5-7-2012

The Use of Provider Audit and Feedback on Improving Hypertension Control in the Type 2 Diabetic Population

Kara Painton
Valparaiso University

VALPO

THE USE OF PROVIDER AUDIT AND FEEDBACK ON IMPROVING HYPERTENSION CONTROL IN THE TYPE 2 DIABETIC POPULATION

by

KARA PAINTON, MSN, RN, FNP-BC

EVIDENCE-BASED PRACTICE PROJECT REPORT

Submitted to the College of Nursing

of Valparaiso University,

Valparaiso, Indiana

in partial fulfillment of the requirements

For the degree of

DOCTOR OF NURSING PRACTICE

2012

Kara Painton 5/6/12
Student Date

[illegible] 5/7/12
Advisor Date

ACKNOWLEDGMENTS

Julie Koch, DNP, RN, FNP-BC for her support and patience throughout this journey. I would not have survived without her wisdom and guidance.

TABLE OF CONTENTS

Chapter **Page**

ACKNOWLEDGMENTS……………………………………………………..……….. iii

TABLE OF CONTENTS ……………………………………………….……….. iv

LIST OF TABLES…………………………………………………………………..v

ABSTRACT……………………………………………………….……….…..… vi

CHAPTERS

CHAPTER 1 – Introduction………………………………….……………….1

CHAPTER 2 – Theoretical Framework and Review of Literature …..…….7

CHAPTER 3 – Method………………..……………………………………...30

CHAPTER 4 – Findings……………………………………………………….38

CHAPTER 5 – Discussion………………...………………………………….51

REFERENCES……………………………………..………………...…………...59

AUTOBIOGRAPHICAL STATEMENT…………..…………..……………………63

ACRONYM LIST………………………………..………………..……………64

APPENDICES

APPENDIX A – Evidence Data Table……..…………………………...…66

APPENDIX B – Standardized Audit and Feedback Procedure…………..70

APPENDIX C – Diabetic Blood Pressure Intervention Worksheet……….73

LIST OF TABLES

Table **Page**

Table 4.1 Patient Demographic Data per Provider……………………………….42

Table 4.2 Primary Provider Demographic Data………………………..............43

Table 4.3 Pre-intervention Blood Pressure Control per Provider………………..44

Table 4.4 Post- intervention Blood Pressure Control per Provider……………...45

Table 4.5 Paired Sample *t*-tests (2-tailed) and Change of SBP and DBP Post Intervention……………………………………………………………………..46

ABSTRACT

As the seventh leading cause of death, diabetes affects more than 25 million Americans and contributes to major cardiovascular diseases and complications (CDC, 2011). The cost of care for these Americans is astounding: $174 billion dollars was spent on diabetes care in 2007 (ADA, 2011). Furthermore, an estimated 75% of patients with type 2 diabetes have concomitant hypertension, and nearly one-half of these patients have uncontrolled hypertension (Thomas & Kodack, 2011; USDHHS, 2011). An initial chart audit at an outpatient, rural clinic in east central Illinois revealed that 90% of the type 2 diabetic population had concomitant hypertension, and only 57% of these patients had controlled blood pressure ($\leq$ 130/80 mmHg). The purpose of this EBP project was to determine the effectiveness of provider audit and feedback for improving blood pressure control in the type 2 diabetic population. Rogers' Diffusion of Innovation and the Promoting Action on Research Implementation in Health Services (PARIHS) framework were used to guide this EBP project. Six providers received individual 20-minute verbal feedback in September 2011 regarding chart audit results of blood pressure control in their diabetic patients. The session detailed benchmarks and included strategies for achieving these benchmarks within the next four months. After four months, a repeat chart audit of the 134 diabetic patients was obtained. Chi-square analysis and frequencies were used to compared the percentage of the patients (mean age = 62.99 years; 48.1% male) who achieved blood pressure control pre and post intervention. Overall, an additional 24 clinic patients achieved systolic control (17.9%) and 17 patients achieved diastolic control (12.7%) following the intervention. However, statistical analyses revealed that the changes within systolic blood pressure control ($X = 15$, $p = 0.088$) and diastolic blood pressure control ($X = 14.61$, $p = 0.024$) within the clinic and among individual providers were not statistically significant.

Keywords: *audit and feedback, diabetes, hypertension*

CHAPTER 1

INTRODUCTION

Diabetes affects more than 25 million Americans, a rapidly increasing statistic as 1.9 million adults were newly diagnosed in 2010 (Centers for Disease Control and Prevention [CDC], 2011). Researchers project that approximately one-third of Americans born after the year 2000 will develop type 2 diabetes (Williams et al., 2009). Diabetes has led to major cardiovascular diseases and complications and has resulted in nationwide treatment costs of nearly $200 billion in 2007 (American Diabetes Association [ADA], 2011). Diabetics have two to four times the risk of heart disease and stroke as compared to those without diabetes (LaMarr, Valdez, Driscoll, & Ryan, 2010). Furthermore, a recent study revealed that more than 40% of patients with end stage renal failure were diabetic (Pappoe & Winkelmayer, 2010). In addition to these morbidity statistics, diabetes results in a significant increase in mortality, as the seventh leading cause of death (CDC, 2011).

In comparison, hypertension affects one of every three adults in the United States, presenting an additional economic impact of more than $73 billion in treatment costs in 2009 (Fitzgerald, 2011). This impact has been compounded by the co-existence of diabetes; experts estimate that 75% of patients with type 2 diabetes also have hypertension (Thomas & Kodack, 2011). Elevated blood pressure in the diabetic population has been correlated with an increased risk of major cardiovascular events and death (CDC, 2011; Fitzgerald, 2011). Macrovascular complications from the combination of hypertension and diabetes include heart failure, stroke, and myocardial infarction. Microvascular changes include retinopathy and renal failure (Fitzgerald, 2011). Therefore, it is of utmost importance to control blood pressure to prevent or minimize the risk of microvascular and macrovascular complications associated with combined hypertension and diabetes.

Because of the increased morbidity and mortality associated with concomitant diabetes and hypertension, the ADA and the American Heart Association (AHA) have established guidelines for blood pressure control in patients with diabetes. The ADA and AHA have recommended a target systolic blood pressure of no greater than 130 mmHg and a diastolic blood pressure of no greater than 80 mmHg (ADA, 2011; AHA 2010). Maintaining blood pressures at these targeted levels has been shown to reduce the risk of microvascular complications by 33% and macrovascular complications by 33 to 50% (CDC, 2011; LaMarr et al., 2010). Furthermore, the CDC (2011) noted that each 10 mmHg reduction in systolic blood pressure resulted in a 12% reduction in risk for microvascular and macrovascular complications. Because of an additive effect, reducing the diastolic pressure from 90 mmHg to 80 mmHg reduced the risk of developing a major cardiovascular event by 50% (CDC, 2011).

Furthermore, specific antihypertensive agents have been shown to be effective in controlling blood pressure and reducing the risk of vascular disease; these include the use of an angiotensin converting enzyme inhibitor (ACEI) or an angiotensin receptor blocker (ARB) (CDC, 2011; LaMarr et al., 2010). Because of the overwhelmingly positive findings of numerous clinical trials, the ADA and the AHA have developed standards of care for diabetics with hypertension, noting that a systolic blood pressure of greater than 130 mmHg or a diastolic blood pressure of greater than 80 mmHg should be treated with an ACEI or an ARB (ADA, 2011; AHA, 2010). Using an ACEI or an ARB has been shown to reduce proteinuria by 35%, thereby reducing the risk for the development of chronic kidney disease and slowing the progression of nephropathy (CDC, 2011; Heart Outcomes Prevention Evaluation [HOPE] Study Investigators, 2000; National Kidney

Foundation [NKF], 2010). Within the HOPE study, the use of an ACEI reduced the risk of major cardiovascular complications by 25 to 30% (HOPE Study Investigators, 2000).

Statement of Problem

Although the impact of diabetes and concomitant hypertension on the nation's healthcare has been well documented, the problem has also been apparent on a regional and local level. Within Illinois, an estimated 67% of adults had hypertension and diabetes (CDC, 2009). In 2008, 7.4% of the population in Coles County, Illinois had diabetes (CDC, 2011). An initial chart audit at a rural, outpatient clinic in east central Illinois revealed that approximately 5% of the total adult patient population receiving regular care had diabetes; approximately 90% of these patients had concomitant hypertension.

The National Health and Nutrition Examination Survey (NHANES) revealed that, during the period from 2005 to 2008, only 51.8% of adults aged 18 and older with diagnosed diabetes had their blood pressure controlled (U.S. Department of Health and Human Services [USDHHS], 2011). More recently, the CDC reported that 67% of adult diabetic patients had blood pressures greater than 140/90 mmHg or were taking prescription antihypertensive medications (CDC, 2011). Based on these data, the USDHHS established the Healthy People 2020 goal of at least 57% of diabetics nationwide meeting the well-established blood pressure target (130/80 mmHg or less), a 10% increase above the Healthy People 2010 goal (USDHHS, 2011).

As reflected by these statistics, improvements in outpatient care are needed to help the nation meet and surpass the Healthy People 2020 goal. Yet, healthcare providers face multiple challenges to meet the quality measures developed for diabetic patients with concomitant hypertension. It is important for primary care providers to follow evidence-based clinical practice guidelines outlined by the ADA and AHA in order to improve the quality of care given to patients. Thus, primary care providers need to make significant changes to improve blood pressure control in the diabetic population, including the use of an ACEI or an ARB when appropriate.

Clinical Agency Data

The clinic in which this evidence based practice (EBP) was implemented has been designated as a not-for-profit, branch of a large healthcare organization caring for thousands of central Illinois residents (Medical Director, personal communication, May 20, 2011). The clinic has served thousands of local residents and provides holistic care to people of all ethnicities and insurances. The clinic has provided care to more than 500 diabetic patients (Medical Director, personal communication, May 20, 2011). At the time of project implementation, there were 10 providers at the clinic who treated adults with type 2 diabetes. Four were advanced practice providers (APPs): two family nurse practitioners and two physician assistants. Three physicians specialized in internal medicine and had the largest diabetic patient population, with a total of 352 diabetic patients with hypertension. The remaining three providers were family practice physicians who had a total of 108 type 2 diabetic patients. The APPs have collaborated with the physicians, sharing in the care of the patients in their physicians' practices. Individual data collection on the APPs care was not possible as each APP's charting was maintained under the collaborative physician. One physician assistant (PA) was paired with a family physician, while the other PA was paired with an internist. One family nurse practitioner (NP) cared for multiple physicians' diabetic patients, though she primarily specialized in gynecological care. The remaining NP (the project facilitator) was paired with an internal medicine physician.

An internal chart audit conducted to evaluate clinical practices in February 2011 revealed that only 45% of diabetic patients within the entire organization had documentation of controlled blood pressure. At the time of the audit, controlled blood pressure was defined by organizational goals as a blood pressure less than 130/80 mmHg in patients younger than 65 years of age and less than 140/80 mmHg in patients 65 years of age and older. Data collected were reflective of the most recent office visit with a diagnosis of diabetes and hypertension. The overall data collected within the clinic for this EBP were slightly more positive than the data from the February 2011 audit; 57% of diabetic patients had documentation of a blood pressure reading meeting the organization's well-established goals. This EBP's audit data also differentiated between physicians' practices, revealing that two (an internist and a family physician) of the six physicians exceeded the Healthy People 2020 goal with 73% and 65%, respectively, of their patient's having documented blood pressures in the targeted range. Both of these physicians had an APP (a PA paired with the family physician and an NP paired with the internist). Yet, chart documentation of the remaining four physicians reflected that blood pressure goals were met in less than one-half of their diabetic patient population. There was no statistical difference in blood pressure goal attainment between specialties; the entire six internal medicine and family physicians had an overall mean of 57% of their diabetic patients with controlled blood pressure. Although the clinic providers, when evaluated as a group, had met the Healthy People 2020 goal, there remained room for improvement within individual provider practices. In addition, the clinic's medical director had expressed the need to significantly reduce morbidity and mortality within the diabetic population cared for in the clinic. The medical director established a clinical goal of having 75% of hypertensive diabetics meet the AHA and ADA targeted blood pressures by the end of the project. (Medical Director, personal communication, May 20, 2011). The medical director noted that healthcare providers at the clinic needed to be more aggressive in treating hypertension in the diabetic population (Medical Director, personal communication, May 20, 2011). Therefore, an effective intervention was needed to improve blood pressure control within the entire clinic population and to target the providers who were not meeting the goals.

Purpose of the Evidence Based Project

This evidence-based practice project was designed to improve patient quality of care and reduce overall morbidity and mortality by improving blood pressure control in the diabetic population at the clinic. After reviewing the standards of care that were not being met at the clinic, a PICOT format was used to guide the project. This EBP project was designed to answer the following PICOT question: In diabetic patients with hypertension, what is the effect of audit and feedback on improving blood pressure control, compared with current practice, within a four month period of time?

