IMPLEMENTATION OF A SELF-MONITORING BLOOD GLUCOSE LOG TO IMPROVE ADHERENCE IN PATIENTS WITH TYPE 2 DIABETES MELLITUS IN THE OUTPATIENT SETTING

A DOCTOR OF NURSING PRACTICE PROJECT SUBMITTED TO THE GRADUATE EDUCATION OF THE UNIVERSITY OF HAWAIʻI AT MĀNOA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

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ABSTRACT

Type II Diabetes Mellitus (T2DM) is the most prevalent type of diabetes, occurring in approximately 90% to 95% of people with diabetes. Adherence to diabetes self-care skills improves patients' health outcomes and quality of life. However, studies show that for adult patients with T2DM, the adherence to self-monitoring blood sugar (SMBG) is as low as 24 percent. A SMBG tracking system allows patients and providers to identify blood glucose (BG) patterns and alter treatment regimens or lifestyle factors accordingly. The purpose of this quality improvement project was to develop a patient-driven SMBG recording system for patients with T2DM with the goal to improve SMBG adherence. Patients with T2DM were provided with a log form to keep track and record their blood glucose (BG) over a period of 3 months. Patients were encouraged to turn in their BG logs periodically via standardized bi-weekly reminder emails and a reminder phone call. Increased overall patient adherence to SMBG was calculated and documented by log return and overall log completion for all logs received. Out of twenty five (25) patients, four (4) emailed at least one log with their BG measurements in 3 months, accounting for 16% of the patients when the original goal for log return was 25%. For log completion on all logs received, a total average of 21.2 days, or 70% of days per month, with at least one BG measurement was calculated, surpassing the original log completion goal of 7.5 days or 25% of days per month. For those patients who did engage, using a BG tracking log increased SMBG adherence. Suggestions for the future include more controlled studies with a larger sample size and longer implementation period, multiple cohorts, and analysis of patients' change in HbA1c to assess clinical relevance.

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Implementation of a Self-Monitoring Blood Glucose Log to Improve Adherence in Patients with Type 2 Diabetes Mellitus in the Outpatient Setting

Introduction

Type II Diabetes Mellitus (T2DM) is the most prevalent type of diabetes, occurring in approximately 90% to 95% of people with diabetes; between the years of 2000 and 2010, the prevalence of self-reported T2DM in Hawaii increased by 60% (*Diabetes – Chronic Disease Prevention & Health Promotion Division*, 2020). T2DM is a lifestyle disease that requires the individual living with this illness to self-manage and make several daily decisions regarding food, activity and medications. It also requires participation in a number of self-care skills, such as blood glucose monitoring and taking medications (Colagiuri et al., 2009). Adherence to diabetes self-care skills improves patient health outcomes, such as reduced risk of diabetic complications, decreased emergency admissions at the hospital, and improved quality of life (Mogre et al., 2019). However, studies have revealed relatively poor adherence rates to diabetes self-management behaviors, with self-monitoring blood glucose (SMBG) adherence rates as low as 24% in adults patients with T2DM (Patton, 2015). Thus, clinical strategies that can improve adherence to self-management behaviors in patients with T2DM are needed in diabetes care worldwide to improve health outcomes and reduce disease complications in this population.

Literature Review

Comprehensive searches in PubMEd, CINAHL, the Cochrane Library, Medline, and Medscape were conducted incorporating search terms such as “Guidelines AND diabetes”, “Self-management AND diabetes management”, “Blood glucose monitoring AND diabetes”, “Blood glucose monitoring AND diabetes AND adherence”, “Blood glucose monitoring AND type 2 diabetes”, “Blood glucose monitoring AND T2DM”, “SMBG AND type 2 diabetes”, “Blood

glucose monitoring AND recording", "Blood glucose AND log", "Self-management AND diabetes AND Hawaii". A total of 15 sources including websites and peer-reviewed articles were analyzed, and 10 sources were synthesized for the purpose of this project. Publication dates ranged from 2009 to 2019, with the only limitation being that the studies had to be conducted on human subjects only. The selected sources were critiqued utilizing the Quality of Evidence rating system by Mosby (Appendix A).

