilized to increase nurse knowledge of the hypoglycemia protocol. All direct observation unit nurses and charge nurses were required to complete the simulation as it was required for their annual competency per their department manager. De-identified pre and post data was obtained to evaluate the effectiveness of the simulation, and nurse compliance to the hypoglycemia protocol.

Results

The project's first stages were finished in two weeks, from September 18, 2022, and finished on September 29, 2022. There were 46 direct observation unit nurses who took part in the project and completed the simulation training. The patient records of those admitted to the DOU between October 1, 2022, and December 31, 2022, were reviewed. All patients with a diagnosis of diabetes, who were admitted to the DOU were monitored for hypoglycemic events. Demographics of the patient population are listed (Appendix F)

Baseline data collection took place during quarter one of 2022, which was January 1, 2022, to March 31, 2022. There was a total of 37 patients admitted with DM into the DOU. Twelve of the 37 patients experienced hypoglycemic events (Table 1). Most patients were male (58%). The ages of patients ranged from 22 to 94, average age of 65. There were 23 total incidences of hypoglycemia. Hypoglycemic blood glucose levels ranged from 40 to 66. The average BG level was 53. Post-implementation data from quarter four of 2022, which was October 1, 2022, to December 31, 2022. During this time, there was an increase of hypoglycemic events with 50 patients being admitted with DM. During quarter four, 18 patients experienced hypoglycemia while in the DOU. Most patients were female (12). The patients' ages ranged from 26 to 85, and average age of 63. There was a total of 34 incidences of hypoglycemia. BG levels ranged from 43 to 66. The average BG level was 63 post implementation of simulation education.

There was an increase in the incidence of hypoglycemic events post implementation, in quarter four, which was 34 when compared to 23 in quarter one. However, compliance with the hypoglycemia protocol was slightly higher in quarter four at 41.2%, whereas in quarter one the compliance rate was 39.1%. The data also showed that of the 37 patients who were admitted with a diagnosis of DM to the DOU in quarter one, 32% of patients experienced hypoglycemia within 24 hours of admission. In quarter four, there were 50 patients admitted with DM, and 38% of those patients experienced hypoglycemic events within 24 hours of admission.

Data Analysis

The average of the observations for Post Hypoglycemic Compliance data was 0.41 (SD = 0.50, SEM = 0.09). The average of the observations for Pre-Hypoglycemic Compliance data was 0.41 (SD = 0.50, SEM = 0.11). The average of the observations for Post 24 Hours Hypoglycemic data was 0.55 (SD = 0.51, SEM = 0.09, M). The average of the observations for Pre 24 Hours Hypoglycemic data was 0.55 (SD = 0.51, SEM = 0.11). Table 2 contains the summary statistics.

A two-tailed paired samples *t*-test was conducted to examine whether the mean difference between the Pre-Hypoglycemic Compliance data and the Post Hypoglycemic Compliance data was significant. The result of the two-tailed paired samples *t*-test was not significant ($t(20) = 0.53, p = .605$). The results are presented in Table 3. A bar plot of the means is presented in Figure 3.

Discussion

This DNP project aimed to improve hospital hypoglycemia protocol adherence to ADA practice guidelines. Non-compliance with the hypoglycemia protocol is expensive and has a negative impact on patient outcomes, resulting in increased LOS, complications, and high mortality risk (Araque et al., 2018). This quality improvement project implemented diabetes education with DOU nurses using a simulation intervention. The simulation was conducted for two weeks. During the simulation, DOU nurses were instructed on the steps of the hypoglycemia protocol, glucometer use, and hypoglycemia treatment. Data was gathered, aggregated, and presented in charts and bar graphs. The information was gathered through a chart review of the patients's EMR. Baseline data was pulled for three months (January 22-March 22), and post-implementation of education was pulled for three months (October 22-December 22).

When pre and post data were compared, there were no significant differences in hypoglycemia protocol adherence. However, the occurrence of hypoglycemia increased during this time, and there was a slight increase in compliance after simulation education was implemented. Moreover, as shown in Table 1, patients admitted to the DOU with a diagnosis of diabetes increased, perhaps explaining why the occurrence of hypoglycemia increased. The diabetes simulation education reminded DOU nurses to assess their patients after hypoglycemic events upon admission, provide interventions such as carbohydrate snacks and medication, reevaluate, and document activities.

