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A Protocol to Increase Referral Rates to Diabetic Education

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A PROTOCOL TO INCREASE REFERRAL RATES TO DIABETIC EDUCATION

by

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DEDICATION

This project is dedicated to my twin sister Sarah who, despite her lifelong battle with cerebral palsy, lights up the world with her smile, sense of humor, and work ethic. To my parents Dennis and Nancy, who encouraged and supported me through undergraduate and graduating schooling. To my roommates Paul and Nate, your ability to cope with my messiness while providing fun alternatives to completing my homework supplied the needed distractions to sustain a healthy school/life balance. To my friends Melinda, Jim, and David, I would not be here without you.

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ABSTRACT

In 2015, approximately 30.3 million Americans, including 10.5% of the population of Minnesota, had been diagnosed with diabetes mellitus (American Diabetes Association, 2019). Increased risk of diabetic complications including neuropathy, retinopathy, nephropathy, cardiovascular disease, and chronic wounds has been associated with an elevated hemoglobin A1C (HgA1C). Formal diabetic education has been shown to be a cost-effective intervention to reduce HgA1C. The Office of Disease Prevention and Health Promotion published an objective within HealthyPeople 2020 that seeks to increase the percentage of diabetics receiving formal diabetic education in the United States from 46.9% of adults to 58.4%. The purpose of this evidence-based project was to determine if providers managing diabetic patients at a primary care clinic (PCC) in Minnesota were positively impacted by a written policy, point of care reminders, and audit and feedback to increase referral rates to diabetic education, compared with no interventions. The providers at the PCC included physicians (n = 9) and family nurse practitioners (n = 2). Pre-intervention data from the same time period (n = 12 weeks) was gathered from the previous year and compared with post-intervention data collected at 2 weeks, 6 weeks, and 12 weeks. This data was analyzed using a Wilcoxon Signed Rank test. A secondary outcome examined the effectiveness of each phase of interventions including a written protocol (weeks 1-2) ; written protocol with point of care reminders (weeks 3-6); and protocol, point of care reminders, and audit with feedback (weeks 7-12). The secondary outcome was evaluated with a repeat measure ANOVA. The results and how they pertain to current standards of care and patient outcomes are discussed.

CHAPTER 1

INTRODUCTION

Background

For patients diagnosed with diabetes mellitus, the lifestyle modification, self-care, and pharmacotherapy needed to manage this complex disease process is often overwhelming. Diabetic education provides individuals with the information and support needed to excel at achieving homeostasis in both their diabetes and daily activities. Despite the benefits of diabetic education being realized in the early 1900s, the use of formal diabetic education in modern medicine has not yet become the standard. Recent recommendations from the American Diabetes Association and Office of Disease Prevention and Health Promotion have clarified the importance of formal diabetic education and reinforced the need for all diabetic patients to be referred by their primary care provider.

Approximately 30.3 million Americans had diabetes mellitus (DM) in 2015 with 1.5 million diagnosed annually (American Diabetes Association, 2019a). DM can be classified into two categories: type 1 and type 2. Type 1 diabetes is caused by the pancreas producing insufficient insulin. Type 2 diabetes is caused by a chronic excess of glucose within the body diminishing insulin receptor sensitivity. Insulin is a critical component in the transportation of glucose to cellular respiration. Though both types of diabetes have similar treatment approaches, there are critical differences that are often overlooked by the public. With both type 1 and type 2 DM, misdiagnoses or inappropriate management can lead to a serious increase in morbidity and mortality. In Minnesota it has been estimated that 10.5% (590,000) of the population has DM (American Diabetes Association, 2019b).

A small city located in northern Minnesota with a population of near 12,000 is no exception to this statistic. The primary care clinic (PCC) utilized by the doctor of nursing practice (DNP) student for this project is a private, family practice, clinic located within this small

Minnesota city. Nine medical doctors and two advanced practice registered nurses (APRN) provide care at the facility. Currently the staff at the PCC provides primary diabetic care for 1,433 patients (Clinical Research Coordinator, 2019). The management of the PCC has verbalized an expectation that their providers refer all their diabetic patients for formal diabetic education. As the PCC does not have its own diabetic education program, referrals are to be made to the local community hospital (CH). The CH is located within a short distance from the clinic and has no legal or financial ties to the PCC. The clinic determined for their patients' best interests, as shown by the research, that they utilize the CH to provide formal diabetic education. Since provider participation is not meeting expectations with use of verbal encouragement, the PCC has requested implementation of interventions to increase provider referral rates.

Diabetic education started in the early 1900s and has advanced with the scientific and medical progression of the knowledge and treatment of DM. Formal diabetic education is crucial to helping patients understand the pathophysiology, lifestyle recommendations, and pharmacotherapy associated with their diagnosis. Through better understanding of their diagnosis, improvements in how they manage their disease leads to better disease control. As primary care providers are increasingly busy due to amplified patient numbers and medical complexity, diabetic educators help to provide individualized teaching that is otherwise missed allowing for better chronic disease management.

Data from the Literature Supporting Need for the Project

Diabetic education has emerged as a cost-effective, individualized, approach to assist diabetic patients with managing their DM. Diabetic education involves meeting with a certified diabetic educator, usually a registered nurse, who provides individualized counseling regarding lifestyle modification, glucose monitoring, disease process, and pharmacotherapy. As DM is a complex condition that requires permanent lifestyle changes and daily management, increasing patient's knowledge and support is a critical component to maintaining homeostasis between

lifestyle and medical condition. To decrease the risk factors of diabetic complications, the American Diabetic Association (2019c) recommends a target hemoglobin A1C (HgA1C) less than 7%. The American Association of Endocrinology (2019) recommends HgA1C under 6.5%. New recommendations from the American College of Physicians (2019) encourages a HbA1C of less than 8%. The PCC has adapted the new recommendations of encouraging a HbA1C of less than 8% as well.

Despite varying recommendations, maintaining an uncontrolled HgA1C can result in a higher risk of complications including both macrovascular and microvascular disorders. These include atherosclerosis, retinopathy, nephropathy, and neuropathy. Diabetic education has been shown to decrease HbA1C by 1-2% while improving quality and quantity of life (Bluml, Kolb, & Lipman, 2019; Chrvala, Sherr, & Lipman, 2016). Healthy People 2020 published a target goal that 58.4% of diabetics in the United States should be referred to diabetic education by 2020. As of 2012, only 53.1% of DM patients were referred to diabetic education (Office of Disease Prevention and Health Promotion, 2019).

Data from the Clinical Agency Supporting Need for the Project

The healthcare practitioners at the PCC provide primary diabetic management for 1,433 patients (Clinical Research Coordinator, 2019). Since 2017, only 255 patients have been referred to the CH for diabetic education with 215 patients attending (Clinical Research Coordinator, 2019). According to these gathered statistics, only 17.79% of DM patients at the clinic have been referred for formal DM education. Of the patients referred who attended the CH diabetic education, 80 patients (37.2%) started with a HbA1C less than 8% (Clinical Research Coordinator, 2019). Of the remaining 135 patients, 90 (66.6%) patients reached a HbA1C of 8% or less after attending a minimum of 1 diabetic education appointment (Clinical Research Coordinator, 2019). Therefore, when DM patients attend diabetic education, they show a great improvement at managing their diabetes resulting in a HbA1C of less than 8%. Despite the management at the PCC verbally encouraging their providers to refer all of their diabetic

patients to diabetic education at the CH, a referral rate of only 17.7% warrants additional interventions to increase provider referral adherence to improve diabetic outcomes.

Purpose of the Evidence-Based Practice Project

The purpose of this evidence based project (EBP) project was to increase the provider referral rate of diabetic patients at the PCC to the CH for diabetic education. As previously shown using statistics from the clinic, verbal encouragement has shown to be ineffective. By maintaining low referral rates, the PCC is not maximizing the interventions available to reach optimal diabetic control for the large DM population managed at the facility. Additionally, not referring enough patients in the clinic with uncontrolled DM and a HbA1C of greater than 8% increases the risk for disease complications. Further discussion about the interventions that will be utilized in this EBP project will be discussed in detail in the coming chapters. Current research and recommendations presented in the next chapter's literature search will further establish the importance and need for interventions at the PCC to improve the referral process of DM patients.

PICOT Question

For providers managing diabetic patients at the PCC, what is the impact of a written policy, point of care reminders, and individualized feedback at increasing provider referral rates of diabetic patients to the CH diabetic education, compared with no intervention?

Significance of the EBP Project

This EBP project is significant as it will assist the PCC to adhere to the national recommendation from the Office of Disease and Health Promotion that all diabetic patients be referred to diabetic education. Furthermore, this EBP project will increase the quality of diabetic care and education provided to diabetic patients at the PCC by reducing the DM patient's risk factors of developing diabetic complications. Organizationally, this project will assist the providers to meet standards set by the management at the PCC.