Synthesis and Assessment of the Evidence

As of 2014, an estimated 12.8% of Native Hawaiians, 10.0% of Chinese, 13.0% of Filipinos, 13.6% of Japanese, 14.9% of Other Pacific Islanders, and 5.0% of whites living in Hawaii were diagnosed with diabetes (Uchima et al., 2019). Of these, approximately 90% to 95% have T2DM and between 2000 and 2010, the prevalence of self-reported type 2 diabetes in Hawaii increased by 60% (*Diabetes – Chronic Disease Prevention & Health Promotion Division*, 2020).

According to the Global Guideline for Type 2 Diabetes (2014), the four basic diabetes self-management skills recommended for T2DM patients were dietary control, physical exercise, regular medication, and self-monitoring of blood glucose. The adoption of self-monitoring blood glucose by patients with T2DM led to a significant reduction in HbA1c levels. SMBG improved the HbA1c levels in the short term (≤6 months), but also had long-term effects (≥12-month follow-up). Significant reductions in HbA1c levels were also found in newly diagnosed patients, as well as in patients who had diabetes for more than 12 months, which indicates that SMBG appeared to benefit patients with T2DM regardless of diabetes duration (Zhu et al., 2016). In addition to HbA1c, significant reductions in several clinical indices, including BMI, total cholesterol and waist circumference, were found in various analyses. This indicates that SMBG

does not simply function as a monitoring tool, but it also forms a component of a complex intervention capable of improving overall glycemic control (Zhu et al., 2016). Furthermore, detailed SMBG logs enable physicians to identify blood glucose patterns and alter treatment regimens or lifestyle factors accordingly (Raz et al., 2016).

While adherence to diabetes self-care skills has shown to improve patient health outcomes such as reduced risk of diabetic complications, decreased emergency admissions to a hospital, and improved quality of life outcomes (Mogre et al., 2019), studies also revealed relatively poor adherence rates to diabetes self-management behaviors. SMBG adherence rates were reported to be as low 24% for adults with T2DM (Patton, 2015).

Studies showed that interventions that combine patient education, behavioral strategies, and psychological support have higher rates of success (Patton, 2015). Goal setting can also help patients to set a behavior goal, monitor their progress in meeting that goal, and provide feedback to help with short-term motivation (Patton, 2015). Patients should be trained in correct testing technique and data recording for SMBG, as well as goals for blood glucose and HbA1c levels, so they can determine when their SMBG readings are out of range (Blevins, 2013). An individual's HbA1c target should be reviewed on a regular basis, taking into account benefits, safety and tolerability of therapies. Maintaining an HbA1c goal of below 7.0% minimizes the risk of developing complications. However, a lower HbA1c target may be considered if it can be easily and safely achieved, and a higher HbA1c target may be considered for people with co-morbidities or whose previous attempts to optimize control have been associated with unacceptable hypoglycemia (Global guideline for type 2 diabetes, 2014).

The evidence used for this DNP project is high-level evidence utilizing the Mosby's Quality of Evidence rating system. While the current evidence describes in detail the

recommended self-management skills for T2DM patients, it lacks recommendations on how to effectively improve SMBG adherence in T2DM patients and guidelines for providers on how to help patients with disease self-managing behaviors. With the exception of one study, which described the benefits of adopting a blood glucose log to help manage T2DM, most high-level evidence studies only generally identify that a consistent control of blood glucose levels as well as lifestyle modifications in diet and exercise can achieve long-term disease control as evidenced by a decrease in HbA1c levels. After analyzing the available literature, it is clear that there was a knowledge gap and future high-level research is needed to establish guidelines that would help practitioners effectively enhance patient self-management behaviors in T2DM treatment.

Needs Assessment

Currently, there are few strategies proven to consistently improve SMBG adherence in T2DM patients, and most providers lack the tools required to help patients to improve SMBG. This quality improvement (QI) project took place at a primary care clinic in the metro Honolulu area in Hawaii. Prior to this project, this clinic did not have a procedure in place to encourage T2DM patients to regularly track their blood glucose (BG) at home. The clinic estimated that only 10% of their T2DM patient population had a BG record that was shared with their provider.

Problem Statement

The PICOT question for this evidence-based QI project was: In adult patients with T2DM (P), can facilitating a tailored BG log, in conjunction with six bi-weekly reminder emails, plus a one phone call reminder during the last four weeks of the project (I), help increase patient adherence to SMBG from 10% (C) to at least 25% (O), after 3 months (T)?