Although results of the project did not improve compliance significantly, the data identified areas of concerns. Results show that majority of patients admitted with the diagnosis of DM were likely to experience hypoglycemia within the first 24 hours of their admission. This finding was true for patient in both the pre and post intervention, in which there was a lack of nutrition provided in the emergency department prolonged wait times for inpatient beds, and improper diet overall prior to arriving at the ED. Data also identified that patients were experiencing multiple episodes of hypoglycemia while being admitted. This could be a result of prolonged wait times, lack of access to medication, improper nutrition during hypoglycemic events and non-compliance to hypoglycemia protocol

Recommendations

The goal of this DNP project was to improve DOU nurse adherence to the hypoglycemia protocol. The goal was to integrate DM education through simulation into the daily practices of DOU nurses. While the initial reports did not show significant improvement in nurse compliance when comparing pre and post data. The author identified that changes to current workflow would be required, particularly for DM patients admitted within the first 24 hours. The author also identified the need for more nurse education specific to non-pharmacologic options of treating hypoglycemia. To develop the new protocol, the author collaborated with the department leader, CNS, and diabetes research team (See Figure 4 for new protocol).

The first step of the protocol is the identification of DM patients, ensuring diet and glucose monitoring orders are placed immediately upon admission to the unit, as well as to provide the nurse with specific instructions on how to treat hypoglycemia, and maintaining standard documentation for all hypoglycemic events. A poster was also created showing carbohydrate options available in the nutrition room that can be given to patients during hypoglycemic events (see Figure 5). The chart provides nurses with information on how many carbohydrates are required to raise BG during a hypoglycemic event. Recommendations include reinforcing diabetes education during annual training, collecting compliance reports at least twice a year, and assigning diabetes champions to assist staff as needed

Limitations

This quality improvement project had numerous constraints. The simulation education could only be implemented for two weeks by the author. This prohibited the training of travelers and registry nurses, who at the time, were working on the unit and providing patient care without knowledge of the hypoglycemia protocol. Also, longer implementation of the simulation education was required to effectively assess the effect it would have on increasing compliance with the hypoglycemia protocol. When reviewing year-to-date January 2023 through March 2023 data for nurse hypoglycemia compliance, there was a 49% compliance rate, which higher than the previous three months of compliance with a rate of 41% in October, November, and December.

The facility in which the project took place experienced staff shortages following the implementation of simulation training, which were attributed to an increase in COVID-19, increased sick calls, flu season, vacations, and holidays. As a result, managers hired more traveler nurses, who then never received the simulation education.

Conclusions

The goal of this DNP project was to educate direct observation unit nurse staff on hypoglycemia treatment protocols through simulation to increase nurse compliance with hypoglycemia protocols. According to the DOU department leaders, a lack of adherence to the existing protocol resulted in several instances of patients being in a state of prolonged hypoglycemia, hyperglycemia, and increased hospital length of stay. Patients who experienced hypoglycemia during a hospital stay had a 30% increase in healthcare costs and a 3-day increase in their average length of stay.-All DOU nurses received the simulation education for two weeks. Following project completion results showed that post-hypoglycemia compliance was not statistically significant.

Although this project did not produce the desired results, the author believed that the project will be successful in the future if it is extended for a longer period. More importantly, discovery of increased hypoglycemic episodes during the first 24 hours of admission has been noted and may enhance future management of these patients. Finally, a new protocol has been drafted (Figure 4) and will be reviewed and implemented by RNs this year.