Significance of the Project

Diabetes is an expanding problem in the United States. More than 11% of the total adult population, 25.6 Million Americans, have diabetes; nearly one-half of these diabetic patients have uncontrolled hypertension (USDHHS, 2011). The cost of care to these Americans is astounding: $174 billion dollars was spent on diabetes care in 2007 (ADA, 2011). Because of the societal cost, as well as individual mortality and morbidity, further focus on diabetes and concomitant hypertension is warranted. To improve quality and provide holistic care to the diabetic population, healthcare providers need to incorporate an effective strategy for reducing blood pressure, thereby reducing morbidity and mortality. The Advanced Practice Nurse (APN) is in a prime position to affect practice changes that will achieve these goals. This EBP project will provide additional depth to the current body of knowledge regarding the use of audit and feedback in primary care settings. Results may be used by other APNs and healthcare providers to improve patient outcomes.

CHAPTER 2

THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE

Theoretical Framework

The proposed practice change was guided by Rogers' diffusion of innovation (DoI). Rogers' framework was developed in the 1940s when researchers at Iowa State University sought to understand the slow adoption rate of drought resistant hybrid corn by farmers (Carboneau, 2005). Since then, Rogers' model has become well known and used in multiple disciplines, including nutrition, marketing, public health, and healthcare (Rogers, 2003). Rogers' DoI model has incorporated four main elements to represent the process of diffusion of innovation: (a) social system, (b) communication channels, (c) time, and (d) innovation (Rogers, 2003). Social system has been defined as a border in which individuals or organizations work together to solve problems and accomplish goals. Rogers (2003) noted that a communication channel is the means by which information and innovation is shared in order to reach mutual understanding. Interpersonal communication has been identified as the most effective way of influencing adoption of an innovation (Rogers, 2003). The innovation-decision period has been defined as the length of time required to pass through the innovation-decision processes; the inclusion of the key element of time is considered a strength in this model, compared to other models of change that do not incorporate this component (Rogers, 2003).

Rogers' four elements (social system, communication channels, time, and innovation) were readily apparent within the designated location of this EBP. The social system within the healthcare clinic had been a cohesive organization of providers who worked well together. The providers had sustained one main focus: improving patients' health and quality of care. Because of this focus, monthly meetings had been scheduled to discuss quality issues; time was allotted for problem solving. The atmosphere within the meetings facilitated opening the communication channels between the medical director and the providers, enabling the group to reach a common goal. Consistent with the clinic's group dynamics, Rogers (2003) defined provider to provider communication as (a) the most effective level of communication and (b) the type of communication most likely to influence change. Within this designed project, the innovation was the use of provider audit and feedback to improve blood pressure control in the type 2 diabetic population; the time for the innovation was limited to a period of four months.

An innovation has been described as an idea or project that is created and has five characteristics: (a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability (Rogers, 2003). Rogers (2003) has further defined these five intrinsic characteristics of innovations that influence an individual's decision to adopt or reject an innovation. Relative advantage is the perception that the new innovation is better than the current standard. Compatibility is the perception that the innovation is a good fit (a) into the organization and (b) with individuals in the social system. Complexity focuses on the level of difficulty of the innovation in regards to learning and practice. Trialability refers to the ability to pilot an innovation on a small scale. Observability is the ability to see obvious results from implementing the innovation.

In addition, the five intrinsic characteristics (relative advantage, compatibility, complexity, trialability, and observability) of an innovation within Rogers' (2003) model were incorporated into this EBP project. At the time of project implementation, the current standard of care was not consistent with the clinic's goal of high quality care or with the ADA, NKF, or the AHA guidelines for blood pressure control in the diabetic population. Therefore, the relative advantage of using audit and feedback as a new innovation into the practice was anticipated to be better than standard treatment. This project facilitator determined that the intervention was compatible with the current social system, as audit and feedback was already being used by the medical director for other quality improvements in the clinic, had been shown to be successful and useful, and had demonstrated effectiveness in changing provider behavior. This project was of low complexity. The intervention of audit and feedback was simple, easily understood by the providers, and required no additional training. Blood pressure changes were recorded during patient visits and readily retrieved from the electronic medical record (EMR) after implementing the innovation, which created high observability for audit and feedback. This EBP project was designed as a pilot study conducted using a relatively small sample of specific patients with diabetes; the use of a pilot project was consistent with Rogers' definition of trialability.

Rogers (2003) also noted that the entire innovative-decision process involves evaluating and processing information about the innovation and reducing any uncertainty. Thus, the process has been identified as a type of decision-making that occurs through a series of communication channels over a period of time among members of a similar social system. Rogers (2003) identified five stages or steps to this process: (a) knowledge, (b) persuasion, (c) decision, (d) implementation, and (e) confirmation. Rogers opined that although an individual (or facilitator within an EBP project) could reject an innovation at any time during or after the adoption, conditions would need to be considered (i.e., examining current practice and finding any needs or problems) prior to entering the five-step process; following these considerations, the individual would enter the knowledge stage of the model. Within the knowledge stage, the facilitator would need to have an awareness of the innovation which can be used to motivate others to learn about the innovation and adopt the change. Another essential component of the knowledge stage has been identified as understanding why the innovation works as designed, thus facilitating the proper use of the innovation. Once the knowledge has been obtained, the facilitator may then proceed to the second step, the persuasion stage. Within the persuasion stage, the facilitator would develop a favorable or unfavorable attitude towards the innovation. Based on this attitude, the innovation would either be adopted or rejected. The implementation stage has been defined as the period in which the innovation is put into practice. In the final stage, the individual would evaluate the results of the innovation and look for support. The decision to adopt the innovation could be reversed if others in the group did not support it.

The stages described, similar to those of many other change theories, have been integrated into this EBP project. A need has been identified to improve blood pressure control in type 2 diabetic patients. Research has demonstrated the effectiveness of audit and feedback in improving healthcare guidelines, as well as how to best incorporate the intervention of audit and feedback into practice. The project facilitator was able to persuade the providers to accept the innovation. The intervention was then initiated and later evaluated to determine if audit and feedback was effective in changing provider behavior targeting improving patient blood pressures. If audit and feedback was determined to be successful within this project, it was anticipated that audit and feedback could be used in improving other quality measures within the clinic.

Strengths of using Rogers' DoI model for this EBP project were apparent. Rogers' DoI model can be applied to different specialties with varying problems and needs. Rogers' DoI was initially used for a communication theory and now has been used to provide direction for topics in agriculture, technology, and healthcare. The model's generalizability has been helpful in manipulating it to fit for certain needs. The model has been identified as easy to follow and understand.

A major limitation of using Rogers' DoI reported in the literature is that the steps within Rogers' model are linear; researchers have noted that the model is not flexible (Dopson, FitzGerald, Ferlie, Gabbay & Locock, 2010). Instead, the steps in the process are dependent upon the previous ones, so they cannot be skipped and no more than one step can be applied at a time. Thus, Rogers' DoI model has been viewed as more rigid than other change models. Another limitation of the DoI model identified by previous researchers is that different terms and phrases need to be explained in order to (a) be able to use the model properly and (b) completely understand the workings of the model; for example, it is imperative to define the four main elements and explain how they work together (Dopson, et al., 2010). Within this EBP project, the major limitation of using Rogers' DoI was that the timeframe for project completion may limit the project facilitator's ability to fully evaluate the innovation.

Evidence-based Practice Model

The Promoting Action on Research Implementation in Health Services (PARIHS) framework was also used to guide this EBP project. The PARIHS framework represents a function of the relationships among evidence, context, and facilitation (Rycroft-Malone, 2004). Rycroft-Malone (2004) stated that for successful implementation of evidence requires clarity among the (a) evidence used, (b) quality of context, and (c) type of facilitation needed to create a successful change process. Evidence within the literature reviewed for this EBP project revealed that audit and feedback is a practical and useful intervention in changing provider practice and patient outcomes, but the EBP change needs to match professional agreement and patient quality care. The evidence was incorporated in the project in order to change current practices to improve quality of care in diabetes. The context needed to be receptive to change with the use of transformational leadership and appropriate evaluation and feedback system. The project facilitator strived to be a transformational leader in improving patient outcomes by improving blood pressure control in the diabetic population. The leader promoted clinical guidelines to current providers at the clinic to improve quality care and patient outcomes. Therefore, the PARIHS framework as a link to reconnect research into practice (Rycroft-Malone, 2004) was an appropriate guide for this EBP project.

The PARIHS framework has been compared to Rogers' DoI model (Kitson, et al., 2008), the theoretical model of change guiding this project. Both the PARIHS framework and Rogers' DoI model incorporate transformational leadership qualities to incorporate needed change in practice through best evidence-based research. During project implementation, the facilitator worked to change the social system and the team members' standards of patient care to promote clinical practice excellence. Consistent with the recommendations of Rogers' DoI and the PARIHS framework, evaluation was needed to determine whether the new intervention and outcomes were appropriate and useful to the current practice. The project facilitator recognized that the evaluation stage would ultimately determine if audit and feedback was a sustainable intervention for the practices. Another similarity recognized between the PARIHS framework and Rogers' DoI model was that both could be applied to many different types of projects and many different specialties (Kitson et al., 2008); this applicability was important with the targeted implementation site as there were varied providers within the clinic: physician's assistants, nurse practitioners, family practice physicians, and internal medicine specialists.

Literature Search

A comprehensive search was obtained to find the best evidence-based research using audit and feedback to improve blood pressure control in the diabetic population. The databases searched included CINAHL, Proquest Nursing and Allied Health Source, Medline via EBSCO, and Cochrane library. Key words included "audit and feedback", "diabetes and/or hypertension", "benchmarking", and provider performance measurement. An initial web-based review of available resources revealed a limited number of recent key articles within the past five years; therefore, no time frame stipulation was used for the comprehensive search. Searches focused on systematic reviews, meta-analyses, randomized controlled trials (RCTs), evidence-based clinical practice guidelines, non-randomized controlled trials, case control studies, qualitative studies, and descriptive studies. A search of the CINAHL database using “audit and feedback” and diabetes resulted in 12 articles. A search of Medline database using the same keywords yielded 27 results. Searching Proquest database resulted in 190 articles. A search of Cochrane database yielded 13 results; ten of these articles were duplicates. Another search in those same databases using the key words “audit and feedback” and “hypertension” resulted in a total of 192 articles; of these, more than 50 articles were duplicates of articles obtained from previous searches. After reviewing abstracts of the 370 yielded articles, 75 full text articles were obtained for further evaluation.

The inclusion criteria for full text article evaluation included articles (a) written in English (b) using adult subjects, (c) focusing on provider change, performance measurement, and patient outcomes, (d) involving diabetes or hypertension, and (e) including audit and feedback as an intervention. Articles were excluded from further evaluation if the intervention (a) included computer generated audit and feedback or (b) focused on type 1 diabetes. Using these inclusion and exclusion criteria limited the applicable data to a total of 35 articles. A hand search of the reference lists of the 35 articles was also undertaken. Four additional articles, including three RCTs and one systematic review were obtained from this search. An additional search for clinical guidelines was completed through the websites of the ADA, AHA, NKF, and National Guideline Clearinghouse. No further research articles were obtained from this search.

The full text of each of these articles was read and evaluated in depth. Of the 39 articles reviewed, 29 were eliminated because they did not fit the above criteria or did not support the use of audit and feedback in improving quality measures in diabetic patients. A total of 10 articles, (two systematic reviews, one meta-analysis, four RCTs, one non-RCT, one integrative review, and one retrospective descriptive study) provided evidence that audit and feedback was a useful and evidence-based approach to changing provider behavior and improving blood pressure control and other diabetic measurements. In addition to the literature based evidence, the medical director of the clinic, who is also an internal medicine physician, provided support for the use of audit and feedback (Medical Director, personal communication, July 15, 2011) The director opined that audit and feedback had been the most effective method in changing provider behavior, especially in regards to charting in a timely manner, charging appropriately, and increasing production (Medical Director, personal communication, July 15, 2011).

Appraisal of Relevant Evidence

Melnyk and Fineout-Overholt's (2011) rating system for the hierarchy of evidence was used to divide and further analyze the research articles. Level 1 evidence includes systemic reviews or meta-analysis of RCTs or EBP. Level 2 includes evidence from at least one RCT. Level 3 is evidence obtained from well designed controlled trials without randomization. Level 4 is evidence from well designed case control or cohort studies. Level 5 includes systemic reviews of descriptive and qualitative studies. Level 6 includes evidence from a single descriptive or qualitative study. Level 7 evidence reflects the opinion of authorities or reports of expert committees.

Level I

Hysong (2009). Hysong (2009) used a meta-analytical method to examine the audit and feedback characteristics that contributed to intervention effectiveness when audit and feedback was used by primary care providers. These characteristics included (a) the content of the feedback, (b) the nature of the task or clinical performance, and (c) situational and personality variables. Hysong used Kluger and DeNisi's Feedback Intervention Theory (FIT) to determine what made feedback successful. The FIT framework, from organizational psychology, applied audit and feedback in healthcare and provided clarity in which audit and feedback could be better understood and evaluated. The researcher re-examined the articles from Jamtvedt (2005), a Cochrane systematic review, and initiated an additional search using the same criteria. A total of 122 studies from the Jamtvedt systematic review plus an additional 397 studies found from 2005 to 2009 were evaluated. Hysong included RCTs that objectively measured clinical performance and healthcare outcomes in the healthcare setting. The main focus of the studies examined was audit and feedback. Of the initial 521 studies evaluated, only 19 studies met criteria and were included in the final analysis. Within the final meta-analysis, Hysong evaluated three main areas of feedback: (1) feedback content ([a] if providers received their personal audit data, [b] if that datum was compared to their peers' performance, and [c] if goals were described), (2) feedback format (feedback given verbally, via computer, written, in a group, or individually), and (3) feedback frequency (how many times feedback was given in a certain period of time).