Purpose/Goals/Objectives

The purpose of this QI project was to develop a patient-driven SMBG recording system for T2DM patients that can be shared with their health care provider, with the goal to improve SMBG adherence. The project objectives were: 1) Participants with T2DM were provided with a log to record their BG. 2) Participants utilized the BG log to keep track of their daily blood glucose measurements over a period of 3 months; and 3) Increased overall patient adherence to SMBG, as documented by log return and log completion.

Conceptual Framework

The RE-AIM framework was developed as a framework for consistent reporting of research results, organization of existing literature on health promotion and disease management in different settings, and translating research into practice. This framework encourages its users to pay more attention to essential program elements, including external validity, which can improve the sustainable adoption and implementation of evidence-based interventions (Glasgow et al., 2019). Prior authorization was obtained by the specific parties to utilize the RE-AIM framework during this project (Appendix B). All five steps in the RE-AIM framework that were implemented during the development and execution of this DNP project are listed as follows.

Reach- This step involves identifying who benefited from the project or initiative (*RE-AIM Planning Tool – RE-AIM*, n.d.). This project benefited both the patients with T2DM and the providers who managed their disease. *Effectiveness*- In this step, we analyzed what were the most important outcomes we expected to see from the initiative, and how likely it was that the initiative would achieve its key outcomes (*RE-AIM Planning Tool – RE-AIM*, n.d.). The most important outcome expected from this project was an increased adherence to SMBG by T2DM patients from 10% to at least 25%. *Adoption*- Here, the specific setting or organizational type

targeted for this project was a primary care clinic, in the private sector, in the metro Honolulu area on the island of Oahu, Hawaii. This clinical site saw adult patients with a large variety of health care conditions and had a special interest in metabolic health disorders, such as T2DM.

Implementation- This step details the format how the initiative was delivered including any adjustments and adaptations made (*RE-AIM Planning Tool – RE-AIM*, n.d.). A detailed breakdown of this project's implementation methods is provided in the Methods section.

Maintenance- When the initiative will need to be renewed and what will happen over the long-term? (*RE-AIM Planning Tool – RE-AIM*, n.d.). Any future adjustments to this initiative's implementation will be carried out by the providers and staff at the primary care clinic where this project was conducted. It is hoped that its patients continue to benefit from this project's findings in the future.

Methods

Project Setting and Patient Criteria

This QI project was implemented at a private primary care clinic located in the metro Honolulu area in the State of Hawaii. Patient inclusion criteria were adults with T2DM, non-insulin dependent, who were willing to participate in this project and were identified as eligible candidates by their primary care provider (i.e., the patient had an email address, the ability to send and receive emails, a smartphone with camera capabilities, and the ability to operate the phone's camera settings).

Pre-implementation

On August 13, 2020, the clinic's personnel (N=5), consisting of two healthcare providers, a medical assistant, and two administrative staff, participated in a one-hour orientation session, conducted by the DNP student, on the implementation processes described in this document.

Additional meetings between the DNP student and the clinic's healthcare providers and staff were conducted on an "as needed" basis throughout the implementation phase.

Implementation and Data Collection

The clinic designated an email account to be used for the purpose of this QI project; all reminder emails sent to patients and logs received from patients were stored on this account. The DNP student was given access to this email account to facilitate data retrieval.

By September 10, 2020, twenty five patients were selected and willing to participate in this project and received (via email) a *Personal Health Log* (Appendix C) to record their blood glucose levels daily for a period of 3 months. A standard email was sent to all participants every two weeks (on September 16, October 1, October 15, November 1, November 19, and December 1, 2020) as a reminder to share their updated log with their provider via email. In addition to the bi-weekly reminder emails, attempts to contact all 25 participants via a phone call (on November 18, 2020), were made by the DNP student, to remind them how to use the log and how to return it to their provider. All data collection was completed by December 31, 2020.

Ethical and Human Subjects Consideration

The DNP student completed the Collaborative Institutional Training Initiative (CITI) training for research ethics and compliance, and Health Insurance Portability and Accountability Act (HIPAA) training on patient privacy protections. All patient identifiers were omitted from the data to meet HIPAA guidelines with the exception of participants' gender. All implementation tasks were related to quality improvement and did not generate research-based knowledge or utilize private patient information. Therefore, Institutional Review Board (IRB) application and review was not required.