References

- Abusamaan, M. S., Klonoff, D. C., & Mathioudakis, N. (2020). Predictors of time-to-repeat point-of-care glucose following hypoglycemic events in hospitalized patients. *Journal of Diabetes Science and Technology*, *14*(3), 526–534.
<https://doi.org/10.1177/1932296819883332>
- Adams, V., Burger, S., Crawford, K., & Setter, R. (2018). Can you escape? Creating an escape room to facilitate active learning. *Journal for Nurses in Professional Development*, *34*(2), E1–E5. <https://doi.org/10.1097/NND.0000000000000433>
- Araque, K. A., Kadayakkara, D. K., Gigauri, N., Sheehan, D., Majumdar, S., Buller, G., & Flannery, C. A. (2018). Reducing severe hypoglycemia in hospitalized patients with diabetes: Early outcomes of standardized reporting and management. *BMJ Open Quality*, *7*(2), e000120. <https://doi.org/10.1136/bmjopen-2017-000120>
- Centers for Disease Control and Prevention. (2023, April 24). *What is diabetes?*. Centers for Disease Control and Prevention. <https://www.cdc.gov/diabetes/basics/diabetes.html#:~:text=Diabetes%20is%20the%20eighth%20leading,limb%20amputations%2C%20and%20adult%20blindness>.
- Cruz, P., Blackburn, M. C., & Tobin, G. S. (2017). A systematic approach for the prevention and reduction of hypoglycemia in hospitalized patients. *Current Diabetes Reports*, *17*(11), 117. <https://doi.org/10.1007/s11892-017-0934-8>
- Destree, L., Vercellino, M., & Armstrong, N. (2017). Interventions to improve adherence to a hypoglycemia protocol. *Diabetes Spectrum: A Publication of the American Diabetes Association*, *30*(3), 195–201. <https://doi.org/10.2337/ds16-0042>
- Eukel, H. N., Frenzel, J. E., & Cernusca, D. (2017). Educational gaming for pharmacy students - design and evaluation of a diabetes-themed escape room. *American Journal of Pharmaceutical Education*, *81*(7), 6265. <https://doi.org/10.5688/ajpe8176265>
- Hanrahan, K., Fowler, C., & McCarthy, A. M. (2019). Iowa model revised: Research and evidence-based practice application. *Journal of Pediatric Nursing*, *48*, 121–122. <https://doi.org/10.1016/j.pedn.2019.04.023>
- Hypoglycemia (Low Blood Glucose) | ADA. (2022.). Retrieved on February 12, 2022, <https://diabetes.org/healthy-living/medication-treatments/blood-glucose-testing-and-control/hypoglycemia>
- Intellectus Statistics. (2022). Intellectus Statistics [Online computer software]. <https://analyze.intellectusstatistics.com/>
- Ilcewicz, H. N., Hennessey, E. K., & Smith, C. B. (2019). Evaluation of the impact of an inpatient hyperglycemia protocol on glycemic control. *Journal of Pharmacy & Pharmaceutical Sciences: A publication of the Canadian Society for Pharmaceutical Sciences, Societe canadienne des sciences pharmaceutiques*, *22*(1), 85–92. <https://doi.org/10.18433/jpps30180>
- Iowa Model Collaborative, Buckwalter, K. C., Cullen, L., Hanrahan, K., Kleiber, C., McCarthy, A. M., Rakel, B., Steelman, V., Tripp-Reimer, T., Tucker, S., & Authored on behalf of the Iowa Model Collaborative (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing*, *14*(3), 175-182. <https://doi.org/10.1111/wvn.12223>
- Kadayakkara, D., Balasubramanian, P., Araque, K., Davis, K., Javed, F., Niaki, P., Majumdar, S., & Buller, G. (2019). Multidisciplinary strategies to treat severe hypoglycemia in hospitalized patients with diabetes mellitus reduce inpatient mortality rate: Experience