Meta-analytic procedures were used to calculate a mean effect size, with 95% confidence interval (CI), for the impact of audit and feedback on outcome performance using a random effects model. Cumulative analyses and Egger's regression test were used to evaluate for potential bias. Rosenthal's failsafe N was used to test for publication bias.

Hysong (2009) calculated an effect size estimate of 0.40, suggesting that audit and feedback had a moderate to significant effect on clinical outcomes (95% CI, [$\pm$ 0.20]). Further analyses indicated that audit and feedback was most effective when the feedback was (a) written rather than verbal, and (b) frequent (p = 0.025). Hysong opined that the feedback needs to keep the provider focused on the task, should be individualized, and not be negative or discouraging to be effective and promote primary care providers to adhere to clinical guidelines. Setting goals was also found to be effective. Hysong (2009) concluded that audit and feedback is an effective method in modestly improving healthcare outcomes and clinical performance. Even though this meta-analysis was not solely focused on diabetes care, the analysis provided good support for the proposed EBP project related to the overall effectiveness of audit and feedback when used in primary care settings.

Jamtvedt et al. (2010). Jamtvedt, Young, Kristoffersen, O'Brien, and Oxman (2010) systematically reviewed 118 studies that evaluated audit and feedback as the main intervention to improve professional practice and healthcare outcomes. Eighty-eight studies were found using the Cochrane Effective Practice and Organisation of Care (EPOC) registry from 2004 that had been coded as RCTs. The remaining 30 articles were found by searching through MEDLINE with key words 'audit and feedback'. Jamtvedt et al.'s review attempted to answer two questions: is audit and feedback effective in improving professional practice and healthcare outcomes, and how does the effectiveness of audit and feedback compare to other interventions? Variations in the studies evaluated included the (a) type of intervention (audit and feedback alone, audit and feedback with education, or multifaceted interventions that included audit and feedback), (b) intensity of the feedback, (c) complexity of the targeted behavior change, (d) seriousness of the outcome, (e) baseline compliance, and (f) study quality.

Twenty-one of the included studies focused on prevention, 14 on test ordering, and 20 on prescribing; the remaining 63 studies evaluated general management. The complexity of the studies and the intensity of the feedback ranged from average to moderate. Twenty-four studies were categorized as high quality by the researchers and 80 were of moderate quality. A total of 38 studies examined audit and feedback alone compared to no intervention. Eleven of the studies combined audit and feedback with education. Fifty studies involved multifaceted interventions.

In the 38 studies comparing audit and feedback to no intervention, the adjusted risk ratio of compliance with desired practice ranged from 0.7 to 2.1 (adjusted risk difference range; -16% to + 32%). The adjusted percent change for outcomes within these studies ranged from -10.3% to + 67%. In nine studies comparing audit and feedback with educational meetings to no intervention, the adjusted risk ratio ranged from 0.98 to 3.01 (adjusted percentage change ranged from 3% to 41%). In the ten studies comparing audit and feedback as a multifaceted intervention compared to no intervention, the adjusted risk ratio ranged from 0.78 to 18.3 (3% to 60%). In the remaining studies that compared audit and feedback with other interventions or added audit and feedback to another intervention, there were no significant differences in outcomes between those groups.

Jamtvedt et al. (2010) found that there were many variations in effectiveness of audit and feedback and in the way audit and feedback was provided. When baseline compliance was low, it appeared that audit and feedback produced greater outcomes. Overall, Jamtvedt et al. concluded that audit and feedback was an effective and useful method in professional practice and clinical outcomes, though the results have been found to be small to moderate (0% to 10%). This systematic review provided fair evidence for the proposed project.

Grimshaw et al. (2004). A systematic review by Grimshaw et al. (2004) examined the effect of multiple interventions for guideline dissemination and implementation strategies to improve professional practice. Multiple databases, including EPOC and Medline, were searched. Study designs included RCTs, controlled clinical trials (CCTs), controlled before and after studies (CBAs), and interrupted time series (ITSs). Outcome evaluation involved objective measures of healthcare professionals' behavior change or patient outcome. A total of 235 studies were included in the review. Single interventions or combination of interventions (including reminders, educational meetings, educational outreach programs, local opinion leaders, educational material, and audit and feedback) were evaluated.

A total of 10 studies (eight RCTs, one CBA, and one ITS), with a total of 12 comparisons, evaluated audit and feedback. Eight of the ten studies were undertaken in the U.S. Six were based in outpatient, primary care sites. The targeted behavior was general management in three studies and prevention services in three studies; the remaining four studies evaluated test ordering and discharge planning. Five RCT comparisons averaged a 7.0% absolute improvement in performance. The researchers undertaking the CBA reported a 32% improvement in performance. Two patient-centered RCTs had a mean performance improvement of 15.4%. All 10 studies showed some improvement in patient care. Even though the results revealed only modest change, Grimshaw et al. (2004) determined that audit and feedback was an effective method for guideline dissemination and improvement in patient outcomes. The authors also noted that multifaceted interventions were not more effective than single interventions. This systematic review provided good evidence for the proposed EBP project.

Level II

Fischer et al. (2011). Fischer et al. (2011) conducted a prospective randomized trial in eight urban healthcare clinics in the Denver area over a 13 month period of time. The researchers used a computer-based diabetic registry to disseminate patient report cards, by mail or at time of visit, or provider performance report cards. Patients were randomly assigned to either (a) the patient report card intervention or (b) provider feedback and report card intervention. Of the 5,457 participants, 43% were uninsured and 59% were Latino. The age of the participants ranged from 17 to 75 years.

Patient report cards were either mailed or given at the time of the visit. The mailed report cards were sent every three months and discussed recent results on their

HgbA1c, blood pressure, and cholesterol. These results were then compared to national guidelines. The patients were asked to create a self-management goal and told to follow up with their primary provider if it had been more than two months since their last visit. The point-of-care patient report cards were handed out at the time of their appointment, and patients were asked to create a self-management goal; these self-management goals were later discussed with the provider during their visit. Usual care patients were not sent any mailings though they were given their results at the time of their appointment. Provider performance report cards were generated quarterly with (a) provider's performance on the patient panel (i.e., average HgbA1c, percentage of patients with controlled blood pressure, and percentage of patients with controlled LDL cholesterol), (b) the mean outcome performance of all of the providers at the clinic, (c) the individual performance of the providers at the clinic on each outcome, and (d) the target performance goal for each outcome across all of the clinics. Fischer et al. (2011) also used diabetes champions to (a) serve as an additional resource to staff, (b) present at provider meetings, (c) assist with patient outreach to improve control of diabetes and comorbid conditions, and (d) improve patient outcomes.

Fischer et al. (2011) found that the mailed report cards did not improve diabetes testing and therefore, did not improve patients' HgbA1c, blood pressure, or cholesterol. Point of care patient report cards did improve glycemic, blood pressure, and cholesterol control compared to baseline, but not when compared to the standard of care. For glycemic control in the intervention group, 30.7% were at goal at baseline compared to 34.5% after the intervention (p = 0.001; CI 95% [0.017- 0.068]), though in the control group, there was a 6.3% increase in glycemic control after the intervention. Similar results were found in the comparison of blood pressure. In the intervention group, 38.3% were at goal at baseline versus 39.6% post intervention (p < 0.001; CI 95% [0.034- 0.080]); the control group improved 6.9% post intervention. The provider report cards had a significant improvement on glycemic control (6.4%) compared to standard care (3.8%) (*p* < 0.001; CI 95% [-0.131 to -0.077]). The researchers did note a percentage improvement in cholesterol and blood pressure control (7.9% and 5.6% respectively) with the provider performance report cards, but the difference was not statistically significant. Within this study, the provider performance report cards served as feedback. This study provided good evidence for this EBP project.

Frijling et al. (2002). Frijling et al. (2002) examined the effect of a multifaceted diabetes care intervention (audit and feedback and facilitator outreach visits) within 124 medical practices, involving 185 general practitioners, in the Netherlands. Practitioners were recruited through letters and bulletins and each practice was randomized to either the control group or the intervention group. The researchers were blinded to which group the practices were placed in. Each practitioner in the intervention group received individualized feedback based on their baseline performance in regards to diabetes guidelines and was assigned a facilitator who (a) provided support, (b) discussed the feedback results, and (c) gave recommendations and guidance to facilitate improvement. The facilitators visited 15 times per practice over a period of 21 months, spending approximately one hour each visit. The visits focused on practice organization and clinical decision making and were highly standardized to reduce variation between practices.

Outcome measures were based on compliance of following evidence-based practices in diabetes care. Baseline calculations measured provider's adherence to recommended practice (i.e., weight discussion/control, blood pressure measurement, foot and eye examination) and then again at the end of the 21 months. The practitioner completed an encounter form after each visit. If the form was not complete, the assumption was made that incomplete items equaled actions not undertaken. Multilevel logistic regression analysis was used to evaluate the influence of the intervention on changing practice. Frijling et al. (2002) found that the intervention significantly improved two of the seven indicators: foot exams (*OR* = 1.68, 95%CI [1.19-2.39]) and eye exams (*OR* = 1.52, 95% CI [1.07-2.16]). There was a 3% improvement in blood pressure measurement compliance post intervention (*OR* = 1.34, 95% CI, [0.70-2.54], *p* = 0.372), though at baseline the mean compliance rating was 94%.

The intervention used by Frijling et al., (2002) consisted of feedback to providers with repeated feedback to guide clinical practice. As a result of the feedback mechanism, there was significant improvement in diabetes prevention and care in regards to eye and foot exams with modest improvement in blood pressure measurement. This study's use of audit and feedback and the results noted provided good evidence for the proposed EBP project.

Kiefe et al. (2001). Kiefe et al. (2001) evaluated the use of benchmarks and goals in improving quality outcomes through audit and feedback with a group randomized controlled trial. Benchmarks were calculated using data from members of a peer group and represented realistic goals of achievement and excellence. The RCT involved physicians who were part of the Ambulatory Care Quality Improvement Project (ACQIP), a project designed to improve quality of care in outpatient diabetes treatment within the Medicare population. Physicians from Maryland, Iowa, and Alabama received feedback from their baseline data on quality measures. They were then provided targeted goals and structured improvement strategies for their diabetic patients. After a year, a repeat audit and feedback was performed to evaluate for positive changes.

Seventy physicians completed the study. Approximately 20 patients' charts were reviewed for each of the 70 physicians. Each patient's chart was audited for measurement of HgbA1c, total cholesterol, triglycerides, creatinine, office foot exam, and an influenza vaccine. Documentation of each of these items within the patient's chart within the past 18 months needed to be present for that patient's records to be included within the study.

In the control group, physicians received mailed feedback every 6 weeks for one year that included (a) information on group meetings, (b) root cause analyses, and (c) changes in office setting such as patient education postings, reminders, flow sheets, and standing orders. The intervention group received that same information plus an achievable benchmark for each quality measure. These benchmarks were based on the average performance of the top 10% of physicians being assessed. The physicians were randomized to the control or intervention group and 2978 patients were nested within their assigned established physician practice.

Paired *t*-tests were used to compare the changes from baseline data between the intervention and control group. To test for statistical significance of the achievable benchmark effect, generalized linear regression models were used. Kiefe et al. (2001) found that benchmarking resulted in significant improvements in influenza vaccine administration (post intervention improvement from 40% to 58% in the experimental group compared to 40% to 46% in the control group, CI 95%, $p < 0.001$), foot exams (46% to 61% improvement in experimental group compared to 32% to 45% improvement in the control group, CI 95%, $p < 0.001$) and long term HgbA1c measurements (31% to 70% versus 30% to 65%, CI 95%, $p < 0.001$). There was no significant difference in the percentage of charts reflecting documentation of triglyceride measurement (4% increase in the experimental group, $p = 0.18$), though there was statistically significant improvement in cholesterol measurement in the experimental group (66% to 72%, CI 95%, $p = 0.01$).

Kiefe et.al (2001) determined that using benchmarking along with audit and feedback for diabetes management was an effective tool for primary care providers. Setting achievable goals for providers improved quality outcomes in the older diabetic population. In the proposed project, an achievable goal had been set by the medical director at the clinic. Consistent with the Kiefe and colleagues' findings, the addition of achievable benchmarks to audit and feedback should help providers change and improve their quality measures, and provided good evidence for the proposed EBP project.

Phillips et al. (2005). In a randomized control trial conducted by Phillips et al. (2005), a feedback intervention was successful in improving diabetes outcomes. Phillips studied the patients of 345 residents at the Grady Medical Clinic in Atlanta, Georgia to evaluate whether (a) computerized reminders, (b) feedback only, or (c) a combination of both, would be effective in improving HgbA1c, systolic blood pressure, and low density lipoprotein (LDL) cholesterol. A total of 4,138 patients were evaluated over a three year period. Patients were randomized to each intervention group in equal numbers. The computerized reminders provided medical residents with a flow sheet to document weight, blood pressure, current medications, and recommendations for treatment. The reminders also included algorithms that were individualized for each patient. The feedback group incorporated a 5-minute session with an endocrinologist every two weeks, during which individual provider data on patient outcomes was discussed. Emphasis was placed on ADA guidelines and goals for HgbA1c, systolic blood pressure, and LDL. The sessions were interactive, but scripted to maintain consistency.