Evaluation

Measurements

The quantitative data generated by this project was used for outcome evaluation. (1) Following completion of the 3-month implementation phase, a 25% log return was the desired outcome for this QI project. Log return was defined as at least one log turned per patient within three months. (2) In addition, a 25% log overall completion was desired across all participants.

Data Analysis

Descriptive statistics were utilized to calculate measures of frequency. Statistical analysis and data visualization were conducted using Microsoft Excel software, then illustrated via graphs. (1) The total number of logs distributed were compared to the total number of logs returned to generate a log return percentage. For an equal or greater than 25% goal out of 25 participants, a minimum of 6.25 logs had to be returned. (2) The total overall percentage of days with at least one BG measurement was calculated for all logs received. For an equal or greater than 25% completion goal, a minimum of 7.5 days needed to have at least one BG measurement per day for all logs received. The data analysis phase was completed by February 10, 2021.

Results

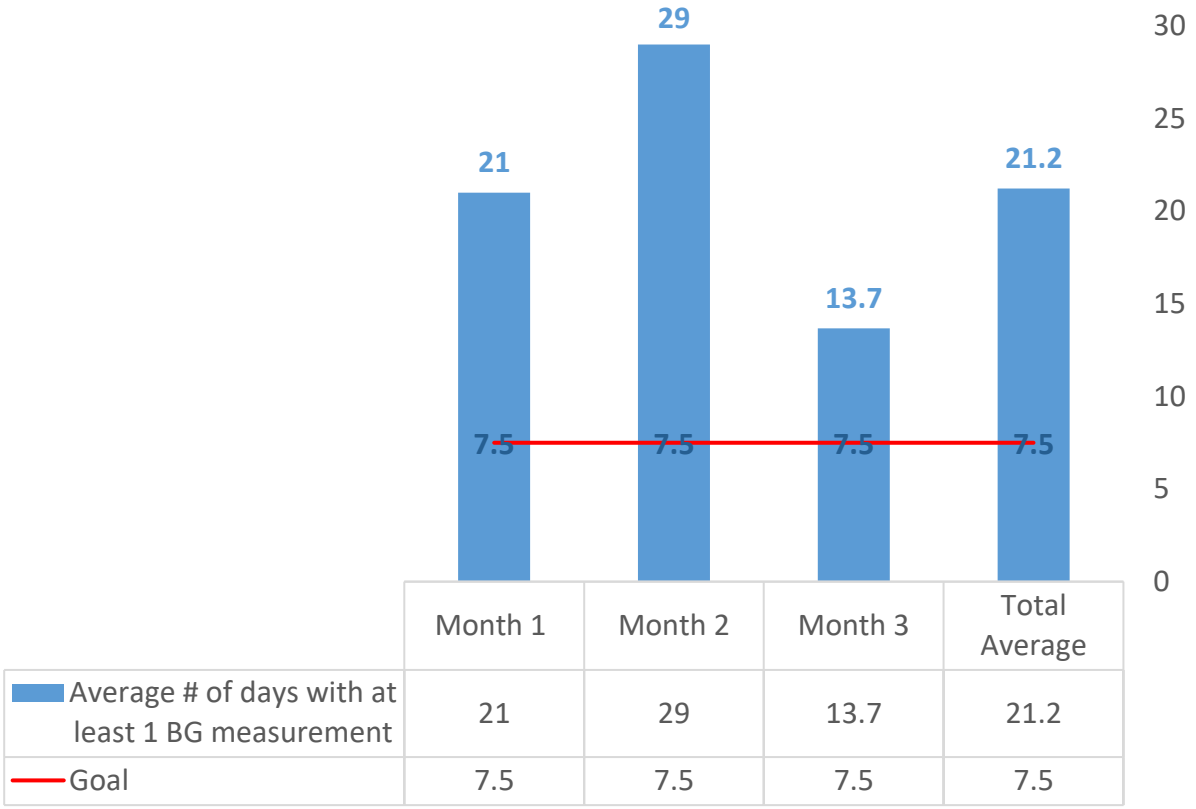
This project began with twenty five (25) participants with T2DM who were emailed a *Personal Health Log* and instructed (within the email) to record their BG at least one time every day and email back the log every two weeks. Out of the twenty five (25), four (4) participants emailed at least one log with their BG measurements during the 3 months. Out of the four participants who sent their logs back, two (2) were female and two (2) were male.