CHAPTER 2

EBP MODEL AND REVIEW OF LITERATURE

Evidence Based Practice Model

Overview of EBP Model

The John Hopkins Evidence-Based Practice Model (JHNEBP) was utilized throughout this DNP project. The JHNEBP is a problem-solving, clinical decision-making tool that was developed by John Hopkins University Hospital in 2002 to assist nurses to solve practical, evidence-based questions (Johns Hopkins, 2016). JHNEBP was created by a team of nurses and faculty from the John Hopkin's School of Nursing and was cultivated from the feedback of nurses who had previously utilized a plethora of current evidence-based practice models (Dang & Dearholt, 2018; Melnyk & Fineout-Overholt, 2015). JHNEBP is founded on a three-phase progression called the PET process. The PET process combines all nineteen steps of the JHNEBP process and organizes them into 3 headings: practice question, evidence, and translation.

Practice Question

According to Dang and Dearholt (2018), **t**he first phase of the JHNEBP process is to develop a practice question based on a problem statement. This includes (1) compiling an inter-professional team that the proposed question is relevant to, (2) defining the clinical problem both numerically and narratively, and (3) creating a succinct evidence-based practice (EBP) question to guide a literature search. After authoring an EBP question, (4) the stakeholders are identified, (5) a leader is appointed, (6) and team meetings are scheduled.

Evidence

Secondly, a search for evidence is conducted. (7) An external and internal search is conducted, (8) each piece of evidence found is appraised for level and quality, (9) and the

evidence found is summarized (10) The overall quality and strength of the evidence found is then evaluated and (11) the stakeholders develop a recommendation for change based on the research discovered.

Translation

The evidence is translated to a practical intervention if the evidence search supports it. (12) The implementation process is evaluated for feasibility and appropriateness. (13) An action plan is created, (14) resources are secured, (15) and the action plan is implemented. Lastly, (16) the outcomes of the intervention are evaluated, (17) the results of the outcome are reported to the stakeholders, (18) the team determines if the additional steps should be implemented, (19) and the findings are disseminated (Dang & Dearholt, 2018).

As discovery of new nursing knowledge alone does not increase patient outcomes, the goal of the JHNEBP is to guarantee that the current best practices and research findings are included in the practical application of nursing (Dang & Dearholt, 2018; Johns Hopkins, 2019). The JHNEBP process provide nurses with a standardized vertical approach for solving practical nursing problems. Problem solving impacts patient outcomes and is essential for increasing quality of nursing care**.**

Application of EBP Model to DNP Project

The nineteen steps described in the JHNEBP model were utilized as an outline for this DNP project. Each of the steps of the PET process was followed in a linear, checklist, approach. The JHNEBP model was chosen for its specific applicability to nursing problems.

Practice Question

(1) A team of individuals were compiled including a nurse practitioner, clinical research coordinator, DNP student, and clinical manager at the PCC (2) The clinical problem (a lack of provider referrals to diabetic education) was defined. (3) A PICOT question was developed and refined with a the final questing being, “For providers managing diabetic patients at the PCC, what is the impact of a written protocol, electronic reminders, and individualized feedback at

increasing provider referral rates of diabetic patients to the CH diabetic education, compared with no intervention?" (4) The stakeholders (the PCC and CH) were identified, (5) a team leader was identified (David Rokser, DNP Student), (6) and frequent meeting times were scheduled with the research coordinator and clinical manager.

Evidence

(7) A literature search was conducted utilizing multiple databases and peer-reviewed journals including Cochrane, Joanna Briggs Institute EBP Database, CINAHL, MEDLINE, Science Direct, and BioMed Central. (8) Each piece of literature was appraised for level of evidence and quality of research using the Melnyk and Fineout-Overholt (2015) Hierarchy of Evidence and the JHNEBP Research Evidence Appraisal Tool. (9) Evidence from 9 literature sources were compiled and analyzed. (10) The overall strength of evidence was evaluated using the JHNEBP Research Evidence Appraisal Tool. (11) The stakeholders developed a recommendation that a protocol be initiated, electronic point of care reminder implemented, and feedback provided.

Translation

(12) The implementation plan was evaluated by all members of the intra-disciplinary team and deemed to be appropriate. (13) An action plan was created to implement the protocol alone for 2 weeks and then initiate point of care reminders with the protocol for 4 weeks. Between week 6 and 7, audit and feedback were provided to each clinician. (14) The resources were secured internally at the PCC (IT support, clinic manager approval, access to electronic medical records). (15) The action plan was initiated as previously stated and (16) the outcomes of the interventions were evaluated. (17) The outcomes of the interventions were reported to the stakeholders (PCC and CH) and (18) the team (clinical advisor, clinical manager, DNP student, and clinical research coordinator) determined that no additional steps should be taken. (19) The findings were disseminated to all members of the research team, staff at the PCC, staff at the CH, and faculty at Valparaiso University.

Strengths and Limitations of EBP Model for DNP Project

The JHNEBP model provides a structured, step by step, outline for an evidence-based practice project. The JHNEBP model was created by nurses, for nurses, with consideration to the scientific examination of practical questions, evidence appraisal, and the spirit of inquiry that nurses possess (Dang & Dearholt, 2018). Strengths of the JHNEBP model include the outline's vertical approach, detailed instructions, and specificity to nursing research. Limitations may include the length of the process, lack of structured variance, and the inability to be utilized in additional research entities. Despite these limitations, the JHNEBP model was ideal for this evidence-based DNP project and was utilized without complication.

Literature Search

Sources Examined for Relevant Evidence

An encompassing literature search was conducted utilizing multiple electronic databases, citation chasing, and hand searching to obtain the best available evidence to answer the PICOT question. The databases searched include the Cochrane Library, The Joanna Briggs Institute (JBI), Cumulative Index to Nursing and Allied Health (CINAHL), Medical Literature Analysis and Retrieval System Online (MEDLINE), and PubMed. The Journal of the American Association of Nurse Practitioners (AANP) was hand searched. Keywords, medical subject headings (MeSH), and limiters were added to narrow the literature to high level, pertinent, evidence. The keywords: remind*, "point of care", feedback, "computer generated", protocol, "written policy", guideline*, behavior, "quality of care", provider*, practitioner* and diab* were utilized.

Inclusion and exclusion criteria were applied to maintain a high quality of evidence. Inclusion criteria consisted of the literature having been authored in the last ten years (2009-2019), written in the English language, peer-reviewed, and pertained to the PICOT question. Evidence was excluded if the literature discussed patient compliance of guidelines, not provider

adherence, and if the inverse of any part of the inclusion criteria was present. A total of 638 articles were found with the keywords and limiters utilized in the 5 databases. A total of 36 articles were reviewed with 11 pieces of literature being accepted - 3 being duplicates. Four articles were found via citation chasing and hand search with 1 meeting the inclusion criteria. Table 2.1 further describes the process of keywords in the search process utilized for the different databases to arrive at relevant literature that was accepted for review. Table 2.2 shows a summary of the evidence in included articles that met criteria for inclusion.

Table 2.1

Summary of Evidence Searched

Database	Keywords	Results	Reviewed	Accepted
Cochrane	Remind* AND “point of care” OR feedback OR “computer generated”	14	3	3
JBI	Remind* AND “point of care” OR feedback OR “computer generated”	155	5	3
CINAHL	remind* OR "point of care" or feedback AND protocol or "written policy" or guideline* or behavior or "quality of care" AND provider* or practitioner* AND diab*	94	12	2
MEDLINE	remind* OR "point of care" or feedback AND protocol or "written policy" or guideline* or behavior or "quality of care" AND provider* or practitioner* AND diab*	178	10	2 duplicates
PubMed	remind* OR "point of care" or feedback AND protocol or "written policy" or guideline* or behavior or "quality of care" AND provider* or practitioner* AND diab*	197	6	1 duplicate
Citation Chase			2	1
Hand Search			2	0