Linear mixed model multivariable regression analyses were used due to multiple levels of data and interventions. Patient outcomes were associated with the resident seen on the previous visit. ADA goal attainment was analyzed using the generalized estimating equation to provide consistency. Odds ratios were used to evaluate the effects of the interventions. Phillips et al. (2005) found that HgbA1c improved modestly in the feedback only group (-0.4%; $p = 0.0002$) but the combination therapy of feedback plus reminders was also statistically significant (-0.6%; $p < 0.0001$). Systolic blood pressure significantly improved in the feedback only group (-3.2 mmHg; $p = 0.0084$). LDL cholesterol significantly improved in all intervention groups, but was noted to decrease in the feedback only group by 15 mg/dl ($p < 0.001$). The HgbA1c goal was attained the highest, 57% of participants, in the feedback only group (*OR* = 1.1762, CI 95% [1.03-1.34], $p = 0.016$). Systolic blood pressure goal was attained the highest in the feedback only group as well (*OR* = 1.19, CI 95% [1.07-1.32], $p = 0.001$). Following multivariable analyses, Phillips et al. determined there was an independent benefit of feedback only in improving HgbA1c levels and systolic blood pressures and in attaining the ADA goals for type 2 diabetics. This study provided strong evidence for the proposed project.

Level III

Kirkman et al. (2002). Kirkman, Williams, Caffrey, and Marrero (2002) evaluated the use of repeated audit and feedback, physician education, practice aids, and development of guidelines to improve quality of care to a diabetic population in rural Indiana using a non-randomized trial design. Each of the seven primary care providers (PCP), male physicians with a mean of 21 years of experience, supplied a list of their diabetic patients seen in the past six months. From this list, approximately 30 patients were randomly selected for the chart audit. After the chart audit, an evening meeting was scheduled to provide feedback on each provider’s pooled patients and the results of the whole provider group. An endocrinologist was available to answer questions and discuss the group data. This similar feedback process was repeated after year one and year two. Practice aids were also utilized in the intervention, which included stickers on front of the patients’ charts to remind staff and providers about eye, foot and urine screenings. Another component of the intervention was evidence based educational sessions for PCPs to discuss the guidelines and answer any concerns or questions. A few weeks following the physician educational sessions, patient focused educational sessions covering similar topics were also conducted.

There were 275 patients included in the baseline chart audit. The mean age was 61 years and the majority of patients were Caucasian. All patients had at least one comorbid condition (55% with hypertension, 31% with CAD). Adherence to the guidelines at baseline was 15% for foot exams, 20% for HgbA1c testing, 23% for eye exam referrals, 33% for microalbumin testing, 44% for lipid testing, 35% for smoking cessation counseling, and 78% for blood pressure monitoring.

Chi-square and paired sample *t*-tests were used to analyze the data. After year one, there was statistically significant improvements in multiple guidelines. Blood pressure monitoring increased to 83% adherence ($p = 0.002$), foot exams increased to 42% ($p < 0.001$), and HgbA1c screenings increased to 37% ($p = 0.012$). There were not statistical changes noted in lipid screenings or microalbumin testing. After year two, only blood pressure screening ($p < 0.001$) and foot exams ($p < 0.001$) were statistically significant from baseline. The year one improvements of HgbA1c screenings decreased nearly back to baseline after year two ($p = 0.867$).

This study used a multifaceted approach to improving diabetes testing and adherence. Kirkman and colleagues (2002) were unable to distinguish which interventions were most successful at improving blood pressure and foot exam screenings, though the study focused on audit and feedback as the main intervention and revealed improved PCPs' adherence to diabetic screening and treatment guidelines. This study provided fair evidence for this EBP project, in that the researchers used frequent chart audit and feedback to change provider behavior.

Level V

Foy et al. (2005). Foy et al. (2005) reviewed 85 RCTs that examined the use of audit and feedback in chronic care, mainly focusing on diabetes care. In this integrative review of descriptive studies, the researchers wanted to explore which techniques were the most useful and effective in providing audit and feedback to primary care providers.

The results of the review were not consistent. Foy et al. (2005) did note that there was not a significant difference in effectiveness based on who provided the audit, peer physician or nurse. Within the research reviewed, there also did not appear to be a difference between using a single versus multicomponent feedback approach. Additionally, Foy et al. found that there were no major differences between group feedback compared to individual feedback, or by the source of feedback (verbal, written, or both). Eight studies indicated that audit and feedback was more effective than no intervention in chronic care treatment.

Unfortunately, due to the heterogeneity of the 85 studies, Foy et al. (2005) were unable to pinpoint specific characteristics of audit and feedback that were the most effective. The reviewers did conclude, however, that (a) audit and feedback could improve practice though the results are usually small to moderate, (b) effectiveness varied greatly among studies, and (c) variation was related to different methods of feedback and different targeted behaviors. Furthermore, audit and feedback appeared to work better in diabetes care than in other chronic conditions, especially when there was low compliance (e.g., a large potential for improvement). Foy et al. also opined that audit and feedback can moderately improve practice: U.S. primary care physicians' compliance with treatment plans for diabetic patients. This integrative review provided fair evidence to support the proposed practice change.

Level VI

Craig et al. (2007). Craig, Perlin, and Fleming (2007) completed a retrospective descriptive study analyzing why the Veterans Health Administration (VHA) system was so successful in implementing 24 clinical outcome measures. The VHA system had achieved high ratings in many categories: counseling (tobacco use and obesity), immunizations (influenza and pneumococcal), outpatient screening (depression, colon/breast/cervical and prostate cancer), heart disease and hypertension (blood pressure and lipid control and aspirin/beta blocker and ACEI use), and diabetes (eye and foot exams, HgbA1c, blood pressure, and lipid control). The VHA system was part of a program designed to uniform their quality of care and improve their performance measures across all clinics. Random chart reviews were conducted each year and each clinic was held accountable to meeting the target performance goals. The VHA national system had dramatically improved their performance measures due to this program and had achieved a 95% level on most of the quality measures.

Craig et al. (2007) sent electronic messages to each VHA facility and queried each quality manager about strategies that had been implemented and elicited feedback on which strategies had been most efficacious. The researchers received an 82.6% response rating, including participation from quality managers at 76 separate VHA centers. For 18 of the 24 process measures, the highest performing clinics achieved 100% score, indicating total success of that performance measure. There was an average of 2.92 strategies used by each clinic for each performance measure. The most common effective strategy, reported by quality managers, was organizational change (i.e., open access and expanding nursing care; 55.6%). Audit and feedback was the third most commonly reported strategy, used by 40% of those responding to improve performance measures throughout the categories listed. Audit and feedback was used 45.9% in the category of hypertension and heart disease and 46.8% in the diabetes category. Craig et al. determined that audit and feedback to providers was an effective method to facilitate performance improvement. This study provided fair evidence for the proposed project.

Synthesis of Appraised Literature

The two systematic reviews, one meta-analysis, four RCTs, one non-RCT, one integrative review, and one retrospective descriptive study combined provided good evidence that audit and feedback is an effective intervention for changing provider behavior and improving clinical outcomes (see Appendix A). There were no major threats to internal or external validity or applicability identified during this literature appraisal. As noted previously, researchers conducting systematic reviews and meta-analysis did have difficulty comparing studies due to the non-homogenous approaches and the use of multifaceted interventions. The compilation of research suggests that there is not one single way to accomplish effective audit and feedback. Some studies demonstrated that repeated feedback was more effective than single feedback (Hysong, 2009; Frijling et al., 2002; Kirkman, et al., 2002; Phillips et al., 2005). The research conducted by Hysong (2009) and Kiefe et al. (2001) demonstrated that providing goals to the providers added to the effect of the audit and feedback. Multiple researchers also noted that audit and feedback was most beneficial and produced larger results when the compliance rate and current standard was low (Foy et al., 2005; Frijling et al., 2002; Jamtvedt et al., 2010). Multifaceted interventions were not necessarily more effective than single interventions (Foy et al., 2005; Grimshaw et al., 2006; Jamtvedt et al., 2010; Phillips et al., 2005). Rather, the evidence suggested that the most effective audit and feedback should be individualized to each practice (Hysong, 2009; Kiefe et al., 2001). Consistent with this suggestion and considering the limited period of time for this EBP project implementation, the EBP project leader determined that the potential for project success would be maximized if the proposed intervention had demonstrated efficacy within the literature and fit within the current organizational structure.

Best Practice Model

The practice model recommendation developed for this EBP project was synthesized from the available evidence integrated from the critically appraised literature. As Rogers (2003) noted, it was important to have open communication and a transformational leader to help improve and promote practice change effectively. The project facilitator's position within the clinic and additional expertise gained through doctoral studies provided the foundation for accomplishing this goal. Interpersonal communication channels were used within the four month intervention period. Rogers' DoI model also stressed evaluating the factors of change and the participants involved, in order to create the best practice change and environment to promote change. Thus, although the appraised research demonstrated that audit and feedback had excellent trialability, the intervention was still adjusted to fit into the social system at the clinic. This focus was consistent with the PARIHS framework which stressed the need to match the EBP change to professional agreement and patient quality care. The synthesized and critically appraised research for this EBP project also demonstrated that those factors play a role in improving clinical outcomes. Therefore, this author proposed that implementing the best practice protocol (see Appendix B) demonstrated that the use of provider audit and feedback, as compared to standard practice of diabetes treatment, would improve blood pressure control in the diabetic population.

CHAPTER 3

METHOD

Sample and Setting

The setting for this EBP project was a rural community clinic located in east central Illinois. The clinic was established in 1992 as an outreach of the larger hospital in Urbana, Illinois to increase accessibility to quality care to residents of Mattoon and the southern Illinois region (Medical Director, personal communication, August 1, 2011). The clinic provided care to patients of all ages needing acute care and chronic disease management. The healthcare providers within the clinic included four Advanced Practice Providers (APPs), three pediatricians, two internists, three family practice physicians, a gynecologist, a psychiatrist, a psychologist, and multiple rotating specialists. All providers, except the psychiatrist, were full time employees, working 40 hours or more a week. During this EBP project, all regional third-party payers were accepted; the majority of patients were covered by Medicare, Medicaid, and Health Alliance (Medical Director, personal communication, July 29, 2011). Most practices were accepting new patients.

The physicians' practice experiences ranged from 3 to 36 years. The mean time of the physicians' practicing within the clinic was eight years. Although the healthcare provider population had been stable over the past three years, one internist left the clinic during project implementation. His patient population was mainly comprised of older adults with multiple chronic diseases and included the majority of type 2 diabetic patients at the clinic. Some of his patient population integrated into other providers' practices; others elected to seek healthcare outside the organization. During project planning, the medical director was searching for a replacement; but during project implementation and evaluation, an additional provider was not added to the practice.

The clinic was open from 8 a.m. to 8 p.m. Monday through Thursday, 8 a.m. to 5 p.m. on Friday, and 8 a.m. to 12 p.m. on Saturday. Typically, physicians worked from 8 a.m. to 5 p.m., taking an hour lunch break at noon. In addition to clinic hours, the physicians took call and completed morning rounds at the local hospital, not affiliated with the clinic; the APPs were not responsible for taking call or making rounds. The after-hours open access visits (5 p.m. to 8 p.m. weekdays and Saturday mornings) were commonly covered by an APP.

The mission of the clinic's organization had been to serve people through high quality care, medical research, and education (Medical Director, personal communication, August 1, 2011). The vision was to be a world class innovator providing exceptional patient care and research. To achieve the mission and vision, it was necessary for members of the entire organization to value integrity, collaboration, accountability, respect, and excellence (Medical Director, personal communication, August 1, 2011).

As an integral component in sustaining the mission, the APPs have worked together with the physicians to provide quality, holistic care. The APPs within the clinic had two to six years of experience; the project facilitator was the most experienced APP. The four APPs mainly cared for adult patients and collaborated with all providers who practiced at the clinic. They spent 4 to 12 hours a week working in convenient care. A good working relationship with mutual respect between the APPs and the physicians was apparent.

Although the APPs had their own schedule, the physicians and APPs collaborated on chronic disease management. Typically, adult patients alternated between the physician and the APP for scheduled visits. Patients were scheduled to be seen every 6 months if their diabetes and hypertension were controlled. Patients whose blood pressures or blood sugars were uncontrolled (i.e., blood pressure readings not meeting established goals) were scheduled to be seen no less frequently than every three to four months. When changes were made to treatment plans, including the initiation or adjustment of antihypertensive medications, patients were scheduled for a follow up visit within 1 to 2 months. The visit was either scheduled with the physician or the APP, depending on the complexity of the patient and the patient's preference for providers.