Relationship of Results to Purpose/Goals/Objectives

The total number of logs distributed were compared to the total number of logs returned to generate a log return percentage. Out of the twenty five (25) initial participants, four (4) participants did not have a working number; nine (9) participants did not answer the phone call but were left a voicemail with instructions; five (5) participants answered the phone call but stated they were not checking their BG and were not interested in doing so anymore; two (2) participants answered the phone call and stated they were checking their BG but were not using the *Personal Health Log*; one (1) participant stated they were using the *Personal Health Log* but preferred to turn in the log to their provider in person rather than via email; and four (4) participants answered the phone call and turned in at least one log, accounting for 16% from the original 25% goal for log return.

The total average number of days with at least one BG measurement was calculated for all logs received. As represented in Figure 1, a total average of 21.2 days, or 70%, with at least one BG measurement for all logs received was calculated, surpassing the original goal of 7.5 days or 25% log completion.

Figure 1. *Log Completion*



Limitations

There were several limitations and complications that impacted the completion of this project. First, the original plan was to provide the patients with the *Personal Health Log* in a face-to-face manner during their routine diabetes follow-up visits and for the patients to have the option to return their logs in person if they did not desire to use the email system. However, due to new COVID-19 restrictions, a large majority of routine follow-up visits were changed to telehealth. Therefore, the implementation plan for log return had to be modified to the use of email only. Second, the small sample size of participants only provided a narrow assessment of the impact and uptake of the *Personal Health Log*. Third, it is unknown if the four patients who turned in their *Personal Health Log* were already measuring their blood glucose daily prior to the

start of this project, which may have skewed the increase in SMBG adherence. And finally, the duration of this project's implementation was only 3 months with only one cohort of patients, which provided a limited utility of the results.

Strengths and Suggestions for the Future

Although this project had its limitations, it also showed a positive impact. All four participants who sent back their *Personal Health Log* showed good adherence to SMBG as evidenced by an overall average of blood glucose measurement of 21.2 days a month when the initial goal was 7.5 days a month, which is a 70% log completion compared to the initial anticipated goal of 25%. While this result was very promising, it is recommended that more controlled studies with a larger sample size and longer implementation period, multiple cohorts, and analysis of changes in participants' HbA1c are done to further evaluate clinical relevance.

Discussion

This QI project implemented and evaluated the use of a patient-driven blood glucose monitoring and recording system to improve SMGB adherence in patients with T2DM. The original project design had to be modified extensively due to new COVID-19 regulation and restrictions, and these modifications potentially impacted the results this project could have achieved. During the COVID-19 pandemic, patients have been encouraged to avoid unnecessary visits to healthcare facilities, and many follow-up routine visits have been transitioned to Telehealth or even postponed; participant interest and uptake in the *Personal Health Log* could have been different outside of the pandemic climate. Additionally, the elimination of a face-to-face log distribution and return system likely discouraged participants who did not feel comfortable utilizing email or other internet-based communications. It is also possible that participants who find the use of technology challenging did not have regular access to their email

and may not have been able to print the *Personal Health Log.* Despite the factors mentioned above, this QI project was successful at showing that with adequate patient engagement, an evidence-based practice change that implemented a patient-driven blood glucose monitoring system can positively impact adherence to SMBG in patients with T2DM for those who used it. Therefore, careful consideration of different methodologies that can increase patient engagement could improve future applications.

Conclusion

This DNP project incorporated all required SONDH DNP Essentials (Appendix D). The project implemented a patient-driven blood glucose monitoring system with the objective to increase self-monitoring blood glucose adherence in patients with type 2 diabetes mellitus. The project did not fully meet the first patient participation goal for tracking SMBG. However, it surpassed its second goal significantly and demonstrated that, for those patients who did engage, using a blood glucose tracking log increased blood glucose self-monitoring adherence. While the results of this project are promising, it is recommended that future implementations incorporate diverse methods to entice patient participation and engagement.