Table 2.2

Summary of Evidence Included

Reference	Purpose	Design/Quality Rating	Sample	Result
Arditi, C., Rège-Walther, M., Wyatt, J. C., Durieux, P., & Burnand, B. (2012). Computer-generated reminders delivered on paper to healthcare professionals; effects on professional practice and health care outcomes. Cochrane Database of Systematic Reviews. doi:10.1002/14651858.cd001175.pub3	Assess the impact of computer generated reminders delivered on paper to healthcare providers.	Systematic Review - Level 3	30 RCTs and 5 non-randomized trials	Moderate evidence that computerized reminders delivered on paper to providers can improve adherence to guidelines and increase outcomes.
Chauhan, B. F., Jeyaraman, M., Mann, A. S., Lys, J., Skidmore, B., Sibley, K. M., … Zarychanksi, R. (2017). Behavior change interventions and policies influencing primary healthcare professionals' practice—an overview of reviews. Implementation Science, 12(1). doi:10.1186/s13012-016-0538-8	Assess the literature on behavior change interventions and policies directed at primary care providers.	Overview of SystematicReview - Level 1	138 Systematic Reviews	Education, training, and a team based approach are effective at changing providers' practice.
Cleveringa, F. G., Gorter, K. J., Van den Donk, M., Van Gijsel, J., & Rutten, G. E. (2013). Computerized decision support systems in primary care for type 2 diabetes patients only improve patients' outcomes when combined with feedback on performance and case management: a systematic review. Diabetes Technology & Therapeutics, 15(2), 180-192. doi:10.1089/dia.2012.0201	Assess the impact of computerized decision support systems alone, and with additional interventions, at improving provider quality of care for DM.	Systematic Review - Level 1	18 RCTs	Computer decision reminders and feedback are effective at improving provider care of DM.
Guldberg, T. L., Lauritzen, T., Kristensen, J. K., & Vedsted, P. (2009). The effect of feedback to	What is the impact of feedback to	Systematic Reviews - Level 1	10 RCTs	Feedback to providers increased quality

general practitioners on quality of care for people with type 2 diabetes. a systematic review of the literature. BMC Family Practice, 10(1). doi:10.1186/1471-2296-10-30	primary care providers on the quality of care for the management of diabetes. available literature.			of care for patients with DM.
Ivers, N., Jamtvedt, G., Flottorp, S., Young, J. M., Odgaard-Jensen, J., French, S. D., … Oxman, A. D. (2012). Audit and feedback: effects on professional practice and healthcare outcomes. Cochrane Database of Systematic Reviews. doi:10.1002/14651858.cd000259.pub3	Review the effectiveness of audit and feedback at improving healthcare practice.	Systematic Review - Level 1	140 RCTs	Audit and feedback can result in small, but important, practice change.
Medves, J., Godfrey, C., Turner, C., Paterson, M., Harrison, M., MacKenzie, L., & Durando, P. (2009). Practice guideline dissemination and implementation strategies for healthcare teams and team-based practice: a systematic review. JBI Library of Systematic Reviews, 7(12), 450-491. doi:10.11124/jbisrir-2009-193	Assess the effectiveness of multiple guideline dissemination interventions	Systematic Review - Level 5	28 RCTs, 34 descriptive/ case series, 27 cohort studies	A multi- pronged approach is required for guideline dissemination due to the complexity of modern healthcare.
Moola, S. (2019). Healthcare teams: guideline dissemination. The Joanna Briggs Institue. Retrieved from file:///C:/Users/david/OneDrive/Documents/Grad%20School%20Year%202/799/Articles/Sandeep,%20Moola_JBI.pdf	Assess the most impactful interventions for guideline dissemination and implementation.	Summary of Evidence Level 7	4 systematic reviews, 1 survey, 1 workshop report	Collaborative team-based interventions, audit and feedback, and understanding local barriers are the best method of promoting guideline adherence.
Shojania, K. G., Jennings, A., Mayhew, A., Ramsay, C. R., Eccles, M. P., & Grimshaw, J. (2009). The effects of on-screen, point of care computer reminders on processes and outcomes of care. Cochrane Database of	To review the effectiveness of computerized point of care reminders delivered to	Systematic Review - Level 3	28 RCTs or quasi-RCTs	Computerized point of care reminders result in small to moderate change of provider behavior.

Systematic Reviews. doi:10.1002/14651858.cd001096.pub2	healthcare providers			
Yimei, L. (2018). Evidence implementation strategy: audit and feedback. The Joanna Briggs Institute. Retrieved from file:///C:/Users/david/OneDrive/Documents/Grad%20School%20Year%202/799/Articles/Yimei,%20Li_JBI.pdf	Assess the impact of audit and feedback on evidence implementation	Review of systematic reviews - Level 3	130 systematic reviews, 5 RCTs, 2 interrupted time series	Audit and feedback can be used alone, or with additional interventions, to change provider practice.

Levels of Evidence

Each piece of literature was leveled based on the Melnyk and Fineout-Overholt (2015) Hierarchy of Evidence tool. Leveling, using the Melnyk and Fineout - Overholt Hierarchy of Evidence tool, was utilized to maintain a high standard of evidence. Level 1 literature, the highest rating level, must contain evidence from a systematic review or meta-analysis. Level 2 literature includes data from well-designed randomized control trials (RCTs) and level 3 evidence is composed of well-designed controlled trials without randomization. Level 4 evidence contains data from case control and cohort studies and level 5 includes information gained from systematic reviews of descriptive and qualitative studies. Information obtained from a single descriptive study or qualitative study is rated as level 6 and lastly, the lowest rating level, evidence from the opinion of topic authorities or expert committees is ranked as level 7.

When appraising literature, one must also review the quality of evidence. The quality of the literature was assessed using the JHNEBP Research Evidence Appraisal Tool. The tool provided criteria to organize the evidence into three categories - Grade A, Grade B, and Grade C. Literature classified as Grade A evidence includes information that contains, “consistent, generalizable results; sufficient sample size for the study design, adequate control; definite conclusions, consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence” (Dang and Dearholt, 2018, p. 4595). Grade

B evidence contains, “reasonably consistent results; sufficient sample size for the study design, adequate control; definitive conclusions; consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence” (Dang and Dearholt, 2018, p. 4595). Grade C literature includes, “little evidence with inconsistent results; insufficient sample size for the study design [and], conclusions cannot be drawn” (Dang and Dearholt, 2018, p. 4595).

Appraisal of Relevant Evidence

Table 2.2 provides a summary of each relevant article including their reference, purpose, design/quality rating, sample, and result. Each article’s appraisal, including the reason for their level and grade of evidence, will be provided in further discussion.

Level 1 Grade A Evidence

Chauhan et al. (2017) reviews literature on behavior change interventions and policies directed at providers working in a primary care setting. Chahan et al. (2017) is an overview of systematic reviews that retrieved 2771 citations. The authors included 138 systematic reviews that represented 3502 individual studies. Due to its impressive sample size, consistent recommendations, and study design, Chauhan et al., (2017) has been classified as Grade A evidence. Cleveringa et al. (2018) includes 18 RCTs and explores the impact of computerized decision support systems at improving the quality of care provided by healthcare practitioners. Cleveringa’s et al. adequate control, definite conclusions, sufficient sample size, and consistent recommendations allow it to be categorized as Level 1 with Grade A evidence.

Guldberg et al. (2009) is a systematic review that contains 10 RCTs. The authors completed an extensive literature search in multiple databases and through citation chasing. Each piece of the literature included in Gulberg et al. (2009) met specific inclusion criteria including requirements to contain RCTs, study diabetes in primary care, and contain interventions utilizing feedback to healthcare providers. Due to Guldberg et al. (2009) containing

a sufficient sample size and consistent recommendations, the article meets the criteria for a Level 1 with Grade A categorization.

Ivers et al. (2012) is a systematic review that explores the effectiveness of audit and feedback at improving healthcare practice. Randomized control trials that assessed the impact of audit and feedback at increasing the quality of provider practice and patient outcomes were included in the study. In total, 140 RCTs were included in the review containing 82 comparisons from 49 studies that resulted in dichotomous outcomes. Due to Ivers et al. (2012) containing a large sample size, adequate control, and consistent recommendations, the review has been classified as Level 1 with Grade A literature.

Level 3 Grade A Evidence

Arditi et al. (2012) is a systematic review that contains 30 RCTs and 5 non-randomized studies. Arditi et al. explores the impact of computer generated reminders delivered on paper to healthcare practitioners. For each study, the authors calculated the median effect size, median improvement, and interquartile range across the results of the literature. Arditi et al. (2012) is classified as Grade B evidence as not all of the research is controlled yet the outcomes are consistent and the sample is sufficient. Shojania et al. (2009) is a review that assesses the effectiveness of computerized point of care reminders delivered to healthcare providers to changing provider behavior. Shojania et al. (2009) is composed of 28 RCTs or quasi-randomized trials. The median improvement, and median absolute improvement, in adherence to a process of care was calculated and the outcome with the largest improvement was identified. Shojania et al. (2009) is categorized as Level 3 with Grade A evidence as the literature contains generalizable results, is appropriately controlled, and supports consistent recommendations.

Yimei (2018) is an evidence summary that includes 130 systematic reviews, 5 RCTs, 2 interrupted time series. Yimei (2018) compiles the research to determine the best available evidence regarding the use of audit and feedback in promoting provider adherence to evidence

implementation. Due to Yimei (2018) using a large sample size, adequate control, and consistent recommendations, the evidence summary has been classified as Level 3 with Grade A literature.

Level 5 Grade B Evidence

Medves et al. (2009) is a systematic review that contains 28 RCTs , 34 descriptive/case series, and 27 cohort studies. Medves et al. (2009) reviews the effectiveness of multiple guideline dissemination interventions. The authors examined the articles by the population studied to determine what amount of interventions, and type of interventions, were more likely to report successful outcomes. Due to the literature's reasonably consistent results, large sample size, adequate control and consistent conclusions, Medves et al. (2009) has been classified as Level 5 with Grade B evidence.

Level 7 Grade B Evidence

Moola et al. (2019) is a summary of evidence related to guideline dissemination strategies. The summary includes 4 systematic reviews, 1 survey, and 1 workshop report. The literature used within the summary was obtained from a structured literature search of evidence-based medical databases with regards to specific inclusion and exclusion criteria. Moola et al. (2019) is Level 7 with Grade B evidence as it contains definitive conclusions, consistent recommendations, and a quality search of the literature.