Prior to project implementation, each physician working with an APP signed an annual collaborative agreement assenting to continue the working relationship. When new APPs were hired, physicians with busier practices expressed a need to collaborate with an APP. The addition of APPs has provided more open access and increased availability for treatment. The physicians have been readily available for any questions or concerns that the APP might have. At the clinic, the physicians and APPs have worked as a team to improve patient care and accessibility. The APPs have been respected by the patients and the physicians and recognized as an integral part of the healthcare team. Because of the collegial relationship, the project facilitator anticipated that the feedback provided within this project would be readily accepted by all the participating healthcare providers.

During project planning, the clinic used an EMR for charting, scheduling, and all documentation. On September 1, 2011, a new EMR, EpicCare, was installed within the clinic. The transition to the new charting system was anticipated to significantly reduce the number of patients seen by each provider, as each provider's schedule was reduced by 50% for the first two weeks of transition (Medical Director, personal communication, August 3, 2011). The project facilitator was aware that the electronic charting system change could affect the overall outcomes of this EBP project due to the decrease in number of patients seen daily.

Prior to project implementation, an internal chart audit was performed every 3 months for the entire diabetic population. The audit had been initiated by the clinic's medical director to improve quality measures. Previous audits measured the percentage of patients who had the following parameters documented at their last office visit: (a) HgbA1c > 7.5%, indicating poor glycemic control; (b) LDL <100 mg/dL; (c) blood pressure control, as evidenced by readings of $\leq$ 130/80 mmHg; (d) aspirin therapy for those with established heart disease; (e) a dilated eye exam in past year; and (f) a foot exam within the past year. In the past, the results of this audit had not been communicated to the individual providers, but the results were available within the EMR system. Because of the lack of feedback, changes in practice had not been influenced by these audit results. No interventions had been implemented to improve blood pressure control in the diabetic population. The addition of feedback was considered a new intervention implemented and evaluated in the practices at the clinic.

This setting provided access to a convenience sample of 460 type 2 diabetics who also had a diagnosis of hypertension. As part of the effort to fully integrate processes across the entire organization, a new billing system was implemented on January 1, 2011. This system had the capacity to identify patients by the International Classification of Diseases (ICD-9) code. This capability facilitated the February 2011 analysis, which initially confirmed the need for this EBP project.

Outcomes

Two major outcomes were evaluated during this project. Consistent with the supporting literature, the primary outcome of interest was a percentage point increase in the number of type 2 diabetic patients meeting the pre-established ADA blood pressure goals. Additionally, this project was designed to determine the effectiveness of the provider audit and feedback for changing individual practitioner behavior as compared to previous practice.

Intervention

Provider audit and feedback was used as the intervention in this EBP project. After a review of the computer database of the current patient population, a comprehensive electronic chart audit of all adult patients seen for chronic disease management in the past 6 months, who had ICD-9 codes of type 2 diabetes and hypertension, was performed by the project facilitator. The audit was used to determine the percentage of hypertensive type 2 diabetics, overall and by individual provider, who met the established national blood pressure goals; special attention was paid to evaluating the patient's current medications to determine whether the patient was currently taking an ACEI or ARB. Patients who (a) had not been seen within the clinic within the past six months or had not been consistently seen a minimum of every six months, or (b) whose healthcare provider had previously been, but was not currently affiliated with the clinic, were excluded from further analyses. The data were divided into the appropriate provider's patient practice.

Information gathered from the chart audit included (a) patient's age; (b) race, when available/documented; (c) gender; and (d) the patient's last two blood pressure readings. Additional information included whether (a) the patient was on an ACEI or ARB; (b) contraindications were documented if the patient was not on an ACEI or ARB; (c) the patient's hemoglobin A1c (HgbA1c) was greater than 7.0%; and (d) the patient had developed microalbuminuria. Data on HgbA1c and microalbuminuria were obtained in order to offer additional feedback to the providers and to further stress the importance of lowering their patients' risk of morbidity and mortality. This data collection was recorded on the Diabetic Blood Pressure Intervention Worksheet (see Appendix C). Names and date of birth were initially recorded to facilitate tracking of follow-up data; a code number was assigned to ensure anonymity of collected data. During the work day, the information collected was secured in two separately locked drawers accessible only to the project facilitator. Throughout the EBP project, the collected data remained within the locked drawers unless otherwise being used by the facilitator.

On September 18, 2011, the project facilitator initiated individual verbal feedback to each of the six providers involved in the audit. Feedback has been defined as a summary of the provider's clinical performance on healthcare delivered over a specific period of time which is then relayed back to that individual provider (Shojania et al., 2006). Meeting times were decided by each practitioner according to their available schedule: before work, during lunch, or after work if necessary. Ten to twenty minutes were spent with each provider and a standardized script was followed to keep consistency with each feedback (see Appendix B). Feedback included (a) information on their own individual audit results (i.e., providers were able to compare their own outcomes to the overall results of the cohort, but were not given specific information on the performance of their colleagues); (b) the current clinical guidelines for blood pressure control instituted by the ADA, the AHA, the NKF, and the CDC, including the use of an ACEI or ARB for those patients who do not have contraindications; and (c) the new goal of blood pressure control established by the clinic's medical director. The facilitator allocated time to discuss any concerns or questions regarding the current guidelines and the established goal. A log was kept to record the time, date, and length of feedback with each provider.

Data from the project facilitator and her collaborating physician's panel of 113 patients were not used in this project due to potential bias; incidentally, at the time of project implementation, the percentage of their diabetic hypertensive patients reaching the established ADA targeted blood pressure exceeded the clinic's goal. The chart audit of the remaining seven healthcare providers revealed that 150 of the 347 type 2 diabetic patients (43%) did not have controlled blood pressure (consistent blood pressure readings ≤130/80 mmHg). Forty-nine type 2 diabetics (14.1%) were not on an ACEI or

ARB and did not have a contraindication or rationale for not implementing the therapeutic regimen listed within the chart. Less than 3% of overall diabetic patients were not on an ACEI or ARB and did not have a contraindication, yet had microalbuminuria. The main focus and goal of this project was to increase the percentage of diabetics with controlled blood pressure to 75% for each individual provider's practice.

Recruiting sample

Each provider signed a consent form agreeing to participate in this project, thus allowing the project facilitator to audit charts of their diabetic patients. Each participating healthcare provider was given the opportunity to opt out of project participation; none elected to do so.

Data

Beginning January 18, 2012, a follow-up audit of the charts of patients whose blood pressure had not been previously controlled was undertaken. The primary focus was to determine the percentage of patients whose blood pressure reading met national guidelines after the project's 4-month intervention. The project facilitator compared the percentage of those patients who met the blood pressure goal before and after the intervention. But, since the project facilitator recognized the challenges of meeting and documenting the attainment of this goal during the limited time for project implement, as well as the impact of initiating a new EMR and with the absence of an essential healthcare provider, the percentage of change in systolic and diastolic readings was also evaluated. Data were recorded on an Excel spreadsheet and was analyzed using chi-square analyses.

At the completion of the study, the aggregate results were verbally discussed by the project facilitator at the April monthly provider meeting. Individual practice changes were discussed per provider request. The medical director was provided access to all results, including access to the entire clinic information and each individual provider's data to maximize the opportunity for continued quality improvement.

Protection of Human Subjects

The project facilitator completed the ethics training through the National Institutes of Health to ensure protection of human subjects involved in this project. The facilitator followed ethical guidelines and practices during the project. Valparaiso University's Institutional Review Board (IRB) approved the project. The nursing manager and the medical director at the clinic approved the project and determined the project to be exempt from IRB approval through the parent organization. Diabetic registries remained on the password secured computerized database at all times, accessible only to clinic employees. As noted previously, although initial data included identifying patient information to allow the project facilitator to track incomplete data, demographic data and patient names were coded to ensure anonymity. Coded data were secured separately from any identifying patient information within locked drawers in the project facilitator's office. The project facilitator was the only individual with access to these drawers. Patient names and other identifying information were not associated in any publication or presentation of the information of this project. No monetary reimbursement was awarded to those involved in the audit and feedback, or to those providers who meet the standard of care prior to or as a result of participation in this project.

CHAPTER 4

FINDINGS

The purpose of this EBP project was to evaluate the effectiveness of the use of audit and feedback for improving the percentage of type 2 diabetic patients with blood pressure control within the rural Illinois clinic. The intended outcome was to reach at least 75% of patients with controlled blood pressure per provider and as a group, as measured by achieving a systolic blood pressure reading $\leq$ 130 mmHg and diastolic blood pressure $\leq$ 80 mmHg. It was anticipated that these outcomes would be noted within all five providers' practices, demonstrating quality improvement in patient care and achieving blood pressure goal as outlined by the ADA, AHA, CDC, and NKF. The following data analyses detail project outcomes and compare the effectiveness of audit and feedback to previous standard practice. Secondary analyses were undertaken to evaluate the number of patients who had > 10 mmHg improvement in systolic readings and the number of patients who had a 90 mmHg to 80 mmHg decrease in diastolic readings.

Sample Characteristics

A total of 339 patients with type 2 diabetes were initially included for chart review. Data collection via computer charting afforded an opportunity to gather information solely on patient age and gender. Other variables of potential interest (i.e., race, ethnicity, and insurance coverage) were not consistently listed within the computerized database; thus, this information was excluded. Ages of the 339 patients ranged from 31 to 85 years (M = 65.06 years; SD = 11.22). Within the initial sample, there was an equal distribution between males and females (50.4% male) within the clinic. The male physicians tended to have a higher percentage of male patients within their practices (50.0 – 71.0%); within the female physician's practice, the majority of patients (68.8%) were female. Provider 5 had the oldest population (M = 69.96 years).

After the four-month implementation period, a repeat chart audit of the original 339 patients was conducted. Of these 339, only 134 qualified for comparison. Eighty-two patients had not had a follow up visit, seven patients were no longer under the care of the clinic providers, and four patients passed away. In addition, 112 patients of the physician who left the practice at the time of project initiation changed primary care providers to one of the five remaining clinic physicians during the four-month implementation period. Since the newly assigned providers had only seen these patients following the intervention, these 112 patients were excluded from further data analysis. Therefore, a total of 134 patients' charts were audited four months after the intervention; demographic data for these 134 type 2 diabetic patients and allocation per provider practice are represented in Table 4.1. There were no significant differences between the initial 339 patients and the 134 patients included in the final data analysis in regards to mean age or gender (M = 65.06 years as compared to 62.99 years, $p > 0.05$; males 50.4% as compared to 48.1%, $p > 0.05$). Therefore, the 134 patients included in the final analysis were considered to be representative of the type 2 diabetic population within the clinic in regards to age and gender.

Because the intervention targeted healthcare providers, data analyses were also conducted to evaluate for differences among providers. All of the providers (4 physicians and 2 PAs) included in the post intervention data analyses specialized in family practice, but providers did vary in regards to (a) age, (b) years of practice, and (c) years of experience within the clinic (See Table 4.2). Ages of the providers ranged from 33 to 59 years. The average number of years of experience was 12.8 years; the average number of years at the clinic was 3.9 years.

Changes in Outcomes

Statistical testing and significance

To determine the effectiveness of the audit and feedback, chi-square analyses and sample *t*-tests were conducted using commercially available software (PASW [Predictive Analytics SoftWare] Statistics 18). Chi-square tests were used to analyze the data comparing the percentages of patients meeting systolic blood pressure and diastolic blood pressure goals before and after the intervention. Chi-square analyses were also used to evaluate gender differences within individual provider practices. Mean ages of patients within individual practices and specific variables of interest including provider's age, years of experience, and length of time within the clinic were compared using ANOVA. Statistical significance for all analyses was established as $p < 0.05$.

With the initial chart review, the most recent blood pressures were entered into an Excel data sheet. The systolic and diastolic readings were initially categorized as either controlled ($\leq$ 130/80 mmHg) or uncontrolled. Patients' blood pressures were then classified into four categories according to the Joint National Committee's classification (USDHHS, 2003): meeting the targeted goal (systolic $\leq$ 130 mmHg; diastolic $\leq$ 80 mmHg); pre-hypertension (systolic 131-139 mmHg; diastolic 81-89 mmHg); Stage 1 hypertension (systolic 140-159 mmHg; diastolic 90-99 mmHg); or stage 2 hypertension (systolic $\geq$ 160 mmHg; diastolic $\geq$ 100 mmHg). The same criteria for blood pressure classification were used during the post intervention chart review which evaluated the most recent blood pressure reading. Pre and post intervention systolic and diastolic control were analyzed, noting any improvement in the percentage of blood pressure control for all patients cared for at the clinic (see Tables 4.3 and 4.4).

Since an internal medicine provider who had worked in collaboration with a PA left the clinic at the beginning of this study, his PA was designated as the main provider for 26 of his patients; these patients were cared for by the PA prior to and during project implementation. This PA was included as Provider 5 (P5), and her data were analyzed accordingly. Three physicians (P1, P3, and P4) did not have a midlevel provider (PA or NP); one physician (P2) provided care in collaboration with a PA. Clinic practice allowed patients to choose their own primary care provider. If the primary physician had a midlevel provider, the patient's care was divided among each provider during the intervention period and the data were combined; thus, information could not be extrapolated for the individual APP or physician provider within this practice (P2).