- from an academic community hospital. *PloS one*, 14(8), e0220956.
<https://doi.org/10.1371/journal.pone.0220956>
- Lutgendorf, M. A., Spalding, C., Drake, E., Spence, D., Heaton, J. O., & Morocco, K. V. (2017). Multidisciplinary in situ simulation-based training as a postpartum hemorrhage quality improvement project. *Military Medicine*, 182(3). <https://doi.org/10.7205/milmed-d-16-00030>
- Pratiwi, C., Mokoagow, M. I., Made Kshanti, I. A., & Soewondo, P. (2022). The risk factors of inpatient hypoglycemia: A systematic review. *Heliyon*, 6(5), e03913.
<https://doi.org/10.1016/j.heliyon.2020.e03913>
- Schober, P., MMedStat, V., Thomas, R., & MPH† Chi-square Tests in Medical Research, Anesthesia & Analgesia: November (2019) - Volume 129 - Issue 5 - p 1193.
<https://doi:10.1213/ANE.0000000000004410>
- Titler, M. G., Kleiber, C., Steelman, V. J., Rakel, B. A., Budreau, G., Everett, L. Q., . . . Goode, C. J. (2001). The Iowa Model of Evidence-Based Practice to Promote Quality Care. *Critical Care Nursing Clinics of North America*, 13(4), 497-509.
- Tong, L. K., Li, Y. Y., Au, M. L., Wang, S. C., & Ng, W. I. (2022). Prebriefing for high-fidelity simulation in nursing education: A meta-analysis. *Nurse Education Today*, 119, 105609. <https://doi.org/10.1016/j.nedt.2022.105609>
- Yun, J. S., Park, Y. M., Han, K. . (2019). Severe hypoglycemia and the risk of cardiovascular disease and mortality in type 2 diabetes: a nationwide population-based cohort study. *Cardiovasc Diabetol* 18, 103 <https://doi.org/10.1186/s12933-019-0909-y>

Appendix A
Medical Center Approval Letter
Institutional Approval Letter

04/27/2022

This letter is to show that, I Maria Ngugi as the nursing champion of the Inpatient Diabetes Management Program at Kaiser Permanente Panorama City Medical Center give permission to Kenyatta D Irvin to conduct the project titled *Increase Nurse Compliance to Hypoglycemia Protocol* on the following unit(s) Medical -Surgical Oncology Unit (4-West)

Upon obtaining all necessary clearances from the 4-West Department Manager, Inpatient Nurse Leader, and Chief Nurse Executive at Kaiser Permanente Panorama City Medical Center, and after obtaining the necessary IRB determination/approval, the above-named project lead is allowed to:

- (1) collect data (pre and post data with demonstrates compliance to hypoglycemia protocols
- (2) access necessary documents/data
- (3) conduct necessary interactions with staff/patients relevant to their project
- (4) Implement project utilizing escape room

The project lead is responsible for ensuring that all activities related to conducting the project are in compliance with the policies that govern practice, HIPPA, and research and research-related regulations at Kaiser Permanente Panorama City Medical Center and its covered entities.

If you have any questions or concerns, please do not hesitate to contact me.

Signature:



Name: Maria Ngugi

Title: Clinical Nurse Specialist

Contact Information: 818 317-3110

Appendix B
Institutional Approval Letter



Institutional Review Board
Kaiser Permanente Southern California

September 08, 2022

KP Principal Investigator(s)

Kenyatta D Irvin, MSN-KPSC - Quality Resources Management
8120 Woodman Ave.
Panorama City , CA 91402

Study Title: Increasing nurse compliance to hypoglycemia protocol (#13326)

On **09/08/2022**, a subcommittee of the Kaiser Permanente Southern California (KPSC) Institutional Review Board (IRB) reviewed and approved your new study.

In accordance with the requirements for research activities that present no more than minimal risk to subjects set forth in 45 CFR 46.110 the study referenced above qualified for expedited review under the following research category(s):

- Category 5: Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis)

Study Document(s):

Data Element_Abstraction Form Template 06/01/2022

In accordance with 45CFR 46.116, informed consent was waived by the IRB based on the following determination(s):

- The research involves no more than minimal risk to the subjects;
- The research could not practicably be carried out without the requested waiver or alteration;
- If the research involves using identifiable private information or identifiable biospecimens, the research could not practicably be carried out without using such information or biospecimens in an identifiable format;
- The waiver or alteration will not adversely affect the rights and welfare of the subjects; and
- Whenever appropriate, the subjects or legally authorized representatives will be provided with additional pertinent information after participation.

The KP Principal Investigator (PI) is required to:

- Review the document entitled HIPAA Privacy Rule Instructions for Researchers available at <http://irb.kp->

scalresearch.org/5/HIPPA_Privacy_Rule_Instructions_for_Researchers.pdf

- Submit a complete final closure report of research activities.