Appendix A

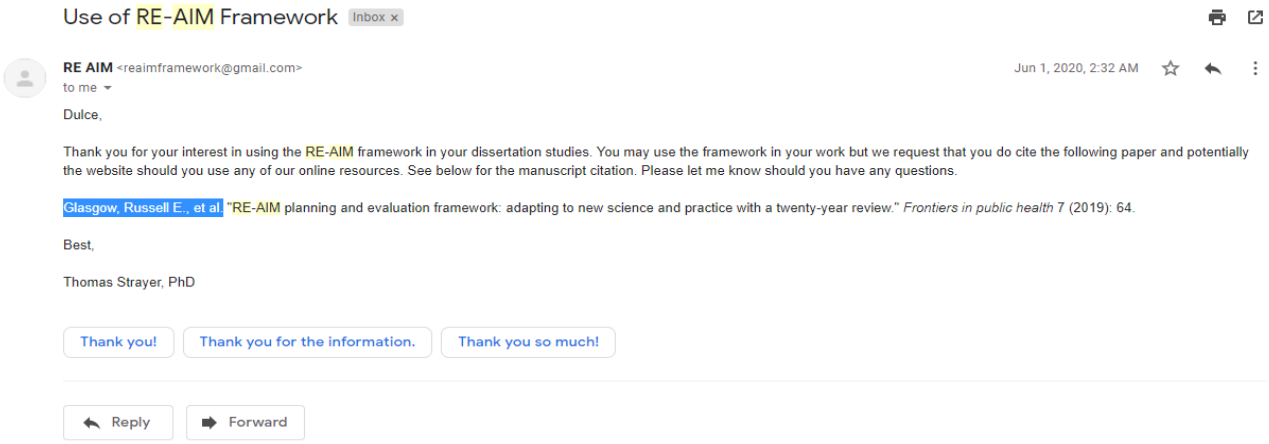
Mosby's Level of Evidence

Level of Evidence	Description	Number of Articles
I	Evidence from a systematic review or meta-analysis of all relevant RCTs (randomized controlled trial) or evidence-based clinical practice guidelines based on systematic reviews of RCTs or three or more RCTs of good quality that have similar results.	4
II	Evidence obtained from at least one well-designed RCT (e.g. large multi-site RCT).	1
III	Evidence obtained from well-designed controlled trials without randomization (i.e. quasi-experimental).	
IV	Evidence from well-designed case-control or cohort studies.	
V	Evidence from systematic reviews of descriptive and qualitative studies (meta-synthesis).	4
VI	Evidence from a single descriptive or qualitative study.	
VII	Evidence from the opinion of authorities and/or reports of expert committees.	1
Other	Literature review, performance improvement	

This level of effectiveness rating scheme is based on the following: Ackley, B. J., Swan, B. A., Ladwig, G., & Tucker, S. (2008). *Evidence-based nursing care guidelines: Medical-surgical interventions.* (p. 7). St. Louis, MO: Mosby Elsevier.

Appendix B

Authorization to use RE-AIM Framework



Use of RE-AIM Framework Inbox ×

RE AIM <reaimframework@gmail.com> Jun 1, 2020, 2:32 AM

to me

Dulce,

Thank you for your interest in using the RE-AIM framework in your dissertation studies. You may use the framework in your work but we request that you do cite the following paper and potentially the website should you use any of our online resources. See below for the manuscript citation. Please let me know should you have any questions.

Glasgow, Russell E., et al. "RE-AIM planning and evaluation framework: adapting to new science and practice with a twenty-year review." *Frontiers in public health* 7 (2019): 64.

Best,

Thomas Strayer, PhD

Thank you! Thank you for the information. Thank you so much!

Reply Forward

Appendix C

Personal Health Log

Personal Health Log

MAUKAI O MALAMA

Your Initials:_____ **Your Email Address:**_____

Please measure your blood sugar at least once per day. Circle the month and the day you start tracking your blood sugar:

Month (circle one): Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

(Circle start day)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23	25	26	27	28	28	30	31
Morning Blood Sugar																															
Afternoon Blood Sugar																															
Evening Blood Sugar																															

Month (circle one): Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23	25	26	27	28	28	30	31
Morning Blood Sugar																															
Afternoon Blood Sugar																															
Evening Blood Sugar																															

Month (circle one): Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23	25	26	27	28	28	30	31
Morning Blood Sugar																															
Afternoon Blood Sugar																															
Evening Blood Sugar																															

Time of Day	Blood Glucose Goals
Morning (fasting)	80-130 mg/dL
Afternoon*	80-140 mg/dL
Evening*	80-140 mg/dL

*30 minutes after a meal

*Daily Activity Legend	
Exercise/Physical Activity	▲
Cheat Meal/Cheat Snack	★
Medication Missed	∅

*Patients, use this legend as needed to record changes in daily activity next to blood glucose levels

Appendix D

DNP Essentials

DNP Essentials	Student's Project Connection to DNP Essentials
Essential 1: Scientific Underpinnings for Practice	• Incorporated knowledge from ethics, the biophysical, psychosocial, analytical, and organizational sciences in project strategy. • Evaluated new practice approaches based on theories from other disciplines.
Essential 2: Organizational and Systems Leadership for Quality Improvement and Systems Thinking	• Assessed the impact of practice policies and procedures on meeting the health needs of the patient population. • Developed new approaches that meet current and future needs of patient populations based on scientific findings in nursing and other clinical sciences.
Essential 3: Clinical Scholarship and Analytical Methods for Evidence-Based Practice	• Used analytic methods to critically review current literature to determine and implement the best evidence for practice. • Designed and implemented processes to evaluate outcomes of practice. • Directed, and evaluated quality improvement practices to promote efficient and patient-centered care. • Disseminated results from evidence-based practice and research to improve healthcare outcomes.
Essential 4: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care	• Exhibited the ability and skills to develop and execute an evaluation plan involving data configuration and extraction.
Essential 5: Health Care Policy for Advocacy in Health Care	• Completed healthcare policy coursework. • Advocate for social justice, equity, and ethical policies within different healthcare areas.
Essential 6: Inter-professional Collaboration for Improving Patient and Population Health Outcomes	• Lead inter-professional communication in the analysis of multifaceted practice and topics within the organization. • Utilized effective communication and collaborative skills in the development and implementation of new practice and standards of care.
Essential 7: Clinical Prevention and Population Health for Improving the Nation's Health	• Analyzed appropriate scientific data related to individual, aggregate, and population health.

References

Ackley, B. J., Swan, B. A., Ladwig, G., & Tucker, S. (2008). *Evidence-based nursing care guidelines: Medical-surgical interventions.* (p. 7). St. Louis, MO: Mosby Elsevier.

Blevins, T. (2013). Value and utility of self-monitoring of blood glucose in non-insulin-treated patients with type 2 diabetes mellitus. *Postgraduate Medicine*, *125*(3), 191–204. https://doi.org/10.3810/pgm.2013.05.2668

Colagiuri, R., Girgis, S., Gomez, M., & Griffiths, R. (2009). *National evidence based guideline for patient education in type 2 diabetes*. http://www.nhmrc.gov.au/guidelines/publications/di16

Diabetes – Chronic Disease Prevention & Health Promotion Division. (2020). https://health.hawaii.gov/diabetes/

Glasgow, Russell E., et al. "RE-AIM planning and evaluation framework: adapting to new science and practice with a twenty-year review." *Frontiers in public health* 7 (2019): 64.

Global guideline for type 2 diabetes. (2014). *Diabetes Research and Clinical Practice*, *104*(1), 1–52. https://doi.org/10.1016/j.diabres.2012.10.001

Mogre, V., Johnson, N. A., Tzelepis, F., Shaw, J. E., & Paul, C. (2019). A systematic review of adherence to diabetes self-care behaviours: Evidence from low- and middle-income countries. *Journal of Advanced Nursing*, *75*(12), 3374–3389. https://doi.org/10.1111/jan.14190

Patton, S. R. (2015). Adherence to glycemic monitoring in diabetes. *Journal of Diabetes Science and Technology*, *9*(3), 668–675. https://doi.org/10.1177/1932296814567709

Raz, I., Zary, R., & Dayan, E. B. (2016). Proposing a new design for self-monitoring blood glucose logs. *Diabetes/Metabolism Research and Reviews*, *32*(1), 60–62. https://doi.org/10.1002/dmrr.2708

RE-AIM Planning Tool – RE-AIM. (n.d.). Retrieved October 11, 2019, from http://www.re-aim.org/resources-and-tools/self-rating-quiz/

Uchima O, Wu YY, Browne C, Braun KL. Disparities in Diabetes Prevalence Among Native Hawaiians/Other Pacific Islanders and Asians in Hawai‘i. Prev Chronic Dis 2019;16:180187. DOI: http://dx.doi.org/10.5888/pcd16.180187

Zhu, H., Zhu, Y., & Leung, S. (2016). Is self-monitoring of blood glucose effective in improving glycaemic control in type 2 diabetes without insulin treatment: A meta-analysis of randomised controlled trials. *BMJ Open*, *6*(9). https://doi.org/10.1136/bmjopen-2015-010524