Findings

As demonstrated within Table 4.1, there was a significant variability between ages of type 2 diabetic patients between individual providers and the total clinic diabetic population included within this EBP project using ANOVA (p = 0.000). Provider 4 had the youngest population (59.05 years) while Provider 5 had the oldest population (69.96 years). There was also a statistically significant difference in gender (p = 0.016) between Provider 1 and 2. Providers 3, 4, and 5 had a more even proportion of diabetic men and women within their practice.

As demonstrated in Table 4.2, there was a statistically significant correlation between provider age and years of experience using Pearson correlation ($r(4)$ = 0.880, p = 0.021). The sole PA provider and the physician working collaboratively with a PA were the youngest of the providers within the clinic with the least amount of experience. Years of clinical experience was not necessarily linked to time within the clinic, as the physician who had been in medical practice the longest, 36 years, had only been at the clinic for 3 years. Only one of the physician's clinical experience, Provider 2, had been attained solely at the clinic. Provider 1 had been practicing at the clinic the longest.

Table 4.1

Patient Demographic Data per Provider

	Total N = 134	P1 MD n = 31	P2 MD + PA n = 48	P3 MD n = 9	P4 MD n = 20	P5 PA n = 26	Significance (p value)
Mean							
Age	63.08	66.32	59.50	60.00	59.05	69.96	p = 0.000
Gender							
Female	51.5% (68)	29.0% (9)	68.8% (32)	44.4% (4)	50.0% (10)	50.0% (13)	p = 0.016
Male	48.5% (66)	71.0% (22)	31.2% (16)	55.6% (5)	50.0% (10)	50.0% (13)	

Table 4.2

Primary Provider Demographic Data

	Group Mean	P1 MD	P2 MD (PA)	P3 MD	P4 MD	P5 PA	Significance (*p* value)
Age	45.2	45	33 (32)	50	59	39	$p = 0.021$
Gender	----	M	F (F)	M	M	F	-------
Yrs of Practice	12.8	11	4 (4)	11	36	2	$p = 0.103$
Yrs at Clinic	3.9	9	4 (3)	2	3	1.5	$p = 0.044$

Table 4.3

Pre-intervention Blood Pressure Control per Provider

	P1	P2	P3	P4	P5	Group
	n=31	*n*=48	*n*=9	*n*=20	*n*=26	*n*=134
Systolic blood Pressure (SBP) ≤ 130 mmHg	54.8% (17)	58.3% (28)	77.8% (7)	55.0% (11)	42.3% (11)	55.2% (73)
Diastolic blood Pressure (DBP) ≤ 80 mmHg	93.5% (29)	81.3% (38)	88.9% (8)	70.0% (13)	76.9% (20)	82.1% (108)

Table 4.4

Post intervention Blood Pressure Control per Provider (2 tailed Chi-square)

	P1 *n*= 31	P2 *n*= 48	P3 *n*=9	P4 *n*=20	P5 *n*=26	Group *n*=134
SBP ≤ 130 mmHg	48.4% (15)	52.1% (25)	44.4% (4)	55.0% (11)	34.6% (9)	47.8% (63)
Significance (*p* value)	0.452	0.452	0.413	0.908	0.169	0.088
DBP ≤ 80 mmHg	71.0% (22)	83.3% (40)	77.8% (7)	80.0% (15)	76.9% (20)	77.6% (104)
Significance (*p* value)	0.070	0.057	0.047	0.701	0.448	0.024

Table 4.5

Paired Sample t-tests (2- tailed) and Change of SBP and DBP Post intervention

	P1 *n*= 31	P2 *n*= 48	P3 *n*= 9	P4 *n*= 20	P5 *n*= 26
SBP					
t-test	*p* = 0.883	*p* = 0.370	*p* = 0.259	*p* = 0.779	*p* = 0.307
# improved	10 (32.2%)	10 (20.8%)	1 (11.1%)	4 (20%)	8 (30.1%)
# worsened	11 (35.5%)	17 (35.4%)	5 (55.5%)	6 (30%)	7 (26.9%)
Net change*	(-1)	(-7)	(-4)	(-2)	(+1)
DBP					
t-test	*p* = 0.639	*p* = 0.768	*p* = 0.040	*p* = 0.826	*p* = 0.207
# improved	1 (3.2%)	8 (16.6%)	0	5 (25%)	6 (23%)
# worsened	7 (22.5%)	6 (12.5%)	2 (22.2%)	3 (15%)	5 (19.2%)
Net change*	(-6)	(+2)	(-2)	(+2)	(+1)

*Data does not include those patients with no change in BP

Table 4.3 displays the results of systolic and diastolic control before the intervention, and Table 4.4 displays the results of blood pressure control after the intervention and presents the significance of change, using Chi square analysis, of patients meeting the definition for blood pressure control before and after the intervention. As reflected within these tables, only Providers 2 and 4 had an overall improvement in diastolic control following the intervention, though these results were not statistically significant ($p = 0.768$; $p = 0.826$, respectively). The groups of patients cared for by Providers 1, 3, and 5 actually had a decrease in systolic and diastolic control post intervention.

Since the CDC has noted a 10 mmHg reduction in systolic blood pressure and a reduction of diastolic blood pressure from 90 mmHg to 80 mmHg can reduce microvascular or macrovascular events, a secondary analysis was undertaken to evaluate for improvement in blood pressure readings within individual patients, among provider panels, following the intervention. The results of this analysis are represented in Table 4.5, but are discussed in detail here.

None of the providers were able to achieve the project's target of 75% of patients meeting the blood pressure benchmark nor were the documented blood pressure improvements statistically significant. Patients cared for by Provider 1 did not demonstrate a statistically significant improvement in systolic or diastolic blood pressure control ($X = 5.74$, $p = 0.452$; $X = 5.32$, $p = 0.070$, respectively) post intervention. But, ten additional patients who had not been controlled at the start of the project had improvements in their systolic readings, with six of those ten patients meeting the goal post intervention. Yet, eleven of the provider's patients (35.5%) displayed a decrease in control of their systolic blood pressure. Additionally, seven patients had a reduction in control of their diastolic readings post intervention. Nine patients did not show a change of their diastolic or systolic blood pressures, though all of these patients were to goal before and after the intervention.

Patients under the care of Provider 2 also did not demonstrate a statistically significant improvement in systolic (p = 0.452) or diastolic blood pressure control (p = 0.057) post intervention. Ten patients improved their systolic blood pressures, with nine of those patients achieving systolic control following the intervention (18.8%). Fifteen patients did not have a change in their systolic or diastolic control; fortunately, twelve of these patients were already at goal before the intervention. There were eight patients with improvements in their diastolic readings, with seven of those patients achieving diastolic goal. There was a net improvement of two patients in achieving diastolic control (4.1%). Unfortunately, seventeen patients showed declined control of their systolic readings (35.4%) and six patients in their diastolic readings (12.5%).

Diabetics being managed by Provider 3 also did not demonstrate a statistical improvement in systolic or diastolic blood pressure control post intervention. In contrast, although Provider 3 only cared for nine type 2 diabetics followed within this project; there was a significant decrease in systolic control among these patients (77.8% controlled systolic blood pressure before the intervention compared to 44.4% post intervention; X = 1.77, p =0.413). Within patients cared for by Provider 3, there was also a statistically significant decrease in diastolic control post intervention (11% decrease in control; p = *0.047)*. Yet, five of the nine patients (55.6%) displayed a reduction of their systolic blood pressure control; two patients had a decrease in their diastolic control (22.2%). Provider 3 was the only physician to not have any patients with a systolic blood pressure reading above 160 mmHg prior to and following the intervention.

Those being cared for by Provider 4 showed no overall change in systolic control after the intervention compared to prior to the intervention ($X = 4.06$, $p = 0.908$). There was improvement in diastolic control within this group, although this percentage of improvement was not statistically significant (10 percentage point increase; $p = 0.701$). There was no change in blood pressure control for seven of the patients; three of these patients were to goal before the intervention. Six patients had a decline of their systolic readings post intervention, while three had reduction in their diastolic readings. Four of the twenty patients had improvement in systolic readings and were to goal post intervention (20%); blood pressure readings of one patient demonstrated a marked improvement (improving from SBP >160 mmHg to <130 mmHg). Five patients had improvements in diastolic blood pressure control and had achieved diastolic control post intervention (25%).

Patients within the panel of Provider 5 demonstrated no statistically significant change in systolic or diastolic blood pressure control ($p = 0.168$; $p = 0.448$, respectively). But, eight patients did show an improvement in systolic blood pressure following the intervention (30.7%), with half of these patients achieving systolic blood pressure goal. Six patients had improvements in diastolic readings (23.1%); five of these patients had achieved diastolic control following the intervention. Nine patients did not exhibit a change in systolic or diastolic readings (34.6%). Seven patients had an increase in their systolic readings (26.9%) after the intervention; five had worsening of their diastolic readings (19.2%).

In summary, among all the providers combined, there was no statistically significant improvement in the percentage of patients with controlled systolic or diastolic blood pressures following the intervention; in contrast, the post intervention data actually revealed that significantly fewer patients seen within the clinic had controlled diastolic blood pressures (p = 0.024). Although the providers individually had modest improvements in the number of patients with improved blood pressure control, none were statistically significant. Surprisingly, the overall percentage of patients achieving systolic and diastolic control post intervention actually decreased.

CHAPTER 5

DISCUSSION

This EBP project was intended to answer the following PICOT question: Does the use of provider audit and feedback, compared to current practice, improve the percentage of type 2 diabetic patients with blood pressure control in a four month period of time? Even though there were no statistically significant improvements in blood pressure control following this project, there are a few main elements that affected this project's outcomes that warrant addressing. This chapter will discuss and explain the findings using the PARIHS framework (evidence, context, and facilitation) as a guide, as well as identify implications for further research.

Explanation of findings

Evidence.

Ten articles were reviewed and analyzed in depth that focused on using audit and feedback in the outpatient setting to improve diabetes outcomes and quality of care. These studies showed modest effects in improving diabetes quality measures (i.e. HgbA1c, blood pressure, cholesterol, and yearly foot and eye exams). Seven articles were of high quality studies (two systematic reviews, one meta-analysis, and four randomized controlled trials) that provided good evidence to support the use of audit and feedback. Rogers' DoI model was used as a change model to guide this project. Feedback worked as a logical and simple method to improve blood pressure control in the type 2 diabetic population to the social system of providers at the rural, outpatient clinic. The project manager determined that audit and feedback was an appropriate intervention for the clinical setting and matched well with the provider's and patient's experiences and preferences to providing and receiving care.

Context and Facilitation.

According to Rycroft-Malone (2004), the context needed to be receptive to change and would be influenced by environmental factors and culture. With the use of transformational leadership and appropriate evaluation and feedback system, audit and feedback was received well by the participating providers in the clinic environment. The project facilitator strived to be a transformational leader within the existing clinic culture. The leader promoted the use of clinical guidelines to current providers at the clinic to improve patient outcomes and quality measures.

The culture within the clinical setting changed dramatically at the start of this EBP project, including social and technological changes that undoubtedly impacted the project’s outcomes. One major change was the loss of a key internal medicine provider who had the largest diabetes practice and had the largest number of patients with uncontrolled blood pressures. Over 180 patients were not able to be incorporated into this project since the provider left the clinic and patients were not able to be established with participating providers prior to project implementation. The inclusion of this patient population with uncontrolled blood pressures may have ultimately led to a higher percentage of control post intervention. Another major system change was the introduction of a new EMR program. This transition initially limited the number of patients seen per provider, which limited access for all patients. The conversion to a new medical record also caused a change in provider focus away from the initial feedback. These system changes most assuredly affected the project outcomes by (a) reducing the total number of patients included in the project post intervention, (b) increasing the load of patients per provider even though their practice was already full, and (c) decreasing the time spent with each patient due to increased patient volume, which may have reduced the number of providers who would have repeated the blood pressure at the time of the visit.

As a result of the above changes in the clinical setting, there were no statistically significant improvements in the percentage of patients with systolic and/or diastolic blood pressure control as a group or among individual providers; instead there were declines in the percentage of patients with controlled systolic and diastolic blood pressures following the intervention. There was no significant change on blood pressure control whether the physician practiced alone or had a midlevel provider. Provider 3 had a statistically significant decrease in diastolic control ($p = 0.047$), though his patient population was the smallest ($n = 9$). None of the providers met the goal of 75% of patients achieving a systolic blood pressure of $\leq$130 mmHg following the intervention; all of the providers, except Provider 1, maintained 75% of diastolic control within their practice.

There was modest improvement in the number of patients with improved blood pressure control, even though the patients did not always reach the goal. This is consistent with previous research conducted by Fischer et al. (2011), Foy et al. (2005), Hysong (2009), Jamtvedt et al. (2010), and Phillips et al. (2005). Overall, 24 patients achieved systolic control (17.9%) and 17 patients achieved diastolic control (12.7%) post intervention that were not controlled prior to the intervention. There was a net improvement in diastolic control of two patients following the intervention in Provider 2 and Provider 4’s practices. The remaining practices displayed a net decrease in overall systolic and diastolic control following the intervention.