And if applicable,

- Submit for IRB review, modifications to the study or any IRB-approved study document(s) before they are implemented **except** when necessary to eliminate apparent immediate hazards to one or more subjects. If you determine that an immediate modification is critical to eliminate hazards to one or more subjects, you must notify the IRB within five business days of having carried out such changes to your study.
- Submit Unanticipated Serious Adverse Event report(s) according to IRB policies and procedures and consistent with federal regulations.
- Submit Protocol Violation report(s) and other Unanticipated Problem Reports according to IRB policies and procedures and consistent with federal regulations

Sincerely,

Signature applied by Isabel M Sanchez on
09/08/2022 01:01:44 PM PDT

Armida Ayala, MHA, PhD
Director
Human Research Subjects Protection Office
Institutional Review Board

Appendix C Department Approval Letter

Institutional Approval Letter

Study Title: Increasing nurse compliance to hypoglycemia protocol, ref#045742
PI Name: Kenyatta D Irvin, MSN
Medical Center Affiliation: KP Panorama City

9/3/2022

This letter is to show that I Shirley T Adriano, RN as the Department Manager of DOU at Kaiser Permanente Panorama City Medical Center give permission to Kenyatta D Irvin MSN, RN to conduct the project titled *Increase Nurse Compliance to Hypoglycemia Protocol* on the following unit(s) Inpatient Units

Upon obtaining all necessary clearances from the Department Managers, Inpatient Nurse Leader, and Chief Nurse Executive at Kaiser Permanente Panorama City Medical Center, and after obtaining the necessary IRB determination/approval, the above-named project lead is allowed to:

- (1) collect data (pre and post data with demonstrates compliance to hypoglycemia protocols
- (2) access necessary documents/data
- (3) conduct necessary interactions with staff relevant to their project
- (4) Implement project utilizing case studies and simulations

The project lead is responsible for ensuring that all activities related to conducting the project are in compliance with the policies that govern practice, HIPPA, and research and research-related regulations at Kaiser Permanente Panorama City Medical Center and its covered entities.

By signing this letter you have reviewed this application and determined the research is appropriate for conduct within KPSC, the source and amount of funds and physician time are appropriate and the needed facility space and support can be made available, without undue disruption of service.

If you have any questions or concerns, please do not hesitate to contact me.

Signature: 

Signature:

Name: SHIRLEY T. ADRIANO
DA DOU

Name:

Title: MSN, RN

Title:

Contact Information:
CELL: 818-314-2242

Contact Information:

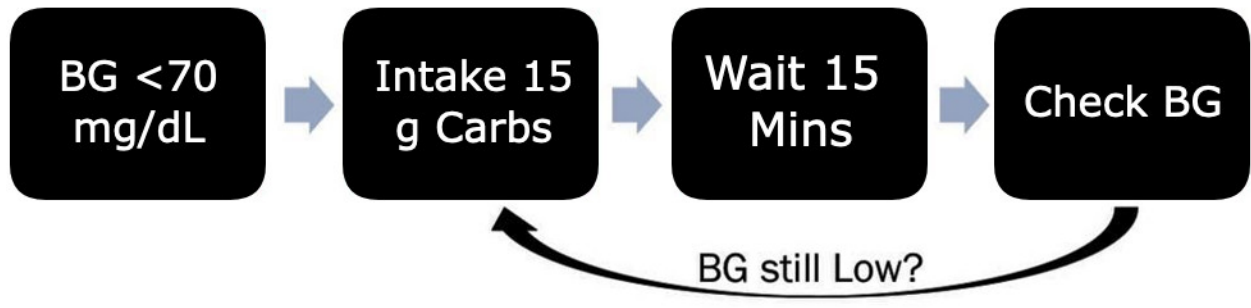
Appendix D

Figure 1: Inpatient Hypoglycemia Treatment Using the 15-15 Rule

Figure 1

Inpatient Hypoglycemia Treatment Using the 15-15 Rule

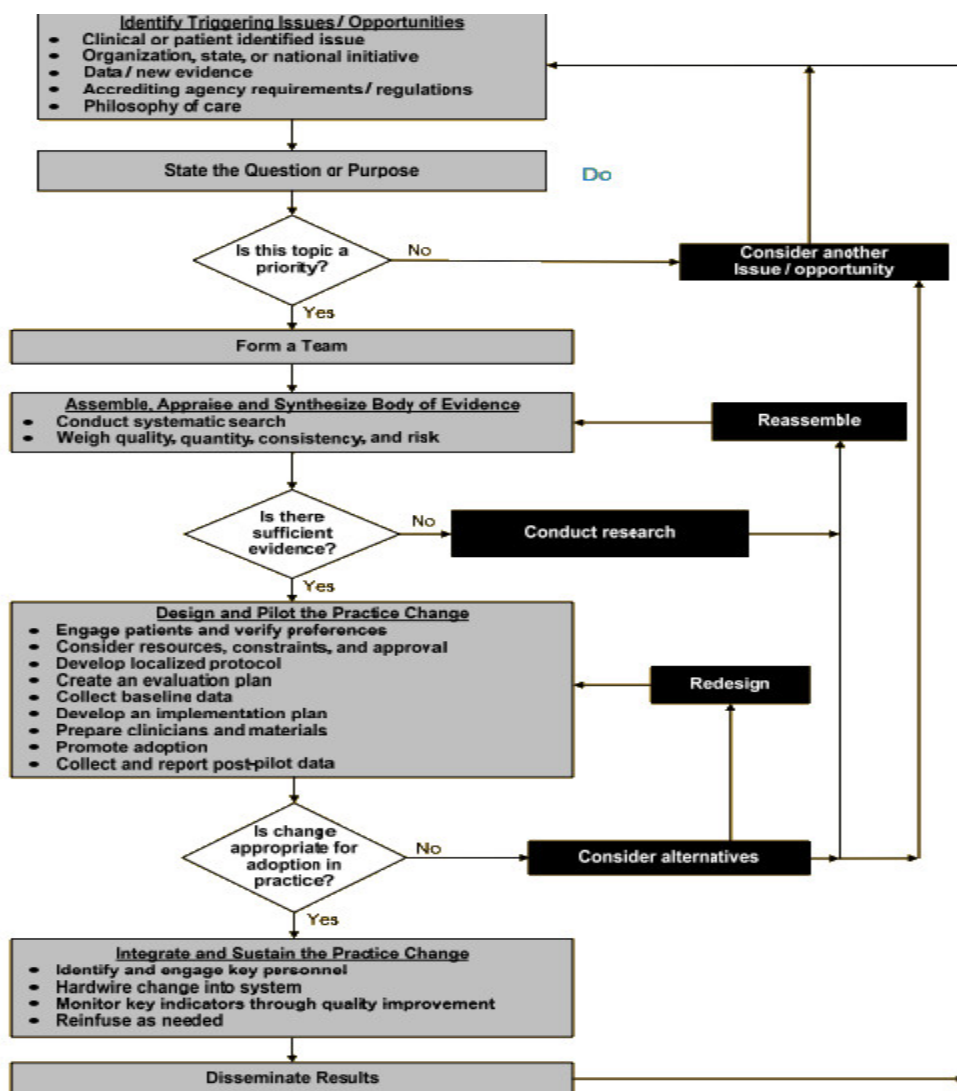
Inpatient Hypoglycemia Treatment Using the 15-15 Rule



Appendix E

Figure 2: *Iowa Model of Evidence Based Practice*

Figure 2
Iowa Model of Evidence Based Practice



Appendix F
Table 1: Patient Demographics

Table 1
Patient Demographics

Demographics	Pre-Implementation January-March 2022	Post-Implementation October-December 2022
Gender		
Male	7	6
Female	5	12
Total	12	18
Age		
Range	22-94	26-85

Average Age	64	63
Incidence of Hypoglycemia	23	34
Blood Glucose	40-66	43-66
Average BG	53	63
Patient admitted with DM dx	37	51

Appendix G
Table 2: Summary Statistics Table for Interval and Ratio Variables

Table 2

Summary Statistics Table for Interval and Ratio Variables

Variable	<i>M</i>	<i>SD</i>	<i>n</i>	<i>SE_M</i>
Post Hypoglycemic Compliance data	0.41	0.50	32	0.09
Pre-Hypoglycemic Compliance data	0.41	0.50	22	0.11
Post 24 Hours Hypoglycemic data	0.55	0.51	33	0.09
Pre 24 Hours Hypoglycemic data	0.55	0.51	22	0.11

Note. '-' indicates the statistic is undefined due to constant data or an insufficient sample size.

Appendix H

Table 3: Two-Tailed Paired Samples t-Test for the Difference Between Pre-Hypoglycemic Compliance data and Post Hypoglycemic Compliance

Table 3

Two-Tailed Paired Samples t-Test for the Difference Between Pre-Hypoglycemic Compliance data and Post Hypoglycemic Compliance

Pre-Hypoglycemic Compliance	Post Hypoglycemic Compliance
-----------------------------	------------------------------

<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	<i>d</i>
0.38	0.50	0.29	0.46	0.53	.605	0.11

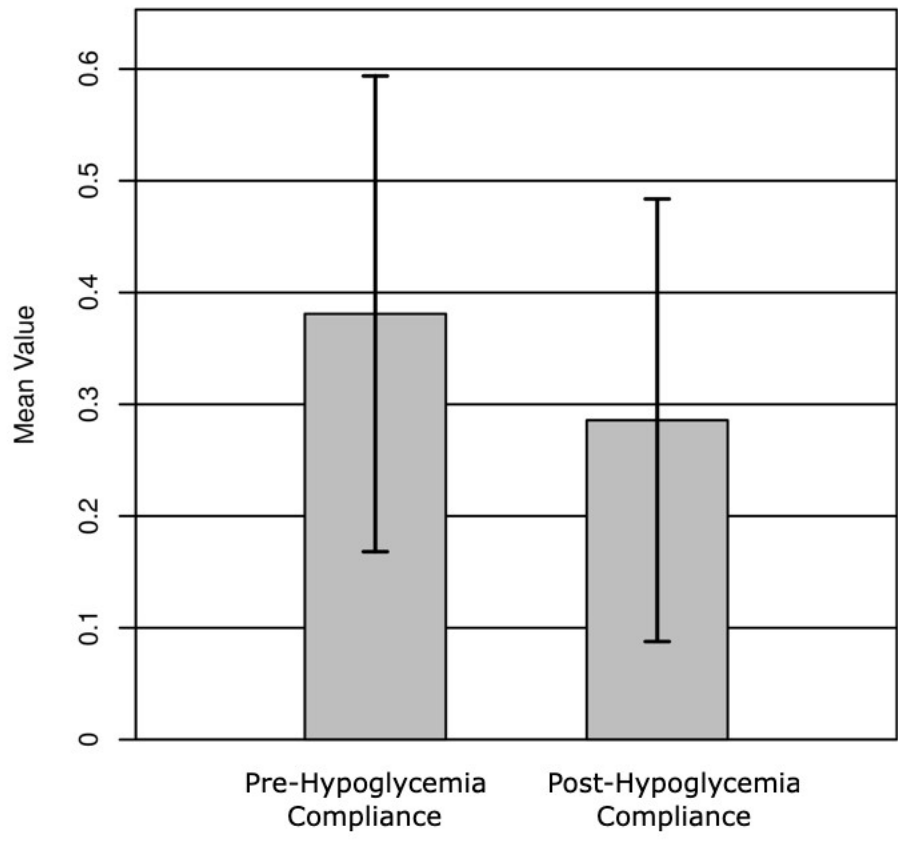
Note. N = 21. Degrees of Freedom for the *t*-statistic = 20. *d* represents Cohen's *d*.

Appendix I

Figure3: The Means of Pre/Post Hypoglycemia Data

Figure 3

The Means of Pre/Post Hypoglycemia Data



Appendix J

Figure 4: Adult Inpatient Hypoglycemia Protocol for Blood Glucose Level <70 mg/dl
Figure 4