Synthesis of Critically Appraised Literature

Guidelines/Protocols

Guidelines and protocols are an essential component of providing high quality, evidence-based, medical care. To maintain consistent care with positive outcomes, providers should adhere to nationally recognized care guidelines and comply with local organizational protocols. Guideline dissemination is a crucial part of promoting current evidence-based practice. As healthcare is becoming increasingly complex, it is crucial that medical practitioners are updated with the most recent research and practice guidelines. This can be accomplished independently

by provider self-education but can furthered be accomplished by facility/organizational assistance (Medves et al., 2009; Moola, 2009). By adhering to best-practice guidelines, standardized quality medical care can be provided to all patients regardless of who is managing their healthcare.

Interventions

After practice guidelines are disseminated to the practitioners, interventions to increase provider compliance/behavior-changes are essential to ensuring that the patient and provider outcomes are met (Chauhan et al., 2017; Shojania et al., 2018). A team-based, multi-pronged, collaborative approach is recommended to achieve maximum provider adherence (Arditi et al., 2009; Chauhan et al., 2017;Moola et al., 2019; and Shojania et al., 2018). Clinical reminders and audit and feedback were most prominently presented as the best intervention to promote provider guideline compliance throughout the literature.

Reminders

Point of care, clinical, reminders are the mainstay of physical interventions discovered through the literature search. As healthcare has progressed to include electronic medical records as a standard of care, point of care reminders are often administered via computerized mechanisms. Despite the common use of electronic reminders, Arditi et al. (2009) assessed the impact of electronic reminders delivered on paper vs. computerized reminders. Arditi et al. (2009) concluded that computer generated reminders delivered on paper with additional interventions (co-interventions) improves quality of care slightly with a 6.8% median provider behavior change. Computer generated reminders delivered on paper alone (independent intervention) also improved provider outcome with an 11% median improvement. Shojania et al. (2018) determined that computer generated reminders delivered electronically resulted in a median improvement of process adherence of 4.2%. Despite continued research being recommended to assess the results of point of care reminders with additional interventions (Arditi et al., 2009; Cleveringa et al., 2013; and Shojania et al., 2018), the literature shows

strong positive outcomes with the use of point of care reminders to change provider practice resulting in improved patient outcomes.

Audit and Feedback

The use of audit and feedback have been shown to result in positive provider behavior/practice changes increasing patient outcomes (Chauhan et al., 2017, Guldberg et al., 2009, Ivers et al., 2012, Moola et al., 2019, and Yimei, 2018). Audit and feedback, defined as a summary of performance over a specific measure in time, is recommended as an intervention as it utilizes a team-based, individualized, approach which is recommended due to the complexity of modern healthcare (Moola et al., 2019 and Chauhan et al., 2017). Ivers et al. (2012) found that the weighted median adjusted percent change was 1.3% with the use of audit and feedback in multiple clinical settings. Specific to diabetes management, Guldberg et al. (2009) concluded that audit and feedback is a promising tool for increasing quality improvement. Additional research is recommended to assess which method of providing audit and feedback is most effective, as well as the ideal environment in which the intervention should be utilized (Chauhan et al., 2017, Guldberg et al., 2009, Ivers et al., 2012, Moola et al., 2019).

Best Practice Model Recommendation

Three interventions are recommended throughout the literature search: (1) The use of guidelines/protocols with dissemination, (2) clinical point of care reminders, and (3) the use of audit and feedback. These 3 interventions are utilized throughout this DNP project as they are the most effective interventions found within the literature that pertain to the PICOT question.

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

To increase provider adherence to an organizational standard or national practice recommendation, a written protocol must be available for the healthcare provider to reference. Additionally, organizational interventions including point of care reminders and audit with feedback should be utilized to assist in guideline dissemination and adoption. All three interventions were implemented at the PCC to increase provider referrals to diabetic education at the CH.

Participants and Setting

The PCC is a private, family practice, outpatient clinic located in northern Minnesota. Nine medical doctors and two APRNs are currently employed at the facility. Two medical doctors included in the initial data analysis are no longer practicing at the facility. Their pre-intervention data was excluded from the data analysis. The clinicians currently employed by the PCC have provided care at the facility for an average of 14.8 years with maximum of 32 years and a minimum of three years. The PCC provides medical services to thousands of patients per year.

Pre-Intervention Group Characteristics

The clinicians at the PCC provided diabetic management for 1,433 patients of which only 266 (18.5%) were referred for diabetic education at CH since 2017 (Clinical Research Coordinator, 2019).

Referred Patients

According to the Clinical Research Coordinator (2019), only 215 of the 266 patients (80.8%) referred for diabetic education at the CH attended at least one educational appointment. Of the 215 patients who attended, 135 patients (62.7%) had an initial HgA1C greater than 8%. Those who attended experienced an average decrease in HgA1C by 1.13%.

Ninety patients (67.6%) of the 135 who started with an uncontrolled HgA1C (>8%) became controlled (HgA1C <8%) with an average HgA1C decrease of 2.75%. Of the 90 patients who became controlled, 56 patients (62.2%) maintained a HgA1C < 7%. The average number of referrals to CH for diabetic education per provider is 21 with a minimum of seven and a maximum of 40. Please see Table 3.1 for additional data on provider referrals.

Non-referred Patients

According to the Clinical Research Coordinator (2019), 1167 diabetic patients (81.5%) are currently being managed at the clinic without a referral to formal diabetic education. A randomized analysis of 266 of the 1167 patients was completed. Of the non-referred patients selected, 117 of the 266 patients (43.9%) started uncontrolled with a HgA1C greater than 7%. The average decrease in HgA1C following initial diagnosis without formal diabetic education was 0.10%. Forty-five of the 117 uncontrolled patients had a HgA1C >8% with the average decrease of HgA1C being 1.06%. At the last recorded HgA1C check, 96 patients remained uncontrolled with 53 patients maintaining a HgA1C >8% and 43 with a HgA1C >7%. Table 3.1 discusses further the providers and their referral data.

Table 3.1

Provider Referral Numbers

Provider Title	Certifying Organization	Referrals
MD	American Academy of Family Physicians	11
MD	American Academy of Family Physicians	40
MD	American Academy of Family Physicians	7
MD	American Academy of Family Physicians	16
MD	American Academy of Family Physicians	17
MD	American Academy of Family Physicians	25
MD	American Academy of Family Physicians	19

MD	American Academy of Family Physicians	34
MD	American Academy of Family Physicians	29
FNP	American Association of Nurse Practitioners	27
FNP	American Association of Nurse Practitioners	13

Intervention

Implementing an intervention at the PCC required extensive planning and communication. In correlation with the JHNEBP process outlined in chapter 2, the DNP student started by creating a formal team composed of the DNP's clinical advisor, clinical research coordinator, clinical manager, and the DNP student to address the clinical question. The DNP student, also the project leader, met with the research coordinator to discuss the purpose and progression of the evidence-based project. Email was utilized to communicate questions and concerns. The team formalized the clinical problem and developed a PICOT question. The clinic provided HgA1C and referral data for each of their diabetic patients which was then analyzed by the DNP student and the results were provided to the team. In addition to analyzing the data, an extensive literature search was completed. As discussed in further detail in Chapter 2, the articles selected were appraised and the interventions were formulated based on the findings within the literature.

It was concluded that a written policy, point of care reminders delivered both verbally and on paper, and audit with feedback should be implemented. The written policy was composed and shared via discussion with each of the providers by the clinical research coordinator at their monthly meeting. The information was shared verbally and with paper handouts. The policy was also made available electronically and posted in all of the nurses' stations. After the clinical research coordinator met with the nursing staff, it was determined the best approach for implementing the point of care reminder would be for the nursing staff to deliver a verbal reminder to the clinicians. Though the literature search showed that paper point

of care reminders disseminated before the provider entered the room was most effective at changing behavior, it was determined by management that this would be too difficult for the nursing staff to accomplish. A paper reminder was provided to the nursing staff to be posted clearly in each nursing station. The nurses were instructed to provide verbal point of care reminders to the provider when they were entering the room of a diabetic patient not referred to CH diabetic education. The DNP student provided intermittent observation and reminders to ensure that the verbal reminders were being completed. Auditing of the referral rates by reviewing the electronic medical record was completed by the DNP student and clinical research coordinator biweekly. Feedback was then provided to each clinician individually via electronic messaging between the sixth and seventh week of implementation.

Comparison

The interventions discussed in the previous section were implemented to increase the referral rate of diabetic patients managed at the PCC to diabetic education at the CH. As of July of 2019, the referral rate was at 17.7% (Clinical Research Coordinator, 2019). The Office of Disease Prevention and Health Promotion (ODPHP) (2019) published a recommendation that all diabetic patient should be referred for formal diabetic education. ODPHP disseminated a goal of increasing diabetic education rates from 53.1% to 58.4% (Office of Disease Prevention and Health Promotion, 2019). The management at the PCC desired that all (100%) of diabetic patients be referred to formal diabetic education.