After the chart review, it was noted that Provider 3 was the most active in treating hypertension in his patient population with changes in medications to achieve better blood pressure control. Yet, none of the providers documented a repeat blood pressure from the initial medical office assistant (MOA) blood pressure into the EMR though this was encouraged by the project manager during the feedback session. MOAs have been trained at the time they are hired on how to accurately take a blood pressure. They are then tested by the nurse manager before being able to preform their job tasks alone. Manual blood pressures are the main method taken by the MOAs, with very little use of electronic cuffs. Blood pressures fluctuate and can change in a short period of time. It must be recognized that blood pressure readings can be affected by many different factors that were not taken into account in this EBP project (i.e., pain, obesity, caffeine intake, fluid overload). There was no major weight loss noted in examining the 134 individual patient's weight before and after the intervention.

Additionally, no statistical difference was noted between provider demographics and hypertension or diabetes control. There were no significant differences between the number of years of experience or the number of years at the clinic that the provider had compared to the number of their patients with controlled blood pressure or HgbA1c. It is interesting to note that the female physician had the highest number of female type 2 diabetic patients and the lowest number of male patients in the group, though this did not seem to impact the outcome data.

The role of this project manager was clear to the providers at the beginning of the study and was discussed during the feedback sessions. The project manager acted as a transformational leader, encouraging providers to improve their patient's blood pressure control by changing their current practice since their present control did not meet the existing benchmark. The leadership role was mainly displayed at the beginning of the project while supplying each provider with their individual data and providing encouragement to improve their current practice. It is important for the APN to lead by example and to follow the roles of educator, leader, and advocate. The project manager had been practicing in an advanced practice role at the clinic for six years and contributed her experience within this project, acting as an advocate for the patient to improve their quality measures, thereby reducing their risk for cardiovascular disease.

Implications for theory

Due to the loss of a busy internist and the introduction of a new EMR system, the intervention needed to demonstrate the five intrinsic characteristics of Rogers' DoI model (relative advantage, compatibility, complexity, trialability, and observability) in order for the providers to remember and to remain focused on the end goal of blood pressure control. Because of environmental factors that could not be controlled, the persuasion stage of the model was the most challenging step in this change model. Providers' time and focus changed from patient outcomes to the new technology and increased patient demand. The implementation stage was initially supported, but later forgotten. The results of the project suggest that the confirmation step of the intervention was not completely supported by the six participating providers. Yet, Rogers' DoI model provided a rational flow to the project's development and helped guide the project's direction. There were no changes needed for the model to be applied within this setting, and because of its ability to be applied to many different focuses, this model could easily be used for future EBP projects.

Implications for research and education

Both strengths and weaknesses were identified in the evaluation of this EBP project that could affect future research involving audit and feedback. The strengths of this project mainly include the logistics of the intervention. Audit and feedback had the ability to be performed to a wide range of providers and for a wide range of healthcare needs. Audit and feedback was quick and easily applied to this EBP project. Because of the many changes occurring at the clinic and the limited timeframe for project completion, audit and feedback was one of a few interventions that would have been accepted by the providers. The good working relationship between all providers was also a strength within this project, as the relationship facilitated the project manager's efforts of performing feedback within a receptive environment.

The inability to include the multifactorial affects on blood pressure as discussed above was a weakness within the project's design. These labile factors were not intended to be addressed in this project, but could have affected patients' blood pressure readings. Thus, a suggestion for future projects includes addressing these multifactorial affects prior to project implementation. Additionally, the limited time of four months was also a weakness as this timeframe proved to be an insufficient amount of time to notice a significant improvement in blood pressure control. Since over 80 patients had not had a follow up visit during the intervention time, these individuals were excluded from data collection. Thus, the smaller sample size most likely affected the outcomes; a larger sample size would have improved consistency and power. As noted previously, Provider 3 had a sample size of nine. Any small change in blood pressure control within this group of patients resulted in a large impact on the total percentage controlled for that population. A suggested improvement to this project would have been to lengthen the intervention period to a time of at least six months, which would have allowed for the addition of more patients.

Future practice implications include adding reminders to audit and feedback. Follow-up interactions would remind the providers to continue to strive to meet the benchmark of controlled blood pressure, and ultimately improve patients' health outcomes, during the entire implementation period. Within this project, four months was too long a period of time without a reminder; providers tended to forget about the project. Instead, the transition to the new EMR became the main focus within their daily schedule. Another practice implication involves the use of EMR, along with feedback, to improve diabetes outcomes. The clinic's current system does not have all the capabilities for provider reminders that were initially thought when the new EMR system was incorporated into practice. With further development of the system, there could be great improvement in diabetes treatment with the addition of electronic reminders.

Additionally, APNs are in a prime role to maintain the focus of healthcare on the patient and to provide valuable feedback to all providers to improve health outcomes and quality measures. As the healthcare system looks toward the future, with changes in reimbursement based on quality measures, it is vital for healthcare professionals to keep abreast of these changes and focus on providing quality, holistic care (Medical Director, personal communication, March 24, 2012).

Findings from this EBP project support the importance of future research development. Further research should focus on expanding the use of audit and feedback, alone and in combination with other interventions, to improve provider behavior and change current practice. Because of the projected growth of the incidence of diabetes in the future (CDC, 2011), additional research should also include other interventions aimed at improving diabetes quality outcomes, as there is currently a gap in the literature. Although the need to improve the delivery of care to reduce the risk of morbidity and mortality in type 2 diabetes is apparent, there is also a lack of recent research concentrating on provider interventions in helping patients improve diabetes care and outcomes. Although research has demonstrated the effectiveness of using an EMR to improve diabetes outcomes (Craig et al. (2007), Fischer et al. (2011), Phillips et al. (2005), and Shojania et al. (2006), this intervention has produced only modest results. Further focus at the participating clinic for this EBP would be to utilize the EMR more in meeting quality measures.

Education is a key component in healthcare, whether it involves the provider, the patient, or both of the essential members of the diabetic management team. Implications for future education include further education to providers about the importance of improving quality measures to receive higher reimbursement. The focus on monetary reimbursement for developing practice change and meeting established goals may influence needed change. Further education also needs to focus on patients, providing as much information to patients about their health as possible. This added knowledge would encourage self-management and control of their own healthcare.

Conclusion

Overall, this EBP project produced findings consistent with the supportive evidence, demonstrating only a modest improvement in the number of patients with improved blood pressure readings post intervention. Due undoubtedly in part to the environmental system changes that occurred at the start of this project, the use of audit and feedback did not result in any major improvements in quality outcomes. There were no statistically significant improvements in systolic or diastolic readings for each individual provider or as a group; in contrast, there was an overall reduction in the percentage of type 2 diabetic patients with controlled systolic and diastolic blood pressure. These findings are consistent with other research noting that problems with the delivery of healthcare services continue to contribute to the nation's inability to achieve current evidence-based practice goals for optimal chronic disease management. Additional practical intervention strategies are needed to ensure that the most effective evidence-based recommendations for diabetes care are used within clinical practice. The doctorally prepared APN has the knowledge and tools to undertake this challenge and promote improved quality of care and decrease morbidity and mortality in the type 2 diabetic population.

REFERENCES

American Diabetes Association. (2011). *Diabetes statistics.* Retrieved from http://www.diabetes.org/diabetes-basics/diabetes-statistics/

American Heart Association. (2010). *Know your health numbers.* Retrieved from http://www.heart.org/HEARTORG/Conditions/Diabetes/PreventionTreatmentofDiabetes/Know-Your-Health-Numbers_UCM_313882_Article.jsp

Carboneau, C. (2005). Using diffusion of innovations and academic detailing to spread evidence-based practices. *Journal for Healthcare Quality, 27*(2) 48-52.

Centers for Disease Control and Prevention (2009). *Diabetes data and trends.* Retrieved from http://apps.nccd.cdc.gov/DDTSTRS/Index.aspx?stateId=17&state=Illinois&cat=riskfactors&Data=data&view=TO&id=23&trend=hypertenxion

Centers for Disease Control and Prevention. (2011). *National diabetes fact sheet, 2011.* Retrieved from http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf.

Craig, T. J., Perlin, J. B., & Fleming, B. B. (2007). Self-reported performance improvement strategies of highly successful Veterans Health Administration facilities. *American Journal of Medical Quality, 22*(6), 438-444. doi: 10.1177/1062860607304928

Dopson, S., FitzGerald, L., Ferlie, E., Gabbay, J., & Locock, L. (2010). No magic targets! Changing clinical practice to become more evidence based. *Health Care Management REVIEW, 35*(1), 2-12.

Fischer, H. H., Eisert, S. L., Durfee, M. J., Moore, S. L., Steele, A.W., McCullen, K., … Mackenzie, T.D. (2011). The impact of tailored diabetes registry report cards on measures of disease control: A nested randomized trial. *BMC Medical Informatics and Decision Making, 11*(12), 1-11.

Fitzgerald, M. A. (2011). Hypertension treatment update: Focus on direct renin inhibition. *Journal of the American Academy of Nurse Practitioners, 23*, 239-248. doi:10.1111/j.1745-7599.2010.00589x

Foy, R., Eccles, M. P., Jamtvedt, G., Young, J., Grimshaw, J. M., & Baker, R. (2005). What do we know about audit and feedback? Pitfalls in applying evidence from a systemic review. *BMC Health Services Research, 5* (50), 1-7. doi: 10.1186/1472-6963-5-50

Frijling, B. D., Lobo, C. M., Hulscher, M. E. J. L., Akkermans, R. P., Braspenning, J. C. C., Prins, A.,…Grol, R. P. T. M. (2002). Multifaceted support to improve clinical decision making in diabetes care: a randomized control trial in general practice. *Diabetic Medicine, 19,* 836- 842.

Grimshaw, J. M., Thomas, R. E., MacLennan, G., Fraser, C., Ramsay, C. R., Vale, L., …Donaldson, C. (2004). Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technology Assessment, 8*(6), iii- 352.

Heart Outcomes Prevention Evaluation (HOPE) Study Investigators (2000). Effects of Ramipril on cardiovascular and microvascular outcomes in people with diabetes mellitus: Results of the HOPE study and MICRO-HOPE substudy. *Lancet, 355,* 253-259.

Hysong, S. J. (2009). Meta-analysis: Audit and feedback features impact effectiveness on care quality. *Medical Care, 47*(3), 356-363.

Jamtvedt, G., Young, J. M., Kristoffersen, D. T., O'Brien, M. A., & Oxman, A. D. (2010). Audit and feedback: effects on professional practice and health care outcomes. *Cochrane Database of Systemic Reviews, 2,* 1-104. doi: 10.1002/14651858.CD000259.pub2.

Kiefe, C. I., Allison, J. J., Williams, O. D., Person, S. D., Weaver, M. T., & Weissman, N.

W. (2001). Improving quality improvement using achievable benchmarks for physician feedback: A randomized controlled trial. *JAMA, 285*, 2871-2879.

Kirkman, M. S., Williams, S. R., Caffrey, H. H., & Marrero, D. G. (2002). Impact of a program to improve adherence to diabetes guidelines by primary care providers. *Diabetes Care, 25*(11), 1946-1951.

Kitson, A. L., Rycroft-Malone, J., Harvey, G., McCormack, B., Seers, K., & Titchen, A. (2008). Evaluating the successful implementation of evidence into practice using the PARiHS framework: Theoretical and practical challenges. *Implementation Science, 3*(1), 1-12. doi:10.1186/1748-5908-3-1

LaMarr, B., Valdez, C., Driscoll, K., & Ryan, M. (2010). Influence of pharmacist intervention on prescribing angiotensin-converting enzyme inhibitors, angiotensin II-receptor blockers, and aspirin for diabetic patients. *American Journal of Health-System Pharmacy, 67*, 290-294. doi:10.2146/ajhp.090009

Melnyk, B. M., & Fineout-Overholt, E. (2011). *Evidence-based practice in nursing and healthcare 2nd ed.* Philadelphia: LWW.

National Kidney Foundation. (2010). *High blood pressure and chronic kidney disease*. Retrieved from http://www.kidney.org/atoz/pdf/hbpandckd.pdf

Pappoe, L. S. & Winkelmayer, W. C. (2010). ACE inhibitor and angiotensin II type 1 receptor antagonist therapies in elderly patients with diabetes mellitus: Are they underutilized*? Drugs & Aging, 27*(2), 87-94.

Phillips, L. S., Ziemer, D. C., Doyle, J. P., Barnes, C. S., Kolm, P., Branch, W. T.,…Watkins, C. (2005). An endocrinologist-supported intervention aimed at providers improves diabetes management in a primary care site. *Diabetes Care, 28*, 2352-2360.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.

Rycroft-Malone, J. (2004). The PARIHS framework-- A framework for guiding the implementation of evidence based practice. *Journal of Nursing Care Quality, 19*(4), 297- 304.

Shojania, K. G., Ranji, S. R., McDonald, K .M., Grimshaw, J. M., Sundaram, V., Rushakoff, R .J., & Owens, D. K. (2006). Effects of quality improvement strategies for type 2 diabetes on glycemic control. *Journal of the American Medical Association, 296*(4), 427- 440.

Thomas, S. & Kodack, M. (2011, April). Managing the patient with T2DM with RI. *The Clinical Advisor.* Retrieved from http://www.clinicaladvisor.com/managing-type-2-diabetes-with-renal-impairment/article/199963/

U.S. Department of Health and Human Services (2003). The seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. Retrieved from http://www.nhlbi.nih.gov/guidelines/hypertension/express.pdf.