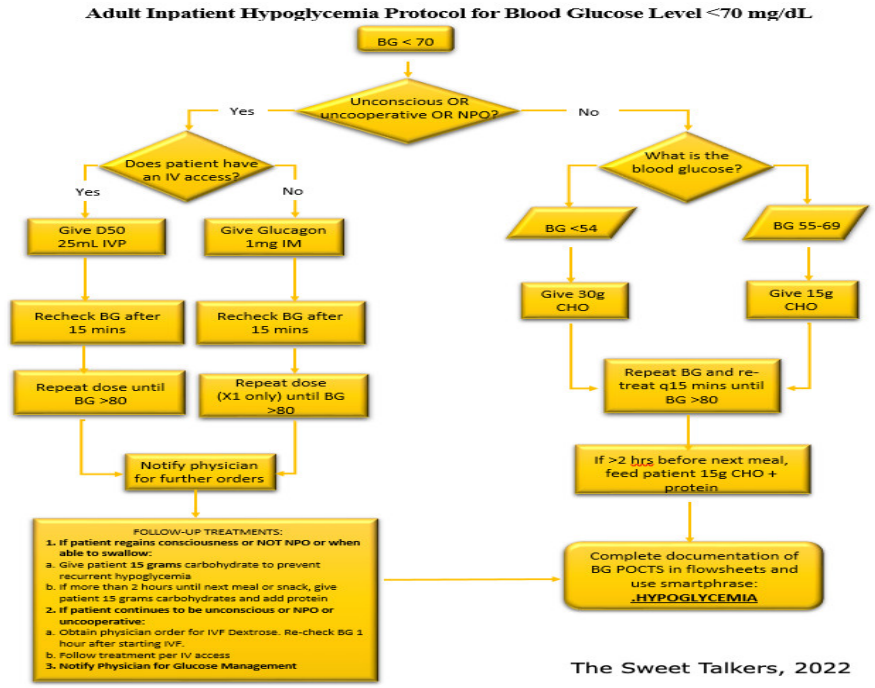











Figure 5

Appendix K
Figure 5: Got Hypoglycemia

GOT HYPOGLYCEMIA?

Every 15g of carbohydrates (CHO) will increase blood glucose by 45mg/dL in 15 mins
(Inclusion Criteria: **ALERT PATIENTS WITH ACTIVE DIET ORDER & ABLE TO EAT**)

Choose any of the following options:	
GLUCOSE < 54 mg/dL (Give 30g CHO)	GLUCOSE 55 – 69 mg/dL (Give 15g CHO)
 14 g + 16 g	 14 g 14 g 12 g
 17 g + 12 g	 CHECK CAREFULLY!!! Regular: 22g No Sugar Added: 13g
 13 g + 3 g + 14 g	 May not resemble the glucose gel available in pyxis
 14 g + 14 g	 3 g DOES NOT CONTAIN CHO <1 g 0 g
<p>The Sweet Talkers, 2022</p> <p>MILK contains fat causing delay in absorption of glucose, thus, <u>NOT</u> recommended for immediate hypoglycemia treatment.</p> 	

Appendix L Simulation Case Study

Mrs. M Case Study 1

Mrs. M is a 78 y/o female with history of CHF, HTN, hyperlipidemia, DM type 2 on insulin (last HgbA1C 9.3), and obesity. She was found confused by the caregiver. She was taken to emergency department and was found to be hypoxic and hypercapnic respiratory failure due to bilateral pneumonia.

Medications ordered:

- Acetaminophen Tab 650 mg every 4 hours as needed for mild pain 1-3
- Albuterol 2.5 mg/3 mL Neb Soln 2.5 mg every 2 hours as needed
- Atorvastatin 20 mg (Lipitor) 20 mg daily
- Benzonatate Cap 100 mg (Tessalon Perles) 100 mg every 6 hours as needed
- D50W Inj Syg 12.5 g 25 mL as needed
- Dextrose 40% Oral Gel 15 g (GLUTOSE) as needed
- Glucagon Inj 1 mg (Glucagon diagnostic Kit) 1 mg as needed
- NPH 20 units 2 times a day before meals
- Regular Sliding Scale Insulin before meals and bedtime moderate scale

Blood glucose trend and medications given:

Time	Blood Glucose Result	Treatment Given
0800	75	NPH 20 units
1130	127	
1730	109	NPH 20 units
2200	246	Regular 6 units
0200	58	

Situation:

You were answering patient's call light at 0200 and she reported feeling that something is not right. You checked her blood glucose and it was 58. Patient is alert, oriented, follows commands and NOT NPO

What would you do? Be prepared to present your treatment plan