Outcomes

The provider referral rate of diabetic patients to the CH for diabetic education was the primary outcome evaluated. The secondary outcomes measured was determining the impact of a written protocol, paper point of care reminders, and audit with feedback for changing provider behavior. The data was collected by reviewing the electronic medical record. Each diabetic patient receiving primary diabetic management at the clinic was evaluated for a referral and linked to the clinician overseeing their care. The data was placed into an Excel spread sheet by

the clinical research coordinator and analyzed by the DNP student. Reliability and validity were assessed by using statistical analysis. The information was then stored in an electronic document with access only to the DNP student. The data was updated every 2 weeks.

Time

Before the protocol was disseminated at the staff meeting, the protocol was composed and reviewed by the clinical manager, clinical research coordinator, and the DNP student. The protocol was implemented over 12 weeks at the PCC. Implementation of the protocol and project began October 2nd, 2019 at the monthly staff meeting scheduled for that day. The protocol was introduced by the clinical research coordinator at this meeting and was disseminated via electronic messenger to all members of the care team. The DNP student prepared a summarization on a paper handout including the literature associated with the importance of diabetic education and the current referral rates. A paper copy of the summarization was distributed to each care provider. During the meeting, the clinical problem was identified by the clinical research coordinator and the interventions were explained. The protocol was utilized alone for 2 weeks. After 2 weeks, the nurses were provided with verbal instructions and paper reminders that were clearly posted in each nursing station. The nurses were also instructed to provide verbal point of care reminders. Between the sixth and seventh week of implementation, audit and feedback was provided to each clinician. All of the components were analyzed after 12 weeks.

Protection of Human Subjects

The DNP student completed the Collaborative Institutional Training Initiative (CITI) ethics training course prior to beginning this EBP project. Further information regarding the importance of maintaining ethical research and the Health Insurance Portability and Accountability Act (HIPPA) was provided by Valparaiso University and reviewed by the DNP student. The project was approved by the Valparaiso Institutional Review Board (IRB) committee on August 12th, 2019. Patient safety and anonymity was maintained by only recording the referral numbers, not

the patient identifiers, in the final data analysis. Provider anonymity was maintained in this publication by excluding any identifying information. The clinic manager was provided with a detailed list entailing each individual clinicians' referral numbers to be used for further research. The electronic records and spread sheets that included patient identifiers were only accessed at the PCC and remain password protected. Only the clinical research coordinator and the DNP student have access to this information.

CHAPTER 4

FINDINGS

The purpose of this EBP project was to increase the provider referral rates of diabetic patients from a PCC to a CH for formal diabetic education. The following PICOT question was addressed: for providers managing diabetic patients at the PCC, what is the impact of a written policy, point of care reminders, and individualized feedback at increasing provider referral rates of diabetic patients to the CH diabetic education, compared with no intervention?

This project was based on the recommendations from the ODPHP (2019) that all diabetic patients should receive formal diabetic education with a goal of 58.4% nationwide. Three interventions were implemented at the PCC. A protocol was written and disseminated to the providers and nursing staff at the start of the implementation phase. Two weeks after the protocol was disseminated, the nursing staff was trained to administer verbal point of care reminders to the clinicians prior to them providing care to a diabetic patient without a previous diabetic education referral. After 6 weeks of protocol and point of care reminder implementation, audit and feedback was provided by the DNP student and research coordinator to the providers regarding their current referral rates. The secondary outcome studied was determining the most impactful intervention of the three intervention plans.

Participants

As the management of the PCC clinic approved the protocol and interventions, all the primary care clinicians working at the PCC participated in the EBP project. In total, 11 providers participated in the EBP project including nine medical doctors (MDs) and two family nurse practitioners (FNPs). All nine of the MDs who participated in this project are certified by the American Academy of Family Practitioners. The two FNPs who participated in this project are certified by the American Association of Nurse Practitioners. The providers employed by the PCC have provided care at the facility for an average of 14.8 years, with a maximum of 32 years and a minimum of three years. The hours worked by the individual healthcare providers varied

from full-time (1.0 fte) to part-time (0.37 fte). Eight providers worked full-time and 3 providers worked part-time. The providers collectively cared for numerous diabetic patients per week including a minimum of 21 and a maximum of 69. Table 4.1 shows the characteristics of the eleven providers included within the study. Figure 4.1 shows the relationship of the providers' demographics. No providers dismissed themselves from the project, though the strength of individual interaction with the interventions significantly varied. No incentive or punitive action was provided by the DNP student or PCC management to promote adherence to the protocol or recommended interventions.

Table 4.1

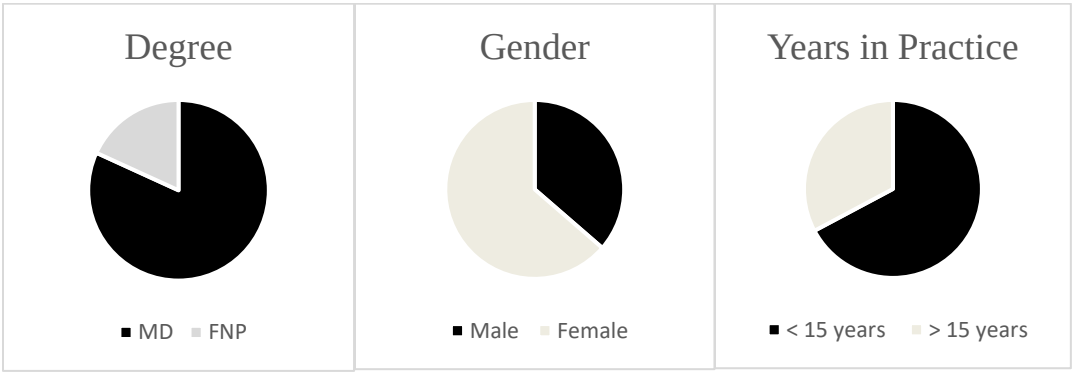
PCC Provider Characteristics

Provider Title	Certifying Body	Gender	Years in practice at PCC
MD	American Academy of Family Physicians	Male	24 years
MD	American Academy of Family Physicians	Male	32 years
MD	American Academy of Family Physicians	Male	30 years
MD	American Academy of Family Physicians	Female	14 years
MD	American Academy of Family Physicians	Female	28 years
MD	American Academy of Family Physicians	Female	6 years

MD	American Academy of Family Physicians	Female	8 years
MD	American Academy of Family Physicians	Female	4 years
MD	American Academy of Family Physicians	Female	12 years
FNP	American Association of Nurse Practitioners	Male	3 years
FNP	American Association of Nurse Practitioners	Female	3 years

Figure 4.2

Provider Characteristics



Changes in Outcomes

The PCC provides primary diabetic management for 1,433 patients (Clinical Research Coordinator, 2019). Only 266 patients (18.50%) had been referred to the CH for diabetic education since 2017 with 215 patients attending an educational session (Clinical Research Coordinator, 2019). As the interventions were utilized at the clinic for a 12 weeks period, diabetic referral data was gathered from the same 12-week period from one year prior (2018)

via chart audits to provide a comparison. During the same 12 weeks in 2018, the 11 providers included in the project provided diabetic management to a total of 611 patients. Of these 611 diabetic patients, 13.11% (n = 80) were referred to formal diabetic education at the CH. Figure 4.3 provides a detailed report of the weekly referral rates from the 12 weeks audited without interventions in 2018.

The interventions utilized in this EBP project were disseminated the week prior to data collection. Data collection started on a Monday and was continued for 12 continuous weeks. Data was gathered by the clinical research coordinator and the DNP student via chart audits. The data was stored in a secure spreadsheet and was only accessible to the DNP student and clinical research coordinator. A total of 541 diabetic patients were seen by the 11 providers during the 12 weeks of implementation. Of these 541 patients, 15.40% (n = 83) were referred to formal diabetic education at the CH. Figure 4.4 provides a detailed report of the weekly referral rates from the 12 weeks audited in 2019 with interventions in place. Figure 4.5 provides a visualization of the success of each of the three intervention strategies utilized over the 12 weeks of implementation.

Figure 4.3

Weekly Referral Rates in 2018 without Intervention

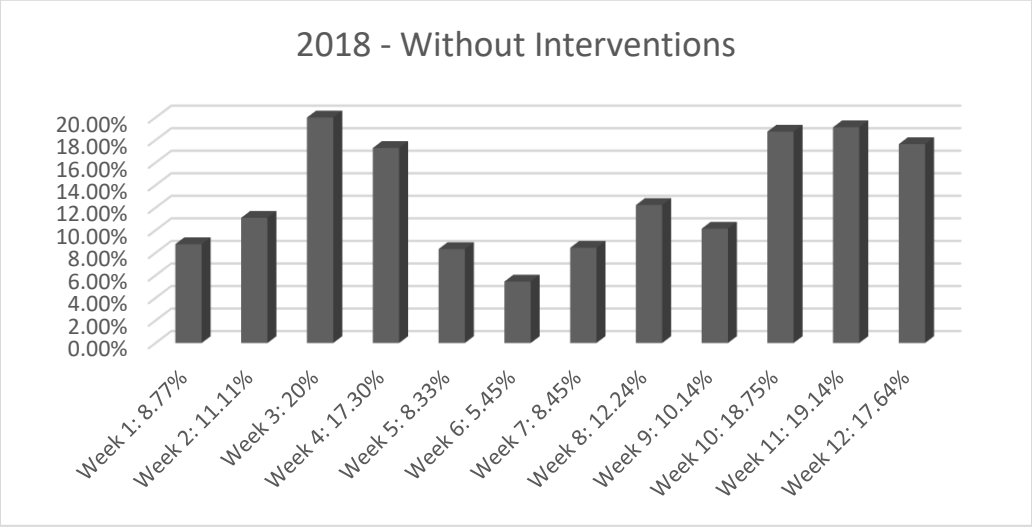


Figure 4.4

Weekly Referral Rates in 2019 with Intervention

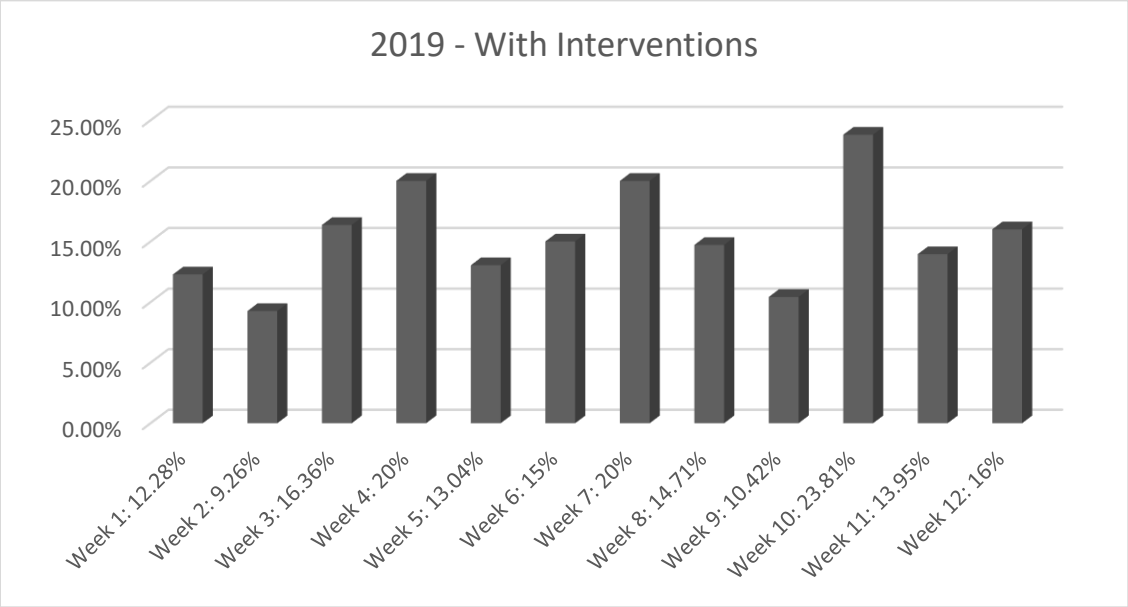
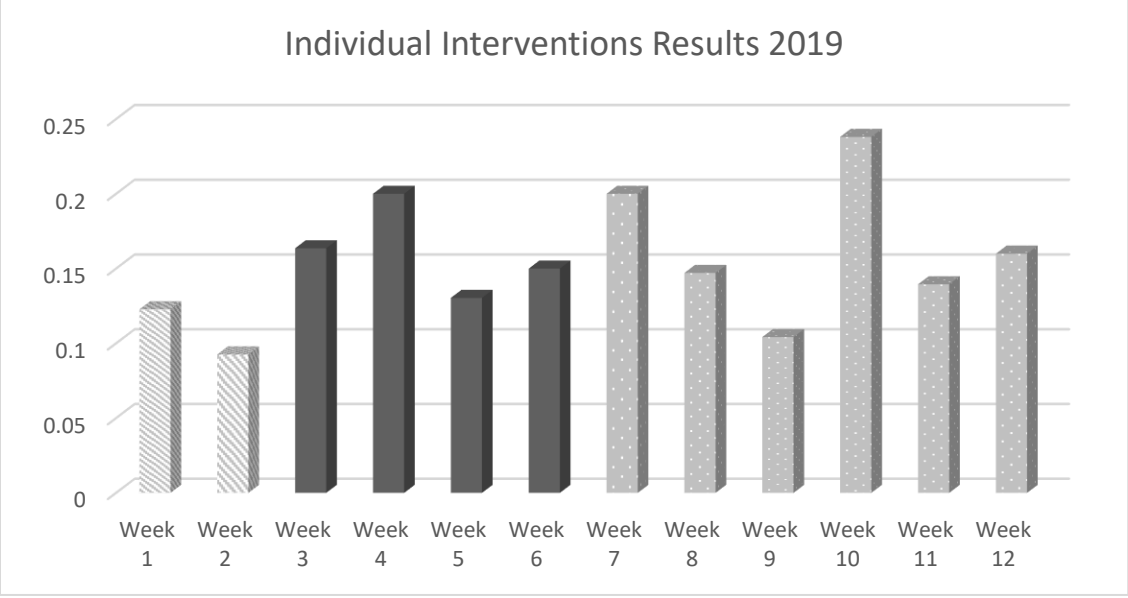


Figure 4.5

Weekly Referral Rates in 2019 Correlated to the Specific Intervention



Stripes = Protocol Only

Sold Fill = Protocol with Point of Care Reminders

Solid Fill with Dots = Protocol Only, Point of Care Reminders, and Audit with Feedback

Statistical Testing and Significance .

Following data collection, a Wilcoxon signed-rank test was utilized to determine primary outcome statistical significance. The Wilcoxon signed-rank test was chosen due to the small sample size and nonparametric approach. The Wilcoxon signed rank test's goal is to establish differences between variables from the same sample prior to, and following, an intervention by comparing the discrepancies between their ranks. The null hypothesis is that the median difference between the provider groups is zero. The mean for the pretest was 13.11 (sd = 5.12) and the mean for the post test was 15.40 (sd = 4.20). The Wilcoxon signed rank test showed that the data is statistically insignificant ($Z = 1.334$, $P > 0.05$). It was determined that a Chi-Square test would be unnecessary when comparing provider characteristics as the pre-intervention and post-intervention groups are exactly the same. Table 4.1 and Table 4.2 provide frequencies that display a visualization of these characteristic. The Wilcoxon signed-rank test was run using Statistical Package for Social Sciences (SPSS) after the weekly percentage of referral rates was transposed into the program. SPSS was provided through Valparaiso University with the data being secured within the university's secure database.

The secondary outcome was analyzed using a repeated measures Analysis of Variance (ANOVA). The repeated measure ANOVA was chosen as it assesses both the independent variable and the effect of intervention simultaneously. During weeks one and two, the protocol was used alone with a median referral percentage of 10.77 (sd = 2.13). The protocol and point of care reminders were used together during weeks three through six with a median referral percentage of 16.1 (sd = 2.57). A protocol point of care reminders, and audit and feedback were used together during weeks six through 12 with a median referral percentage of 16.48 (sd =

3.74). Though the referral percentage slightly increased, the results remained statistically insignificant (P > 0.017). The repeated measures ANOVA was run using SPSS after the weekly percentage of referral rates was transposed into the program.

Findings

Primary outcome. The primary outcome evaluated was the impact of providing a written protocol, point of care reminders, and audit with feedback to increase providers' referral rates of diabetic patients at a PCC over a 12-week period. The post-intervention referral percentage for the 12-week analysis in 2019 was 15.40%, which remained less than the ODPHP goal of 58.4% and the PCC's overall referral percentage between 2017 and 2019 (n = 18.50). The 12-week referral rate increase of 2.7% in 2019 compared with the 12- week referral percentage in 2018 was found to be statistically insignificant (p > 0.05).

Secondary outcomes. The secondary outcome evaluated was determining which intervention combination (a written protocol; written protocol with point of care reminders; written protocol, point of care reminders, audit with feedback) was most effective at increasing provider referral rates to formal diabetic education. The combination of all three interventions provided the most significant impact resulting in an increase in diabetic referral rates of 2.7% over six weeks. The overall difference between interventions was statistically insignificant (p > 0.017). Table 4.4 provides a visualization of the results of each intervention strategy. Chapter 5 will further discuss these findings in greater detail.

CHAPTER 5

DISCUSSION

In 2015, 30.3 million of Americans had DM with approximately 1.5 million diagnosed annually (American Diabetes Association, 2019a). Formal diabetic education has been shown to reduce hemoglobin A1C by 1-2% (Bluml, Kolb, & Lipman, 2019; Chrvala, Sherr, & Lipman, 2016). Based on this knowledge, the ODPHP issued a recommendation to significantly increase the number of DM patients who receive formal diabetic education. The DNP student completed an extensive literature review to determine the best evidence-based interventions with the intent of increasing diabetic education referrals at a PCC. The implemented interventions (protocol, point of care reminders, and audit with feedback) were conducted over 12 weeks in 2019, and the results were compared with the same 12 weeks in 2018. Between 2017 and 2019, the providers at the PCC had a diabetic referral rate of 18.50%. The conclusion of the study showed the total diabetic referral rate was increased from 12.7% during the 12 weeks in 2018, to 15.4% during the 12 weeks in 2019. The following discussion will outline the significance of these findings in relation to the ODPHP's recommendations while relating the findings to patient outcomes, financial impact, provider adherence, and patient compliance.

Explanation of Findings

The increase of diabetic education referrals has the potential to decrease HgA1C in the numerous DM patients with a current HgA1C greater than 8% located at the PCC. Though further research is recommended to establish the benefits of diabetic education within the specific population located at the PCC studied, previous non-specific research established a statistically significant HgA1C reduction resulting in decreased morbidity that may positively impact mortality in DM populations. The DNP student's findings can be correlated with multiple topics impacting quality patient care and outcomes. The variables of patient and provider demographics are also notable.

Primary Outcome

ODPHP's Recommendation

Though the referral percentage (15.40%) over the 12 weeks of implementation in 2019 was lower than the total PCC referral percentage (18.5%) from 2017 to 2019, an increase of 2.7% from the 12 weeks analyzed in 2018 is encouraging. However, the total referral percentage of 18.5% is significantly less than the ODPHP's recommendation of 58.4%. After statistical analysis, it was deemed that the interventions used within this EBP project to increase diabetic referral rates at the PCC resulted in statistically insignificant ($p = > 0.05$) improvement. To meet the guidelines set forth by the ODPHP, additional interventions or increased intervention time would be needed to significantly increase the overall diabetic referral rate at the PCC. In 2012, the national percentage of adults who reported receiving formal diabetic education in the United States was 53.1% with the concurrent years being 55.8% in 2013, 53.6% in 2014, 55.1% in 2015, and 51.7% in 2017 (ODPHP, 2019). To reach the goal of 58.4% set by the ODPHP, the providers at the PCC would need to increase their referral percentage by 39.9%. As the PCC currently manages 1,433 DM patients, the number of patients referred to formal diabetic education should be increased from 266 patients to 837 patients to meet the ODPHP recommendation. The interventions utilized within this study: a protocol; protocol with point of care reminders; and protocol, point of care reminder, and audit with feedback were unable to provide a statistically significant increase of diabetic education referrals to meet the desired goal.

Studied Population

The population studied included 9 MDs and 2 FNPs practicing at the PCC. The hours worked by the healthcare providers varied from full time (1.0 fte) to part-time (0.37 fte). Seven females and 4 males comprised the sample of providers included in the study. Individual provider referral rates were not calculated. The total number of referrals completed by FNPs compared with the MDs was calculated. There was a total of 14 (17.94%) referrals completed

by FNPs and 64 completed by MDs (82.6%). Throughout the extensive literature review prior to implementation, there was not a proven difference in the characteristics of provider type, gender, or years in practice. The same 11 providers were included in pre-intervention and post-intervention groups. An analysis of the diabetic patients' demographics managed by each provider type was not completed. As providers at the PCC often take add-ons and share patient populations, it is assumed that the patient demographics between providers remained similar throughout the study.

Secondary Outcome

Protocol

A written protocol was composed by the DNP student, clinic research coordinator, and PCC management. The protocol was disseminated by the clinical research coordinator at the monthly provider meeting and was sent to the providers via electronic messaging. The nursing staff was notified of the protocol by the DNP student through verbal communication and written handouts. The protocol was disseminated to the providers on a Friday and the data collection started the following Monday. The protocol, without any additional interventions, was utilized for two weeks with the intent of increasing diabetic referral rates. Multiple articles discussed earlier in the literature review recommended that a formal protocol be used, both independently and with additional interventions. Most commonly, the recommendation was to use a multi-pronged approach with point of care reminders and/or audit with feedback (Medevs et al., 2009; Moola et al., 2019; Yimei, 2018). After two weeks of implementing the protocol, the diabetic education referral percentage was 10.77% compared with 9.94% from the same weeks in 2018. This is an increase of 0.83%.

Protocol & Point of Care Reminders

After implementing the protocol for two weeks, a verbal point of care reminder was implemented in addition to the protocol. The verbal point of care reminders were administered by the nursing staff before the clinician entered the room of a diabetic patient. A paper reminder

was provided to the nursing staff posted clearly in each nursing station. The nurses were instructed to provide verbal point of care reminders to the provider when they were entering the room of a diabetic patient not previously referred to CH diabetic education. Though the use of paper point of care reminders were preferred based on the literature search, the clinic management and DNP student agreed that verbal point of care reminders would be more appropriate for the PCC due to workflow and nursing considerations. After four weeks of implementing the protocol and point of care reminders together, the diabetic education referral percentage was 16.10%, which is a 3.33% increase compared with 12.77% in 2018. Though it cannot be determined which intervention had the most impact, it is assumed the combination of multiple proven methods accounted for the increase of 2.50% more referrals compared with the protocol only. Arditi et al. (2012) provided a systematic review of 40 studies implementing point of care reminders both delivered on paper and via electronic devices with an average increase in absolute median improvement of 11%. Similar to Arditi et al. (2012), Shogania et al. (2011) completed a systematic review of 28 studies implementing electronic point of care reminders and found that the average increase in absolute median improvement in an outpatient setting was 3%. The total increase of 3.33% of diabetic referrals compared to 2018 was expected based on the literature review.

Protocol, Point of Care Reminders, & Audit with Feedback

All three interventions (protocol, point of care reminders, and audit with feedback) were used from week seven through 12 of implementation. The audit was completed by the DNP student and feedback was provided to the clinicians by the DNP student and clinical research coordinator. The use of a multi-pronged approach to promote adherence to clinical guidelines was recommended extensively throughout the articles examined during the literature review. Medves et al. (2009) completed a systematic review that examined the effectiveness of multi-pronged approach to increasing knowledge and practice outcomes. The study examined 88 studies from 1995-2007 and found that 72.7% of them were statistically significant at impacting

a desired goal when multiple interventions were utilized. The studies had an average increase in absolute median improvement from 3.2% to 70%. Within this EBP project, it was found that using all three interventions resulted in a diabetic referral percentage of 16.48%, which is an improvement of 2.09% from the 14.39% in 2018. The increase was lower than expected based on the literature review findings. However, this is an increase of 5.71% from the 10.77% of diabetic referrals with a protocol alone, and an increase of 0.38% from 16.1% of diabetic referral using a protocol and point of care reminders without audit with feedback. Though the overall findings of this project were determined to be statistically insignificant, the interventions were successful at increasing the provider referral rate to formal diabetic education when compared with the 12 weeks from 2018.

Strengths and Limitations of the DNP Project

Strengths

Project Design

The faculty at Valparaiso University were helpful in guiding the DNP student to formulate an appropriate PICOT question. The question was influenced by the PCC's needs and research coordinators requests. The research coordinator, clinical site advisor, and PCC management supported the EBP project and provided the DNP student with the appropriate data and guidance to plan and complete the EBP project. The literature review provided 9 high level articles that provided the foundation for this EBP project. The Melnyk and Fineout-Overholt (2015) Hierarchy of Evidence tool and JHNEBP Research Evidence Appraisal Tool were used to rank and level the 9 articles chosen. These resources were successful at establishing quality, pertinent, literature that was critical to establish evidence-based interventions. The use of electronic messaging provided an appropriate method for protocol and feedback dissemination to the providers at the clinic. The research coordinator graciously provided the DNP student with pre-intervention diabetic referral data from 2017-2019. The nursing staff at the clinic remained invested in the outcome of the EBP project and were a valuable resource to provide individual

clinician point of care reminders. Some of the providers at the PCC appeared optimistic throughout the project and provided valuable insight in the benefits and disadvantages of the interventions implemented. SPSS allowed the DNP student to successfully store, and analyze, the data gathered from the implementation phase. The DNP student's project advisor was invaluable due to her constant encouragement and constructive feedback.

EBP Model

The EBP model utilized in this project was the John Hopkins Evidence-Based Practice Model (JHNEBP). The JHNEBP model is a problem-solving, clinical decision-making, tool that was developed by John Hopkins University Hospital to assist healthcare providers to solve practical evidence-based questions (Johns Hopkins, 2019). As the model was designed by nurses for nurses, the model was a perfect fit for this EBP project. The JHNEBP model contains 19 steps that form 3 phases known as the PET process. The PET process contains three primary headings: practice question, evidence, and translation. Each of the 19 steps contained within the PET process provided the structure essential to the composition of quality EBP project. A personalized explanation of how the JHNEBP model was implemented in the EBP project is discussed in detail in Chapter 2.

Limitations

Project Design

Multiple challenges were encountered due to the diverse clinical environment at the PCC. The original protocol was disseminated at the PCC's monthly provider meeting. Not all the 11 clinicians were present at the meeting. The clinicians that were not present at the meeting received the protocol via electronic messaging, but there was no method of ensuring the information was read or understood. Similarly, the nursing staff was provided with personalized education from the DNP student and the point of care reminder guidelines were posted in the nursing stations. The DNP student followed up routinely ensuring protocol and point of care compliance. However, there was no way of ensuring that the nursing staff was implementing the

desired point of care reminders, or that the providers were receptive of them when the DNP student was not at the facility. Though paper point of care reminders instead of electronic point of care reminders were recommended throughout the literature search, the management at the PCC preferred using verbal point of care reminders delivered by the nursing staff. Previous studies showed that point of care reminders delivered on paper had the greatest positive outcome. Further research using paper point of care reminders is recommended to achieve the maximum intervention effect. Audit and feedback also proved challenging as the clinical advisor recommended that the DNP student only provide feedback to certain providers due to facility politics. The clinical research coordinator assisted the DNP student in providing feedback to the remaining providers. By multiple individuals providing feedback, the consistency of the content discussed was not ensured. Contrary to implementing the interventions for two weeks, four weeks, and six weeks, providing the interventions in four-week blocks would have ensured data consistency while resulting in a better understanding of the effectiveness of the specific interventions used. As behavior changes can take between 2 to 3 months to solidify, extending the intervention phase to 6 months would have provided adequate time for provider routine to develop.

Provider Interest

The amount of individual interest and adherence greatly varied among the 11 providers included in this study. Though individual referral rates were not routinely calculated, it was evident that specific providers regularly did not meet the expectations of the policy. No punitive action was provided by the PCC management nor was any incentive offered to increase the effectiveness of the project. Offering an incentive to adhere to the policy may have positively impacted the outcome of the interventions.

Implications for the Future

Practice

HgA1C

Formal diabetic education has been shown to reduce HgA1C by 1-2**%.** In the United States between 2013 and 2016, 50% of diabetic patients had an HgA1C greater than 7.0% with 22.3% between 7.0% and 7.9%; 13.2% between 8.0% and 9.0%; and 14.6% greater than 9.0% (National Diabetes Statistics Report, 2020). The complications associated with uncontrolled HgA1C are extensive. In 2016, 16 million emergency medicine visits were associated with hypoglycemia or hyperglycemia resulting in 41% of the patients being admitted to a tertiary care facility (National Diabetes Statistics Report, 2020). Chronic conditions including macrovascular conditions (cardiovascular disease, peripheral vascular disease, and stroke) and microvascular conditions (nephropathy, retinopathy, neuropathy) account for a significant amount of morbidity in the United States. Though the recommendations outlining HgA1C goals vary between 6.5% to 8%, there is complete agreement among governing bodies that maintaining a Hg1C greater than 8% can lead to complications increasing mortality rate among the diabetic population. Increasing referral rates to diabetic education could reduce HgA1C by 1-2%, therefore minimizing the risk of diabetic complications in the populace with HgA1Cs greater than 8%.

Financial

In 2017, the estimated direct and indirect costs associated with DM in the United States was 327 billion dollars annually (US Department of Health and Human Services, 2020). In Minnesota, the estimated costs was 4.4 billion dollars in 2012. Zhuo et al. (2013) found the lifetime associated costs with men who experienced type two diabetic complications was $124,700 if diagnosed between 25-44 years of age; $106,200 if diagnosed between 45-54 years of age; $84,000 if diagnosed between 55-65 years of age; and $54,000 if diagnosed at 65 years old or grater. Women had similar expenditures with a total lifetime cost of 130,800 if diagnosed between 25-44 years of age; $110,400 if diagnosed between 45-54 years of age; $85,500 if

diagnosed between 55-65 years of age; and $56,600 if diagnosed at 65 years old or grater. It is thought that the average initial visit cost of diabetic education is $335 and is projected to decrease mortality by 9% and microvascular complications by 15% among participants who complete the program (Ohsfeldt, 2005). Between 2012 and 2017, additional medical costs per individual that was associated with diabetic care in the United States increased from $8,417 to $9,601 (US Department of Health and Human Services, 2020). Increasing referrals to diabetic education by utilizing simple interventions such as protocols, point of care reminders, and audit with feedback has the potential to decrease diabetic complications reducing the cost of diabetic care in the United States.

Education Level

In the state of Minnesota, where this EBP project was implemented, approximately 7.8% of the population (n= 330,000) had been diagnosed with DM type one or two by 2017 (Minnesota Department of Health, 2018). Notably, 5.2% of adults in Minnesota who earned a college degree reported having DM while 8.9% of adults without a college degree reported having DM. Across the United States, 9.7% of adults with less than post-secondary education have been diagnosed with DM compared with 7.5% of individuals with post-secondary education (Source). The majority of health education is written between a 10th and 12th grade reading level. For individuals with any educational background, information at the 10th to 12th grade level (if unfamiliar with the verbiage and topic) can be difficult to understand. Improving formal diabetic education referrals to reach the ODPHP's goal can assist with providing individuals, regardless of their educational level, with a personalized understanding of the management strategies and lifestyle modifications needed to maximize their quality of life while minimizing diabetic complications.

Theory

A theoretical framework was not used in the construction of the EBP project due to Valparaiso University's recommendations and guidance. The JHNEBP was used to form the

foundation of the DNP student's project. A theoretical framework assists with understanding the background and causation of a research question. Future EBP projects should consider utilizing a theoretic theory to assist with relating EBP results to the broader areas of clinical science.

Research

Additional research is recommended to establish the long-term impact of the interventions (protocol, point of care reminders, audit with feedback) at increasing the PCC's provider referral rates to formal diabetic education at the CH. Data was not collected to assess patient compliance once referred to formal diabetic education, or the impact of diabetic education at the CH on individual HgA1C. A longitudinal study is recommended to evaluate the long-term impact of the interventions, patient compliance, and HgA1C reduction. Further studies are recommended to examine the significance of face-to-face formal diabetic education compared with written diabetic educational material provided by primary care providers.

Education

The use of a protocol, point of care reminders, and audit with feedback did not produce a statistically significant increase in PCC provider referral rates to formal diabetic education ($p = > 0.05$). Despite this finding, all three interventions have previously been successfully utilized to improve provider adherence to clinical guidelines in multiple high-level studies. If further studies are completed that show statistically significant results at increasing provider referral rates to formal diabetic education, the results should be disseminated to both clinicians and individuals in healthcare management. The importance of diabetic education should be emphasized in primary education for healthcare providers, and their continuing education after certification.

Conclusion

Three intervention phases including an initial protocol; a protocol with point of care reminders; and finally a protocol, point of care reminders, and audit with feedback were implemented at a PCC over a 12-week period in 2019. The interventions were selected based on an extensive literature review with the goal of increasing the PCC provider's formal diabetic

referral rate based on the Office of Disease Prevention and Health Promotion's diabetic recommendations. The results were compared to the same 12 weeks in 2018. It was determined that despite an increase in 2.7% from the 2018 referral numbers, the interventions had a statistically insignificant impact. A combined intervention using a protocol, point of care reminders, and audit with feedback was the most successful at increasing referral rates to diabetic education. An additional EBP project spanning greater than 6 months is recommended to further evaluate the intervention outcomes.

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BIOGRAPHICAL MATERIAL

Mr. Rokser graduated from Bemidji State University with a Bachelor of Science in Nursing (BSN) in 2015. He was employed in multiple critical care settings, including surgical and medical intensive care, before returning to Valparaiso University in 2017 to earn a Doctor of Nursing Practice (DNP). With an interest in shaping the future of nursing, he is also employed as an adjunct faculty member at Lake Superior College where he teaches nursing pharmacology, nursing skills, and clinical simulation. His desire to pursue a career in healthcare stems from his experience as a sibling of a twin diagnosed with cerebral palsy. The impact of the healthcare providers who surrounded his sister throughout his childhood instilled the values of compassion, empathy, honesty, and professionalism that form of the foundation of his current care approach. Mr. Rokser aspires to practice in family medicine or emergency medicine and has an interest in medical missions.

ACRONYM LIST

AANP: American Association of Nurse Practitioners

ANOVA: Analysis of Variance

APRN: Advance Practice Nurse

DM: Diabetes mellitus

DNP: Doctor of Nursing Practice

EBP: Evidence based practice

FNP: Family nurse practitioner

CH: Community hospital

CINAHL: Cumulative Index of Nursing and Allied Health Literature

HgA1C: Hemoglobin A1C

HIPPA: Health Insurance Portability and Accountability Act

IRB: Institutional Board Review

JBI: Joanna Briggs Institute

JHNEBP: Johns Hopkins Nursing Evidence Based Practice

MD: Medical doctor

MEDLINE: Medical Literature Analysis and Retrieval System Online

ODPHP: Office of Disease Prevention and Health Promotion

PCC: Primary care clinic

RCTs: Randomized control trials

SPSS: Statistical Package for Social Sciences