U.S. Department of Health and Human Services. (2011). *Healthy People 2020 topics & objectives: Diabetes.* Retrieved from http://healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=8

Williams, G. C., Patrick, H., Niemiec, C. P., Williams, L. K., Divine, G., Lafata, J. E., … Pladevall, M. (2009). Reducing the health risks of diabetes: How self-determination theory may help improve medication adherence and quality of life. *Diabetes Education, 35,* 484-492. doi:10.1177/0145721709333856

BIOGRAPHICAL MATERIAL

Kara M. Painton

Ms. Painton received her BSN in 2003 and her MSN and post-master's family nurse practitioner certificate in 2005 from Valparaiso University. During her master's program, she worked as a critical care nurse in northwest Indiana. She is currently employed in rural east central Illinois at an outpatient clinic as an ANCC-certified family nurse practitioner and has been in that role since 2006. Ms. Painton is a member of Sigma Theta Tau Zeta Epsilon chapter, the Illinois Society for Advanced Practice Nurses, and the American Academy of Nurse Practitioners. She enjoys providing preventive care, as well as managing chronic diseases in the adult population. Her clinical focus of collaborating with other healthcare providers to deliver quality patient care and to obtain high quality measures led to her DNP evidence-based practice project.

ACRONYM LIST

A & F: audit and feedback

ACEI: angiotensin converting enzyme inhibitor

ACQIP: Ambulatory Care Quality Improvement Project

ARB: angiotensin receptor blocker

ADA: American Diabetic Association

AHA: American Heart Association

APN: advanced practice nurse

APP: advanced practice provider

CAD: coronary artery disease

CBA: controlled before and after

CCT: controlled clinical trial

CDC: Centers for Disease Control and Prevention

CI: confidence interval

DBP: diastolic blood pressure

DM: diabetes mellitus

DoI: diffusion of innovation

EBP: evidence-based practice

EMR: electronic medical record

EPOC: Effective Practice and Organisation of Care

FIT: Feedback Intervention Theory

HgbA1c: hemoglobin A1c

HOPE: Heart Outcomes Prevention Evaluation (study)

HTN: hypertension

ICD: International Classification of Diseases

IRB: Institutional Review Board

ITS: interrupted time series

LDL: low density lipoproteins

MOA: medical office assistant

NHANES: National Health and Nutrition Examination Survey

NKF: National Kidney Foundation

NP: nurse practitioner

OR: odds ratio

PA: physician assistant

PARIHS: Promoting Action of Research Implementation in Health Services

PASW: Predictive Analytic SoftWare

PCP: primary care provider

PICOT: patient population, intervention or interest, comparison intervention or status, outcome, and time

RCT: randomized controlled trials

SBP: systolic blood pressure

USDHHS: U.S. Department of Health and Human Services

VHA: Veterans Health Administration

APPENDIX A

Evidence Data Table

Author(s), Publication, Level of Evidence	Population, Setting	Design, Intervention(s), Comparisons	Outcomes and Effect Measures
Craig et al. (2007) *American Journal of Medical Quality* *Level VI*	• VHA system patients	• Retrospective descriptive study • Performance measure data reviewed and analyzed • Quality manager from 5 highest scoring facilities queried about strategies used to improve 24 clinical outcome measures, including HTN & DM	• Most effective and frequently used was organizational change • A & F used by 40% of respondents to improve clinical measures • A & F was used 17 times in HTN/CAD and 22 times in DM; effective in performance improvement
Fischer et al. (2011) *BMC Medical Informatics and Decision Making* *Level II*	• 5,457 low income DM patients • 8 community clinics	• Prospective, randomized trial • Compared patient report card (mailed or point of care) to provider feedback and report card • Also used diabetes champion	• Patient report cards did not improve process outcomes • Enhanced provider level feedback improved glycemic control (6.4% vs. standard care 3.8%, $p < 0.001$) • Blood pressure control improved by 5.6%, but not statistically significant
Foy et al. (2005) *BMC Health Services Research* *Level V*	• DM care and management • Primary care	• Review of 85 heterogeneous RCTs using A & F in chronic care • Explore techniques most effective in providing A & F to primary care providers	• No major difference in who performed audit, source of feedback, or single/multicomponent approach • A & F can improve practice with small to moderate effects (5-10% improvement) • A & F moderately increased physician compliance with DM care; esp. when initial compliance low

Author(s), Publication, Level of Evidence	Population, Setting	Design, Intervention(s), Comparisons	Outcomes and Effect Measures
Frijling et al. (2002) *Diabetic Medicine* *Level II*	• 185 GPs in 124 general practices in the Netherlands from 1966-1999	• Cluster randomized trial • 124 practices randomized into two groups: intervention (individualized feedback, assignment to facilitator who visited 15 times in a 21-month period) vs. no special attention	• Multilevel logistic regression analysis evaluated influence of intervention for following EBP strategies for DM • Intervention statistically increased rate of foot exams and eye exams (19%, p = 0.004 and 9%, p =0 .020, respectively) • BP measurement compliance increased by 3%, but not statistically significant
Grimshaw et al. (2004) *Health Technology Assessment* *Level I*	• 235 studies included RCTs, CCTs, CBAs, ITS	• Systematic review examining effect of multiple interventions for guideline dissemination and implementation of practice strategies: reminders, A & F, distribution of educational materials, educational meetings, educational outreach visits, and local opinion leaders	• 10 studies evaluated A & F (8 RCTs); 6 in outpatient primary care settings; 6 also involved general management or prevention • All 8 RCTs showed moderate (7%) improvements in care • 2 patient-centered RCTs had overall improvement of 15.4%
Hysong (2009) *Medical Care* *Level I*	• Healthcare settings • Primary care providers • 19 RCTs measuring healthcare outcomes and clinical performance using A & F	• Used FIT to evaluate characteristics of feedback contributing to intervention effectiveness within 3 main areas: feedback content, feedback format, and feedback frequency	• Meta-analytic procedures revealed a mean effect size of 0.4, suggesting a moderate to significant effect on clinical outcomes (95% CI, $\pm$ 0.2) • A & F most effective when written (rather than verbal) and frequent (p = 0.025)

Author(s), Publication, Level of Evidence	**Population, Setting**	**Design, Intervention(s), Comparisons**	**Outcomes and Effect Measures**
Jamtvedt et al. (2010) *The Cochrane Collaboration* *Level I*	• 118 RCTs • Majority from North America • Mainly physicians	• Systematic review evaluating effectiveness of A & F to improve professional practice and healthcare outcomes • A & F alone, A & F with educational outreach, or multifaceted with A & F • 38 studies compared A & F to no intervention	• Multilevel linear regression to determine adjusted *RR* when compared to no intervention • Adjusted *RR* for A & F was 0.7-2.1 • Adjusted RR for A & F with education meetings was 0.98-3.01 • Adjusted *RR* for A & F in a multifaceted intervention was 0.78-18.3 • There was no significant difference between A & F and other interventions
Kiefe et al. (2001) *JAMA* *Level II*	• 70 Physicians part of ACQIP to improve quality outcome measures in 2,978 Medicare patients with DM (20 per physician) • Alabama, Iowa, Maryland	• RCT evaluating use of A & F to improve benchmarks and goals in outpatient diabetes care • Chart audit evaluated HgbA1c, total cholesterol, triglycerides, creatinine, office foot exam, and influenza vaccine • Control group received mailed feedback every 6 months x 1 year; benchmark group received control group information plus an achievable benchmark for each quality measure	• Paired *t*-tests and generalized linear models were used to compare changes from baseline • Benchmarking resulted in significant improvement in foot exams (46% at baseline to 61%; *OR* = 1.33; $p < 0.001$); HgbA1c (31% at baseline to 70%; *OR* = 1.33; $p < 0.001$); cholesterol (66% at baseline to 72%; *OR* = 1.20; $p = 0.01$) • Setting achievable goals appeared to be an effective means of improving quality outcomes in older diabetic population

Author(s) Publication, Level of Evidence	**Population, Setting**	**Design, Intervention(s), Comparisons**	**Outcomes and Effect Measures**
Phillips et al. (2005) *Diabetes Care* *Level II*	• 4,138 type 2 diabetics who received care from Grady Medical Clinic • Over 3-year period of time	• RCT involving care given by 345 residents at Emory University comparing computerized reminders vs. feedback alone vs. both interventions • Evaluated HgbA1c, SBP, and LDL	• Linear mixed model multivariate regression analyses • Generalized estimating equation for ADA goal attainment • SBP improved 3.2 mmHg in feedback only group ($p < 0.0084$) • SBP goal was attained the highest in the feedback only group ($OR = 1.19$, CI 95% [1.07-1.32], $p = 0.001$) • HgbA1c improved modestly in the feedback only group (-0.4%; $p = 0.0002$) • HgbA1c goal was attained the highest in the feedback only group, 57% ($OR = 1.1762$, CI 95% [1.03-1.34], $p = 0.016$) • LDL decreased in the feedback only group by 15 mg/dl ($p < 0.001$)

APPENDIX B

Standardized Audit and Feedback Procedure

PROCEDURE TITLE:		Audit and Feedback to Improve Blood Pressure Control in the Type 2 Diabetic Population	
AUTHOR:	Kara Painton, MSN, RN, FNP-BC	APPLICABLE TO:	Clinic Healthcare Providers
DATE ORIGINATED:	8/11	DATE EFFECTIVE:	9/11
Page 1 of 3			

GENERAL INFORMATION:

Diabetes affects more than 25 million Americans and leads to major cardiovascular disease and complications (Centers for Disease Control [CDC], 2011). Diabetes is the seventh leading cause of death in the United States (CDC, 2011). Diabetics have two to four times the risk of heart disease and stroke as compared to patients without diabetes (LaMarr, Valdez, Driscoll, & Ryan, 2010). It is estimated that 75% of Americans with type 2 diabetes, 67% of Illinois residents, also have hypertension (Thomas & Kodack, 2011). An initial chart audit at the clinic revealed that approximately 5% of the total adult patient population receiving regular care had diabetes; approximately 90% of these patients had concomitant hypertension.

Because of the increased morbidity and mortality associated with concomitant diabetes and hypertension, the American Diabetes Association (ADA), CDC, National Kidney Foundation (NKF), and the American Heart Association (AHA) have established guidelines for blood pressure control with a target systolic blood pressure of no greater than 130 mmHg and a diastolic blood pressure of no greater than 80 mmHg. Maintaining blood pressures at these targeted levels, preferably through the use of an ACEI or ARB, has been shown to reduce the risk of microvascular complications by 33% and

TITLE:	Audit and Feedback to Improve Blood Pressure Control in the Type 2 Diabetic Population	
DEPARTMENTS:	Clinic Healthcare Providers	Page 2 of 3

macrovascular complications by 33-50% (CDC, 2011; LaMarr, et al., 2010). Furthermore, the CDC (2011) noted that each 10 mmHg reduction in systolic blood pressure results in a 12% reduction in risk for microvascular and macrovascular complications, and reducing the diastolic pressure from 90 mmHg to 80 mmHg reduces the risk of a major cardiovascular event by 50%.

Audit and feedback has demonstrated effectiveness in improving blood pressure control and other diabetic quality measures in multiple research studies. This evidence-based practice project will be implemented with the objective of determining the effectiveness of audit and feedback intervention in improving blood pressure control in the adult diabetic population within CFPS.

PROCEDURES:

1.0 A chart audit of 460 diabetic patients with hypertension was completed in July, 2011.

2.0 From September 18 to September 21, 2011, individual feedback sessions will be undertaken with each individual provider to review the audit results.

2.1 After signing the consent form to participate in the study, providers will select a convenient time and location to review the audit findings.

2.2 At the appointed time, the project facilitator will meet the individual provider at the requested location.

2.3 Verbal feedback will last approximately 10 to 20 minutes per provider.

2.3.1 Discussion will start with purpose of this EBP project.

TITLE:	Audit and Feedback to Improve Blood Pressure Control in the Type 2 Diabetic Population	
DEPARTMENTS:	Clinic Healthcare Providers	Page 3 of 3

2.3.2 Individual audit results will be reviewed, including the data obtained from the chart audit (e.g., BP control, ACEI/ARB use, and glycemic control).

2.3.3 Clinical guidelines from ADA, AHA, NKF, and CDC will be reviewed and discussed.

2.3.4 Aggregate clinic data will be used to compare to individual provider data.

2.3.5 Goal of percentage of blood pressure control will be detailed.

2.3.6 Feedback will be provided detailing interventions demonstrated to be effective in improving blood pressure control (i.e., use of ACEI/ ARB if not contraindicated, and the results of the HOPE study).

2.3.7 Time will be allotted for each provider to identify and discuss concerns or questions regarding the guidelines.

2.4 Time, date, length of visit, and provider initials will be recorded in a log book to keep track of each feedback session.

APPENDIX C

Diabetic Blood Pressure Intervention Worksheet

Patient Code Number	Age	Gender	ACEI or ARB?	SBP1	DBP1	Provider Initials	HgbA1c >7.0%	Microalbuminuria?	Seen within past 6 months?	SBP2	DBP2
xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx