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The Impact of Interprofessional Collaboration on Diabetes Outcomes in Primary Care Settings

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This is to certify that the doctoral study by

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Walden University
2018

Abstract

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MS, Walden University, 2006

BS, Clemson University, 1996

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Inadequate interprofessional collaboration (IPC) and communication among health care professionals are associated with medical errors and mortality. Guided by the theory of goal attainment and the chronic care model, a systematic review was conducted to explore the evidence related to whether interprofessional collaborative primary care can have a positive effect on health outcomes for patients living with diabetes (PLWD). The systematic review followed the Joanna Briggs Institute method for systematic reviews and results were complied with the PRISMA evidence-based minimum set for reporting. Data were analyzed to identify if IPC positively impacted the health outcomes of PLWD, as evidenced by a reduction in hemoglobin A1c and body mass index. Five studies met the inclusion criteria of English-speaking, peer-reviewed studies. Statistically significant improvement in hemoglobin A1c ($p < 0.001$) and body mass index ($p = 0.026$) was shown in 2 studies. Two studies lacked robust statistical analysis of the data; however, researchers showed an average reduction in participants' hemoglobin A1c from 10.6% to 8.8% ($N = 45$) in one study and a change of -0.7 to -0.9% ($N = 3$) in another. A fifth study showed that collaboration patterns that included equitable and comprehensive participation of 3 disciplines resulted in a lower proportion of patients with hemoglobin A1c levels greater than 9%. Four out of the 5 research studies noted the integration of pharmacists into the interprofessional collaborative team. The implication for positive social change for this systematic review is that the greater use of interprofessional collaboration and communication may improve the outcomes of patients with diabetes in primary care settings.

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Dedication

I dedicate this project in memory of my brother, Bruce Phillips who lost his life due to complications of diabetes. It is because of our earthly loss of you that I am passionate about helping others who are living with diabetes.

Acknowledgments

I would like to thank. Dr. Janice Wise, my committee member, for your kind and prompt feedback, as well as your words of encouragement. I would also like to thank Dr. Debra Gogatz and Dr. Barbara Schmitz, who started as colleagues, but later became my preceptor and second reviewer. Thank you both for your willingness to share your knowledge and expertise to assist me in this process.

I want to acknowledge my village. First, I want to thank my husband, RaShane DeLoach, Sr. for your unwavering patience and understanding as I worked to complete this doctoral program. To my children, RaShane, II and Carmen, thank you for believing that your Mommy is the best, even when the work of the program pulled me away from giving you my undivided attention. You are my inspiration and the driving force that never allowed me to give up on my dream. Last, but certainly not the least, I dedicate this project to my parents who instilled in me the values of hard work and determination.

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Section 1: Introduction

Introduction

Preventable errors in health care contribute to one in every 10 patients being harmed or killed. The Institute of Medicine (IOM) reported that inadequate collaboration and poor communication among health professionals resulted in 44,000 American deaths in 1997 due to medical errors (Donaldson, Corrigan, & Kohn, 2000). Interprofessional collaboration (IPC) was identified as a promising solution to improve the quality of care outcomes for patients with chronic health problems (Schmitt, 2001). IPC is the sharing of ideas, clinical judgments, and diagnostic modalities to collectively achieve better outcomes (D'Amour, Ferrada-Videla, San Martin Rodriguez, & Beaulieu, 2005). IPC and effective communication encourage effective teamwork that promotes continuity of care and clarity within the health care team (O'Daniel & Rosenstein, 2008). Continuity of care and clear directions for the plan of care are important in reducing health care errors.

The American Association of Colleges of Nursing (2006) identified IPC as an essential competency for Doctor of Nursing Practice (DNP) graduates. The complex and multi-tiered structure of the health care environment requires contributions of multiple professions. Nurses must function in highly collaborative teams to provide safe, efficient, effective, and patient-centered care in a complex health care environment (American Association of Colleges of Nurses, 2006). In its report *The Future of Nursing; Leading Change, Advancing Health,* the IOM (2011) identified registered nurses as key players in the development of policies, implementation of change, provision and coordination of patient care, and measurement of health care improvements. Nurses are prepared by

training and practice experience to be effective players in interprofessional collaborative environments (American Nurses Association, 2011, 2016).

Health professions share a common focus on patient care; however, each discipline such as medicine, nursing, and pharmacy are unique in their ontological and epistemological foundations. For those disciplines, the education and clinical preparation are different with varying similarities. Despite the differences, the team approach to providing high quality and extremely safe care requires each member to work collaboratively to achieve the same outcomes (Newhouse & Spring, 2010). Zwarenstein, Goldman, & Reeves (2009) noted that it is important to understand the effectiveness of IPC on health outcomes for patients with complex conditions such as diabetes.

In 2015, health care spending in the United States reached $3.2 trillion (Centers for Medicare & Medicaid Services, 2017), which was up from $2.49 trillion in 2009 (National Center for Health Statistics, 2016). Because of these escalating health care expenditures, it is necessary to look at ways to reduce fragmentation of care and to lower the cost to provide care (Retchin, 2008).

There are more than 29 million Americans diagnosed with diabetes and another 86 million with prediabetes (Centers for Disease Control and Prevention [CDC], 2016). In 2012, the economic burden of diabetes was an estimated $245 billion, with a direct medical care cost of $176 billion and a reduced productivity cost of $69 billion (American Diabetes Association [ADA], 2013). In the 2017 Standards of Diabetes Care, the ADA (2017) identified strategies to improve management of diabetes, which include but are not limited to (a) chronic care interventions of coordination of visits using a team-

based approach; (b) incorporation of care teams that include nurses, pharmacists, dieticians, and other providers; (c) diabetes self-management education; and (d) addressing health disparities and lack of health care insurance in vulnerable populations. These interventions maybe addressed by implementing interprofessional collaborative teams in health care settings.

In this project, I focused on collaboration among members of interprofessional teams in primary care settings and its effect on health outcomes of patients living with diabetes (PLWD). This study may lead to positive social change by spurring discussion about health disparities and how the lack of health insurance negatively affects patients. Patients who do not have health insurance are often treated by safety net providers. These safety net providers can create positive social change by addressing the health disparities of limited access to medications and consistent health care providers to manage their patients' chronic illnesses (Nguyen, Makam, & Halm, 2016). The purpose of this project was to conduct a systematic review of the evidence on the effect of primary care IPC on the health outcomes of PLWD.

Problem Statement

Local Nursing Practice Problem

In the United States, diabetes is the seventh leading cause of death, a number that is likely underreported (National Center for Chronic Disease Prevention and Health Promotion, 2017). Diabetes is the primary cause of complications such as kidney failure, blindness, and amputations of lower extremities (CDC, 2017). Having diabetes doubles a persons' risk of having heart disease or a stroke (CDC, 2016). An emerging body of

research indicates there is a link between a team-based or collaborative approach and increased effectiveness of diabetes management.

According to the CDC (2016), 10.7% of Georgia residents were diagnosed with diabetes in 2015. In 2013, the total estimated cost for medical care and lost productivity for diabetes in Georgia was approximately $5.1 billion (Georgia Department of Public Health, 2015). Identifying and implementing evidence-based practice strategies that are proven to improve diabetic outcomes will potentially decrease the financial burden of this condition in Georgia.

Patients with chronic health conditions such as diabetes require coordinated clinical management (Najarian, Bartman, Kaszuba, & Lynch, 2013). PLWD benefit from interprofessional collaborative care (Greenapple, 2011). IPC is the sharing of ideas, clinical judgments, diagnostic modalities, and a collective action intended to improve patient outcomes (D'Amour et al., 2005). When clinicians engage in interprofessional collaborative care, patients' health outcomes are improved with reductions in costs (Hallin, Keissling, Waldner, & Henricksson, 2009; Wang & Bhatka, 2013).

Local Relevance

Since IPC has an impact on health outcomes for PLWD in primary care settings, organizations need to implement collaborative care as well as measure the results. Experiences at a faith-based medical clinic in the state of Georgia shed light on interprofessional collaborative care in primary care settings. The clinic provided reduced-fee primary health services to persons without health insurance. Without the clinic, these individuals would not have access to affordable health services. The clinic leadership

reported their clinicians engaged in IPC; however, there was no evaluation to identify the impact on patient outcomes.

In addition to the reported interprofessional collaborative care model, the clinic was unique in that the clinicians were mainly volunteers with a limited number of paid staff. The combination of volunteer clinicians with paid office staff provided a sustainable model for providing primary care services to patients who were uninsured. This team consisted of physicians, nurse practitioners, physician assistants, pharmacists, and health educators. The clinic's status as a faith-based organization was another unique aspect. This meant the organization was founded on Christian principles and openly sought to share the principles of its faith with its patients if they choose. This organization chose not to accept state or federal funding because typically regulations restricted the co-mingling of religious outreach and the receipt of federal funding. Clinic leaders believed having restrictions would interfere with their ability to share their Christian faith freely with patients. This aspect of the organization's operational plan further contributed to the need to maximize care while minimizing costs because it depended heavily upon charitable donations in addition to the fees paid by the patients to cover the operating costs.

The clinic was a clinical site for students from nurse practitioner, medical assistant, pharmacy, and osteopathic medicine programs. Due to the volunteer-based staffing model, students often had preceptors from different disciplines, which made IPC most important for clinical rotations. This clinical practice site provided training

opportunities to enhance a future workforce who could work in health care settings that embraced IPC.

Significance of Project

The IOM (2001) reported interprofessional communication, collaboration, and health professions' education are prerequisites for better system outcomes, including but not limited to patient safety and quality of care. I used the evidence gathered from this systematic review to determine if the work done by interprofessional collaborative teams in primary care settings had a positive impact on health outcomes of PLWD.

This doctoral project is significant for its identification of the impact of primary care IPC on the health outcomes of PLWD and is particularly timely considering current proposed legislative changes to repeal existing provisions of health care coverage for vulnerable populations in the United States. Changes in health care coverage can further complicate the care of chronic diseases such as diabetes. These changes will cause an increase in the number of persons who do not have health insurance and potentially a decline in access to essential primary care services. Primary care professionals must be innovative when attempting to meet the needs of those who are vulnerable due to health care disparities such as a lack of health insurance and limited access to preventative primary care. By identifying how IPC affects patient outcomes, it is possible to move toward improving the health care of underserved populations.

Purpose

Gap in Practice Defined

The purpose of this project was to complete a systematic review of available literature to determine if interprofessional collaborative care positively influences health outcomes of PLWD managed in primary care settings. Numerous studies have shown how interprofessional or interdisciplinary teams impact patient outcomes in the acute care settings, but there has been limited research on their impact in primary care settings (Najarian et al., 2013; Piquette, Reeves, & LeBlanc, 2009; Seneviratne, Mather, & Then, 2009). In previously published systematic reviews on IPC, researchers have identified multiple problems such as small sample sizes, variations in methodologies, and findings that did not consistently show if there was an impact on patient outcomes (Wild, Nawaz, Chan, & Katz, 2004; Zwarenstein et al., 2009; Zwarenstein & Reeves, 2006). Other qualitative researchers focused on thematic similarities and development of frameworks for interprofessional collaborative care (Hjalmarson, Ahgren, & Kjölsrud, 2013; Mior, Barnsley, Boon, Ashbury, & Haig, 2010). Despite the limited outcomes, high levels of patient satisfaction seem to be consistently identified in settings with interprofessional collaborative care models (Hjalmarson et al., 2013; Linda, Rahman, Bridges, Horsley, & Neil, 2014; Wensing, Wollersheim, & Grol, 2006). I found no systematic reviews specific to the impact of interprofessional collaborative care on the outcomes of PLWD managed in primary care settings.

Evidence-Based Practice

IPC is an emerging evidence-based practice relevant to nursing practice that positively impacts how patients manage their own chronic conditions such as diabetes and cardiovascular disease (Mast, Rahman, Bridges & Horsley, 2014). Evidence-based practice involves a systematic approach of the evaluation of patient care processes and outcomes against the backdrop of the best and most current evidence (White & Dudley-Brown, 2012). For example, researchers have linked improvements in coordination of care to reduced health care costs as well as improvements in the quality and safety of patient care (Retchin, 2008). Care coordination, an attribute of interprofessional collaborative care models, positively impacts patient outcomes in primary settings (Vachon et al., 2017; Vanderboom, Thackeray, & Rhudy, 2015).

Practice-Focused Question

The PICOT format is a robust guide to systematically develop a practice-focused question (Stillwell, Fineout-Overholt, Melnyk, & Williamson, 2010). The acronym PICOT describes five elements specific to the development of a project question. These elements include: (a) the patient or population and the problem to be investigated, (b) the intervention or the issue that is of concern, (c) the intervention or issue to be compared to this proposed intervention, (d) the anticipated outcomes for the intervention and/or the comparison, and (e) the time necessary to achieve the outcome (Stillwell et al., 2010). A well-built PICOT question supports the development of a robust framework for inquiry that includes a synthesis of the most supported evidence to improve patient outcomes.

The elements of the PICOT question guiding this project included:

- Problem/patient population: Effectiveness of chronic disease management in primary care for adults over 18 years old living with type 2 diabetes.
- Intervention: Interprofessional collaborative care for the management of type 2 diabetes.
- Comparison: Other models of care for the management of type 2 diabetes.
- Outcome: Hospitalizations, re-hospitalizations, and emergency room visits, hemoglobin A1c, body mass index, patient knowledge, patient satisfaction, and cost of care.
- Type/time: Systematic review of the research literature published from 2012-2018 using the Joanna Briggs Institute (JBI) method.

PICOT question: What is the impact of an interprofessional collaborative care on the outcomes of adult patients living with type 2 diabetes managed in primary settings?

The JBI is a leader in evidence-based guidelines and systematic review development. A systematic review is an analysis of available literature on an intervention or issue. The JBI has a specific view regarding literature that should be counted as evidence and prescribes a method of synthesis of the evidence (Aromataris et al., 2015). In this project, I used the critical appraisal tool and JBI method for a systematic review (see Aromataris et al., 2015). A systematic review is considered one of the strongest levels of research evidence in terms of quality for appraisal and synthesis of research findings (Groves, Burns, & Gray, 2013). The purpose of this project was to use a comprehensive, organized systematic review process to synthesize the most supported

evidence available to answer the question: Does primary care IPC positively impact the health outcomes of PLWD?

Nature of the Doctoral Project

Project Sources of Evidence

To gather materials for this systematic review, I searched electronic databases including the JBI EBP database, PubMed, PsychInfo, CINAHL Plus, Cochrane Collaboration, and ProQuest Nursing and Allied Health databases. I limited searches to literature published between the years 2012 and 2018. The key search terms included *interprofessional, collaboration, diabetes,* and *outcomes.* The Boolean term "AND" was used and the type of articles included peer-reviewed randomized control trials, quantitative, qualitative, quasi-experimental, and cohort studies containing the search terms mentioned above.

Project Method

Systematic reviews are widely accepted and highly valued as demonstrations of rigorous evaluation of the available literature (Kable, Pich, & Maslin-Prothero, 2012). I used the JBI checklist to guide this systematic review of the effects of IPC on the outcomes of PLWD in primary care settings. Through this systematic review, I assessed the quality of the methodologies used in the selected studies and the possibility of bias in their design, conduct, and analysis. I used strict inclusion criteria and the studies were appraised by two independent reviewers. I then interpreted and synthesized the results of the included studies to better understand the impact of primary care IPC on outcomes for PLWD.

Project Pathway

In this doctoral project, my intent was to identify the impact of interprofessional collaborative care on the management of PLWD in primary care settings. I disseminated the evidence collected during this project to stakeholders with recommendations on how to improve their practice focus, and how to gather data that was useful when seeking funding opportunities to support the vision of the organization. This project marks a direct contribution to the body of knowledge validating that IPC makes a positive difference in patient outcomes.

Significance

Stakeholder Analysis

The stakeholders of this project were the primary care clinicians who manage PLWD in a primary care setting using interprofessional collaborative care strategies. I completed this project to guide clinicians considering the implementation of interprofessional collaborative care in their practice. These professionals will benefit from this project because in it I synthesize and analyze valuable outcomes data about the effectiveness of this care model. This information will be useful for primary care practices that are clinical practicum sites for undergraduate and graduate nursing programs and other health profession programs. Clinicians and staff will benefit from the evidence I have synthesized during this project, because it shows that IPC impacted patient outcomes. Patients who receive care in primary care settings were considered important stakeholders in this project. These patients benefit from receiving

interprofessional collaborative care that is comprehensive, efficient, and improves their health care outcomes (Mast et al., 2014).

Contributions to Nursing Practice

This project contributes to nursing practice by showing the impact interprofessional collaborative care has on the clinical management of PLWD. IPC enhances the relationship between the clinician and the patient. The IOM (2011) strongly encouraged improving IPC in health care because in a large set of interacting systems it is necessary for involved professionals to communicate and collaborate to improve safety (Donaldson et al., 2000). The evidence from this project was disseminated to advance the knowledge of IPC's impact on patient outcomes for PLWD in primary care settings.

The Essentials of Doctoral Education for Advanced Nursing Practice (American Association of Colleges of Nursing [AACN], 2006) outlines expected competencies of DNP graduates. Essential 3 is clinical scholarship and analytical methods for evidence-based practice; it addresses the need for scholars who can bring together isolated evidence and make connections by integrating clinical scholarship across disciplines (AACN, 2006). Essential 6 requires IPC for improving patient and population health outcomes (AACN, 2006; Zaccagnini & White, 2014)., while Essential 7 addresses clinical prevention and population health that improves the nation's health (AACN, 2006).

Transferability of Knowledge

The findings of this doctoral project on the effectiveness of IPC in care management are transferable to other disciplines working in primary care settings. For

example, the Community Preventive Services Task Force (2012) acknowledged that clinical management of blood pressure control for people living with hypertension is attainable through team-based approaches. IPC and team-based care are increasingly responsible for changes in practice designs to improve patient outcomes (Linda et al., 2014).

In this project, team-based care is defined as a group of diverse clinicians participating and communicating with each other on a regular basis about the care of a specific group of patients (Goldberg, Beeson, Kuzel, Love, & Carver, 2013). IPC is characterized as an interpersonal process involving professionals from multiple disciplines with shared objectives and responsibilities in decision-making working together to solve problems in patient care (Petri, 2010). Professional settings that require several professionals to work together and serve the same group of patients can benefit from additional evidence indicating the merits of teamwork and collaborative efforts.

Implications for Positive Social Change

No single professional discipline can address all patients' health care needs. IPC provides an avenue to improve the provision of quality health care through the collective involvement of more than one health care professional. IPC involves a commitment to a mutual goal and in health care; this goal can include improved patient outcomes. The World Health Organization (2010), in the *Framework for Action on Interprofessional Education and Collaborative Practice*, acknowledged that health systems around the world are fragmented and health care is becoming more complex (see also Health Professions Networks Nursing & Midwifery Human Resources for Health, 2010). IPC in

primary care promotes continuity of care, as well of continuity in the sharing of information to support patient health care decisions and the coordination of patient health services (Pourat, Davis, Chen, Vrungos, & Kominski, 2015).

The lack of health insurance coverage creates health disparities for those who are less fortunate and part of this group. This results in a lack of a consistent relationship with a primary care provider in many instances. IPC in primary care clinics also provides an opportunity to meet the needs of segments of the population that may otherwise not have a consistent source of primary health services. Collaboration among health care professionals while providing patient care improves quality of care (Fewster-Thuente & Velsor-Friedrich, 2008; Schmitt, 2001). The World Health Organization (2010) supports the development of a collaborative, practice-ready health workforce that improves health outcomes and strengthens health systems. This moves health care in the right direction to improve health outcomes for PLWD in primary care settings.

Summary

In this systematic review, I worked to identify the impact of primary care interprofessional collaborative care on the outcomes of PLWD. The implications for social change in practice include addressing the health disparities of those who are unable to development a consistent relationship with a primary care provider. This project was the synthesis of the research literature to identify leading evidence to support the incorporation of interprofessional collaborative care models to improve outcomes for PLWD managed in primary care settings.

Section 2: Background and Context

Introduction

IPC among clinicians from varying backgrounds is increasingly needed to improve patient health outcomes. The purpose of this project was to determine the impact of interprofessional collaborative care on the outcomes of PLWD in primary care settings. Specifically, the project addressed the question: What is the impact of interprofessional collaborative care on the outcomes of people living with type 2 diabetes managed in primary care settings? The purpose of this section is to address the concepts, models, and theories that provided a foundation for the project. In what follows, I offer further explanation of IPC and its relevance to King's (2001) theory of goal attainment and the chronic care model.

Theories, Models, and Concepts

This project was a systematic review of the literature using the JBI method (Aromataris et el., 2015). In this section, I discuss the primary theory and model underpinning interprofessional collaborative care. The concept of King's (2001) theory of goal attainment was the foundational theoretical framework. King's theory of goal attainment was relevant to this DNP project given that primary care settings are systems and the interactions between clinicians and patients in these systems include the sharing of information for interprofessional collaborative care. The chronic care model is also applicable to the management of PLWD because of the complexity of the disease process of diabetes and the benefits of patient and health care professional involvement in effective disease management (Dancer & Courtney, 2009).

Theory of Goal Attainment

Interprofessional collaborative care involves the interaction among clinicians from multiple backgrounds to provide the patient optimal care. This collaborative effort can directly impact patient outcomes. King's theory of goal attainment has been used as a theoretical framework for nursing practice and research since 1981 when she introduced it as a middle-range theory. The theory of goal attainment consists of three interacting conceptual systems: personal, interpersonal, and social (King, 2001). How an individual interacts within the environment, which includes the concepts of space, perception, time, and body image, comprises the personal system. In relation to this project, the personal system is the patient diagnosed with diabetes and all factors that are inherent to the patient's environment. The interpersonal system addresses how the patient interacts with others. The concepts that comprise the interpersonal address communication and interaction with patients. Finally, the social system consists of two or more individuals working and interacting toward a common goal. For this project, the goal is improved health outcomes for patients diagnosed with diabetes in primary care settings.

D'Amour et al. (2005) identified five concepts that provide a framework for IPC. These include sharing, power, partnership, process, and interdependency. When they published their work in 2005, these authors also noted that more work was needed on the correlation between IPC and its impact on patient outcomes.

In this project, I worked to evaluate the interactions among members of the interprofessional collaborative team and the patient to determine if IPC strategies and programs contribute to health improvements in PLWD. Each member of the

interprofessional team works in their area of expertise to assist patients in attaining their optimal level of health. The relationship between the professionals and the patient is purposeful and interactive with the intent of improving the health outcomes of the patient (McEwen & Willis, 2014). One of the goals of IPC is to connect patients with consistent primary health care services that include diagnosis and management of acute and chronic diseases. IPC and the theory of goal attainment share the same goal of improved patient outcomes.

Chronic Care Model

The ADA has identified the chronic care model (Figure 1) as an effective framework aimed at making improvements in the care of patients with diabetes (ADA, 2017). There are six core elements needed to optimally care for patients with chronic diseases. Wagner et al. (2001) identified the chronic care model as the answer to deficiencies in the care of chronic diseases such as hypertension and diabetes.

The first core element is a delivery system designed to be proactive that aims for coordinated visits involving a team-based approach. This is achieved when providing interprofessional collaborative care, as members of the team work together to meet the needs of the patients using strategies such as opportunistic dialogue to discuss patient needs (Clarke, 2010). The second element is supporting patients' abilities to self-manage their chronic diseases. Interprofessional collaborative teams include health educators who support PLWD through one-on-one sessions and group workshops with instructions and guidelines to manage diabetes.

The third core element is the provision of care based upon evidence-based care guidelines, also known as decision support. The guidelines from The Institute for Clinical Systems Improvement's Diagnosis and Management of type 2 diabetes mellitus in Adults support many of the principles that interprofessional professional collaborative teams can implement while managing PLWD (Redmon et al., 2014).

The fourth core element outlines the use of patient registries as a supportive tool in the provision of patient-focused and population-based care. The fifth core element is the identification or development of community resources and policies that support the adoption of healthy lifestyles. The final core element is the creation of quality-oriented cultures in health systems. This model is useful for the management of diabetes due to the chronicity of the disease and the need to shift from episodic care to a more long-term relationship-based management strategy (Dancer & Courtney, 2009; Wagner et al., 2001). Figure 1 illustrates the core elements of the chronic care model.

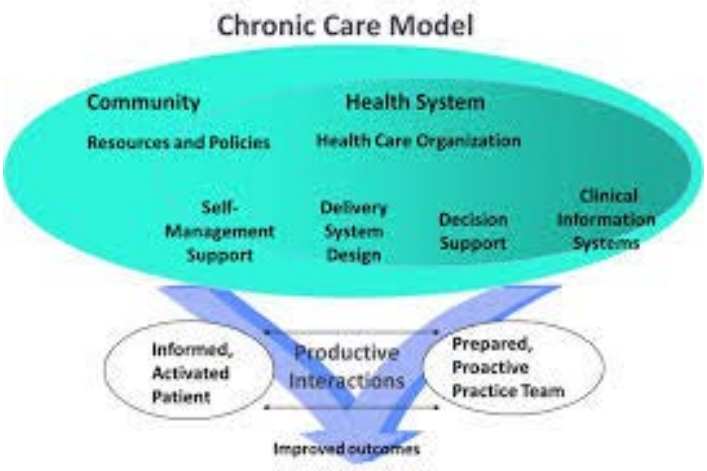

Figure 1. The chronic care model. Adapted from "Chronic Disease Management: What Will It Take to Improve Care for Chronic Illness?" by E. H. Wagner, 1998, *Effective Clinical Practice, 1*(1), p. 3. Copyright 1998 by the American College of Physicians and American Society of Internal Medicine. Reprinted with Permission.

Concept of Interprofessional Collaborative Care

Interprofessional collaborative care, as defined by the World Health Organization (2013) is

> When multiple health workers from different professional backgrounds provide comprehensive services by working with patients, their families, carers and communities to deliver the highest quality of care across settings (p. 13).

In this scholarly project, I defined IPC as the presence of health care providers from multiple disciplines who shared the objective of improving patient health care outcomes and resolving health care problems through shared responsibility and decision-making (see Petri, 2010). IPC is a fluid process that creates an alignment of interactional, organizational, and systemic determinants to impact the success of IPC (D'Amour et al., 2005; San Martín-Rodríguez, Beaulieu, D'Amour, & Ferrada-Videla, 2005). King's theory includes the concepts of communication, perception, interaction, and transaction

(Fawcett, 2000). Through effective communication, problems can be anticipated and thus avoided, and service provision can be improved (Martin, 2010). Effective communication occurs when information is exchanged at the appropriate times so that different health care providers may make decisions that directly impact the patient. The way communication occurs may be different depending upon the role of each professional, and include reciprocity, respect, and relevance. There are many sectors where cooperation is necessary to achieve the expected results; the field of health care is one of them. Awareness for cooperation must be generated among clinicians to offer patients' quality health care. Health care professionals such as pharmacists, doctors, nurses, and other members of the health team must work collaboratively to integrate and transfer available scientific knowledge.

The means to achieve a common goal varies in each professional group according to their roles and functions in the health care environment. When considering the role of nursing in IPC, the overall goal is to promote health, prevent disease, and care for the patient. Researchers have noted that patient-centered care is one of the key areas for cross-industry collaboration and a key element of teamwork and interprofessional collaborative practice (Schwartz et al., 2017).

Terms

I used the following terms in this project:

Chronic care model: A model to describe concepts that can improve the care of patients with chronic diseases (Wagner et al., 2001).

Interprofessional collaboration (IPC): The process of clinicians from different professions taking deliberate actions including communication, sharing of information, and involvement of the patient to solve patient care problems for specific group of patients (Petri, 2010; Zwarenstein et al., 2009).

Opportunistic dialogue: The verbal interactions that are problem-oriented, unplanned, and not constrained by the professional preparation of the clinicians (Clarke, 2010).

Patient-centered medical home: A holistic model that focuses on coordinated, team-based care in the community that seeks to improve health and healing of patients (Stange et al., 2010).

Uninsured: A person without insurance to cover health care expenses (Moyer, 1989).

Relevance to Nursing Practice

Overview of Interprofessional Collaboration

Historically, the organization of the health care system and the socialization of various professional groups has not supported an ethos of equality amongst these groups (Kramer & Schmalenberg, 2003). Differences in educational preparation of nurse practitioners, physician assistants, and pharmacists can present barriers to collaboration (Hall, 2005). As the health care system has evolved, collaborative care has emerged as care teams focus on effective communication, capitalizing on the strengths of each team member and emphasizing effective team functioning (MacDonald et al., 2010). In this

project, I focused on the IPC between the members of the health care team who regard the patient as an integral part of the team interactions.

Advances in health care knowledge coupled with an increase in complexity of patient illness requires a supportive work environment to improve patient outcomes. These supportive work environments require communication, collaboration, and mutual respect among the health care team, and between the team and patients (Bankston & Glazer, 2014). Collaboration among nurses, physicians, and other members of the care team can improve the outcomes of care for patients (Gucciardi, Espin, Morganti, & Dorado, 2016; Mast et al., 2014).

Current State of Nursing Practice

Nurses can provide knowledge and experience that is instrumental in the implementation of IPC (Moss, Seifert, & O'Sullivan, 2016). IPC attributes include (a) a partnership where the professionals mutually value one another, (b) a recognition that responsibility is separate and combined among the professionals, (c) a mutual safeguarding of the interests of each person, and (d) shared goals (Yeager, 2005). Shared accountability by health care professionals when providing care is important to meet the needs of patients. As the complexity of health care continues to evolve, the presence of effective collaborative care teams creates synergy and efficiency that is fostered when there is joint participation among health care professionals, patients, and their families (ANA, 2016). The preparation of a practice-focused doctoral degree, such as the Doctor of Nursing Practice, ensures that nurses can serve in the roles of leadership, development

of health policy, administration, information technology, and advanced clinical practice in interprofessional collaborative care settings (ANA, 2011).

Standards of Practices for Interprofessional Collaborative Care

The ADA recommended the chronic care model as an effective model of a team-based approach for the management of diabetes. Barriers to patient adherence to recommendations by the health care team included: fragmentation of care, lack of clinical information sharing capacity, service duplication, and failure to coordinate chronic disease care (ADA, 2017). The chronic care model included a coordinated team of health care professionals dedicated to the creation of an environment where the patient was at the center and an integral part of the team (ADA, 2017). Nurses, dieticians, pharmacists, and other health care providers were listed as important members of the diabetes care team.

Doctoral Project Advancement of Nursing Practice

A paradigm shift is needed to fully integrate IPC into primary health care settings. No single professional discipline can address all the health care needs of PLWD. IPC is useful to improve the provision of quality health care through the collective involvement of more than one health care provider. IPC is a commitment to developing mutual goals, which may include improved patient outcomes, such as reduction in hemoglobin A1c and body mass index. In the World Health Organization's (2010), *Framework for Action on Interprofessional Education and Collaborative Practice*, health systems around the world were noted to be fragmented and more complex (World Health Organization, 2010). IPC in primary care settings promotes continuity of care, as well as the sharing of information

to support patient health care decisions and the coordination of patient health services (Pourat et al., 2015).

Local Background and Context

Summary of Local Relevance

The question posed in this project was determined while working with a non-profit primary care clinic for uninsured patients. The clinic was a safety net health care clinic for patients who did not have health insurance. The clinic was also a clinical practicum site for students. The clinic staff included physicians, nurse practitioners, physician assistants, pharmacists, and health educators. The leadership of the clinic stated that they provided IPC, but there was no mechanism in place to track if IPC improved patient outcomes. The purpose of this project was to conduct a a systematic review to determine if IPC had a positive impact on health outcomes of PLWD.

Institutional Context Description

Most of the patients of the clinic were Latina and not eligible for health insurance due to problems with immigration status or the lack of employment opportunities with health insurance coverage (Sommers, McMurtry, Blendon, Benson, & Sayde, 2017). Safety net clinics create social change by addressing health disparities for patients who are uninsured (Nguyen et al., 2016). Many of the patients seen in the clinic were living with chronic diseases such as hypertension and diabetes. The practice model that was implemented was an interprofessional collaborative team of physicians, nurse practitioners, physician assistants, pharmacists, and health educators. The mission of the clinic was to serve the community by providing care to those who did not have access to

primary care services. This clinic did not accept state or federal funding and therefore was dependent upon fees collected from patients and charitable donations. The clinic accepted donations of professional services of nurse practitioners, physician assistants, pharmacists, and medical assistants as a method to decrease operating costs. Professionals from different disciplines collaborated to provide patient care. The clinic offered primary care services, but patients were referred to outside organizations for urgent or emergent medical services.

Definitions of Locally Used Terms

The organization explicitly provided care to patients who were uninsured and underinsured. Uninsured referred to patients who did not have health insurance. Underinsured referred to patients who had health insurance, but their health insurance coverage had a high deductible that created a financial hardship for the patient. The clinic was a designated Patient-Centered Medical Home practice by the National Committee for Quality Assurance. In this model, patients were at the center and the focus was on building relationships between clinical care teams and the patient (National Committee for Quality Assurance, n.d.). This designation signified a commitment to quality improvement and patient-centered care.

State and Federal Contexts

The operational structure of the clinic was not to accept state or federal funds, instead revenue was generated from fees collected from patients, donated service by health care professionals, grants, and other charitable donations. Health insurance coverage in the United States is a part of an ongoing discussion in health care and

political contexts. If proposed legislative changes intended to exclude people from health care insurance coverage are successful, the number of uninsured people in the U.S. will increase significantly. Identification of evidence-based strategies is necessary to implement cost-effective and efficient care for those without health insurance coverage.

Health care insurance is important to access health services in the United States. The Patient Protection and Affordable Care Act of 2010 was enacted to increase access to affordable health insurance coverage for many members of the population. However, in 2013, an estimated 13.4 percent of the American population, or 42 million people, remained uninsured (U.S. Census Bureau, 2014). Americans without health insurance were unable to maintain a relationship with a regular primary care provider to manage their preventative care and chronic health conditions (Stephens & Ledlow, 2010). People without health insurance utilized the emergency departments for non-emergent health concerns that could have been better managed in a primary setting (Pourat et al., 2015). This trend created a problem for urban emergency departments that became overloaded with patients seeking services for emergent and non-emergent conditions (Carlin, Flottemesch, Solberg, & Werner, 2016). Another consequence of patients without health insurance is that when a patient is unable to pay for services received in an emergency department, the hospital may have to write off the expense or charge patients with insurance coverage more to offset the amount they were not able to recoup. The cost of emergency services is significantly higher than services offered in the primary care setting (Cheung, Wiler, & Ginde, 2012). A cost-effective alternative for the uninsured patient is not-for-profit clinics that provide primary care health services for reduced fees.

Identification of IPC interventions that have been proven to improve health outcomes for PLWD is beneficial for profit and not-for project health care clinics. Although, all patients in primary care settings can benefit from IPC, it is particularly attractive when resources are scarce and maximum value must be obtained to provide care to more people. Addressing the needs of the uninsured members of the population with strategies that have been proven to be effective is fiscally responsible when considering appropriate use of limited resources.

Role of the DNP Student

Professional Context and Relationship to Doctoral Project

My introduction to the topic of IPC occurred after my experiences in a primary care clinic that operated under the patient-centered medical home concept and used professionals from various disciplines to provide care to their patient population. I observed the interactions among health professionals from varying backgrounds as they provided care to the patients in the clinic. The interactions between health professionals from different disciples demonstrated their willingness to share clinical information to best meet the needs of the patients. I also worked with members of the team to complete a quality improvement project for the clinic. I developed a triage algorithm for the medical assistants, converted a paper health education presentation into a PowerPoint presentation, and created a diabetes outcome tracking form for hemoglobin A1c, mean arterial pressure, and body mass index. I wanted to complete this project to synthesize the best available evidence about IPC and the impact outcomes for PLWD, so that it can be shared with IPC teams.

Potential Bias

To avoid potential bias, two independent reviewers completed the literature search using the proposed search strategy. All differences in search results were discussed and mutually agreed upon for inclusion. When more than one reviewer critically appraises the included research studies in a systematic review it increases the rigor of the review (see Toronto, Quinn, & Remington, 2018). There is an inherent amount of bias in this type of project due to the narrow focus on diabetes in the primary care setting. The inclusion of other chronic disease conditions or the acute setting may have yielded additional data. Broadening the search criteria to include other chronic diseases was outside the scope of this doctoral project.

Summary

The theoretical foundation of the chronic care model and King's theory of goal attainment apply to the concept of IPC and the impact on health outcomes for PLWD. The team-based approach of the chronic care model and the interacting systems of King's theory of goal attainment were appropriately aligned with the purpose of this systematic review. Using two independent reviewers increased the rigor of this systematic review. Section 3 outlines the collection and analysis of the articles that met the inclusion criteria.

Section 3: Collection and Analysis of Evidence

Introduction

Diabetes mellitus has a significant impact on the health of 1 in 11 Americans. It carries the unfavorable title of the seventh leading cause of death in America (National Center for Chronic Disease Prevention and Health Promotion, 2017). The ADA recognizes the chronic care model as an effective strategy to battle this disease. The chronic care model calls for a team-based approach to patient care. The members of the team are likely to come from various clinical disciplines. The goal of teams caring for patients with diabetes is that the health outcomes of those patients will be improved because of the interprofessional collaborative care they provide. This purpose of this project was to complete a systematic review to analyze and synthesize evidence about IPC and its impact on the health outcomes of people living with diabetes in primary care settings. In Section 3, I explain the methodology I used for the systematic review and analysis for this doctoral project.

Practice-Focused Question

The practice-focused question for this project was: What is the impact of the interprofessional collaborative care on the outcomes of adult patients living with type 2 diabetes managed in primary care setting? In this doctoral project, I systematically reviewed the literature to identify and synthesize the best available evidence regarding the health outcomes of PLWD who receive interprofessional collaborative care in primary care settings.

Purpose and Approach Alignment to Practice Question

The strength and validity of the best research evidence is dependent upon the quality and the number of studies that are conducted in a clinical focus area (Grove et al., 2013). Systematic reviews are conducted with rigorous research methodology and used to address specific practice problems (Grove et al., 2013). I used the JBI critical appraisal tool and the Oxford Centre for Evidence-Based Medicine levels of evidence to guide my review of the evidence. Synthesis of this evidence supports efforts to identify interprofessional collaborative interventions that are effective in the management of PLWD in primary care settings. Management of chronic disease is more appropriately addressed in primary care settings instead of emergency departments. Management of chronic disease in primary care settings reduces hospitalization for other complications of diabetes.

Operational Definitions

Interprofessional collaborative teams for this project included physicians, nurses, dieticians, and pharmacists. *Outcomes* that were evaluated included patient outcomes of a decrease in hemoglobin A1c and body mass index.

Sources of Evidence

Source of Evidence

A systematic review, as defined by the JBI, is the analysis of available literature on an intervention using a specific methodology for appraisal and synthesis (Aromataris et al., 2015). Using the JBI systematic review checklist (Aromataris et al., 2015), I reviewed randomized controlled trials and quantitative, qualitative, and cohort studies

evaluating the impact of IPC care interventions on diabetes outcomes including hemoglobin A1c, body mass index, hospitalization and rehospitalization rates, patient satisfaction with care, and improvement in patient knowledge of diabetes management.

I was granted approval for this study by the Walden University DNP Project Committee following its rigorous review of the project proposal. Next, I obtained approval from the Walden University Institutional Review Board (IRB) to ensure compliance with the ethical standards of the university and federal regulations of the United States. The IRB approval number is 04-06-18-0102821. To increase the rigor, this systematic literature review was also appraised by a second reviewer who is an accomplished DNP scholar with IPC experience in cardiovascular health initiatives.

Per the guidelines for the DNP scholarly project, I conducted analysis of published outcomes and research using a step-by-step process as outlined in the JBI critical appraisal checklist for systematic review. The checklist contains 11 criteria that guide the decision to include or exclude studies in the review. Two reviewers independently analyzed the titles and abstracts I had identified using the prescribed search criteria for the inclusion and exclusion criteria (Appendix A). If the title and abstract were found to be inconclusive, reviewers assessed the full text. The reviewers jointly discussed texts to include to resolve discrepancies in opinion.

Relationship of Evidence to Purpose

My primary goal in this systematic review was to identify the best available evidence of the impact of interprofessional collaborative care on the outcomes of PLWD in primary care settings. The increasing number of patients diagnosed with type 2

diabetes requires that health care teams provide care in a collaborative manner that meet the patients' needs to manage their chronic illnesses. The evidence from the studies I reviewed showed whether interprofessional collaborative care teams have a positive effect on the health outcomes of PLWD in primary care settings.

Collection and Analysis of Evidence

IPC in diabetes management is necessary to provide care that is coordinated instead of episodic and disjointed (ADA, 2017). The aim of interprofessional collaborative care in diabetes management is to improve the health outcomes of patients. The original health outcomes I focused on in this doctoral project were a decrease in hospitalization or rehospitalization, decrease in hemoglobin A1c, decrease body mass index, and improvement in patient chronic disease management knowledge or satisfaction with care. The selected articles included evidence on the health outcomes of hemoglobin A1c and body mass index. The types of studies that I considered including were filtered resources such as systematic reviews and unfiltered resources such as randomized controlled trials, cohort studies, and case-controlled studies (see Burns, Rohrich, & Chung, 2011; Oxford Centre for Evidence-based Medicine, 2009). My doctoral committee members reviewed this DNP scholarly project after submission.

Published Outcomes and Research

To gather materials for this systematic review, I searched the following databases: the JBI EBP database, PubMed, PsychINFO, CINAHL Plus, Cochrane Collaboration, and ProQuest Nursing and Allied Health database. The databases were selected because

they contain citations of peer reviewed articles relevant to nursing practice (Grove et al., 2013).

The keywords and Boolean terms that I used in this systematic review were *interprofessional AND collaboration AND diabetes AND outcomes*. I limited the searches to articles published in English from 2012 to 2018 (see Appendix A). A PRISMA flow diagram was included to clearly delineate the identification, screening, eligibility, and inclusion and exclusion criteria of studies in the review (see Appendix C). A PRISMA checklist (see Appendix D), was completed to outline the systematic review protocol, which will be submitted to PROSPERO, an international database of prospectively registered systematic reviews (Booth et al., 2012).

A systematic review using the JBI Critical Appraisal Checklist for Systematic Reviews and Research Syntheses (see Appendix B) of the impact of interprofessional collaborative care for the management of type 2 diabetes is useful to identify interventions that positively impact patient outcomes. In this review, one inclusion criterion was adult patients over the age of 18 years old diagnosed with type 2 diabetes. Pediatric-focused studies were excluded from this review. I focused on studies of interventions that occurred in outpatient, primary, or primary care settings. Studies on IPC in inpatient settings were excluded. Studies on patients with gestational diabetes and type I diabetes were excluded. Finally, I excluded studies that did not assess any health outcomes of decrease in hospitalization or re-hospitalization, decrease in hemoglobin A1c, decrease in body mass index, improvement in patient chronic disease management knowledge, or satisfaction with care.

Analysis and Synthesis

The eligible articles were assessed by the two independent reviewers using the JBI Critical Appraisal Checklist for Systematic Reviews and Research Syntheses (JBI, 2017). Each study was appraised, and its methodological quality was evaluated for the following:

1. Clarity and explicit statement of the review questions.
2. Appropriateness of the inclusion criteria for the review question.
3. Appropriateness of the search strategy.
4. Appropriateness of sources and resources for the search.
5. Appropriateness of the criteria used to appraise each study.
6. Completion of critical appraisal by two or more independent reviewers.
7. Appropriateness of the methodology used to minimize errors in the data extraction.
8. Appropriateness of the methodology to combine studies.
9. Likelihood of publication bias.
10. Reported data supported the policy or practice recommendations.
11. Directives for new research were specific and appropriate.

The second reviewer for this systematic review is an experienced family nurse practitioner, nurse educator, and researcher with experience in collaborative care in cardiovascular health care teams. Any discrepancies between the two reviewers was resolved through discussion. I selected and reviewed the research studies that met the inclusion criteria. In my analyses of the selected studies, I sought to identify if the

intervention of IPC had an impact on the identified patient outcomes as evidenced by a statistically significant variable.

Summary

The JBI Critical Appraisal Checklist for Systematic Reviews and Research Syntheses and the Oxford Centre for Evidence-Based Medicine levels of evidence were used in this project. I sought to analyze and synthesize the most current evidence IPC in diabetes care. The methodology of this systematic review can be replicated, and this review meets the standards of high quality analysis. Section 4 will include analysis of the findings of this systematic review.

Section 4: Findings and Recommendations

Introduction

Diabetes is a complicated, multi-faceted disease process. Assisting PLWD to manage their health is possible with coordination and collaboration of members of an interprofessional team. It is important to identify IPC interventions that are proven to create positive outcomes for PLWD, such as decreased hemoglobin A1c, decreased body mass index and hospitalization rates, or increased patient satisfaction. A systematic review of the literature is an appraisal of current evidence from years 2012 to 2018 to determine the effectiveness of interprofessional collaborative care for the management of care in primary care settings for PLWD. My initial search of scholarly databases was limited to years 2012 through 2017, but as a part of the review process, the second reviewer identified relevant articles that were published in 2018. I presented the proposed change in search years to my doctoral committee chair who decided that the search years should be expanded to include 2018. The literature included articles from the JBI EBP database, PubMed, PsychINFO, CINAHL Plus, Cochrane Collaboration, and ProQuest Nursing and Allied Health database. Using a PRISMA flow diagram (see Appendix C), I reviewed the titles, abstracts, and full texts articles, respectively and excluded those that did not meet study criteria. In this section, I present the findings of my analyses of the five studies that met the inclusion criteria for this systematic review (see Appendix E).

Findings and Implications

I completed this systematic review by analyzing and synthesizing five research studies that met the inclusion criteria. The quality of the research studies was graded

using the Oxford Centre for Evidence-Based Medicine levels of evidence. It is important to note that although the JBI levels of evidence and grades of recommendation is available as an appraisal tool, I chose to use the Oxford Centre for Evidence-Based Medicine levels of evidence instead because it is more generalizable for different question types. The types of questions the grading addresses include therapy or prevention, prognosis, diagnosis, differential diagnosis, or economic and decision analyses (Oxford Centre for Evidence-Based Medicine, 2009). Overall, the evidence shows that interprofessional collaborative care, in most cases, leads to a decrease in hemoglobin A1c and in some cases body mass index.

Interprofessional Collaborative Team Composition

The five research studies that met the inclusion criteria included interprofessional collaborative teams composed of physicians, registered nurses, and/or advance practice registered nurses. Other health care professionals that were a part of the teams in the research studies included pharmacists, physical therapists, dieticians, and diabetes educators. A core element of the chronic care model is a team-based approach to the care of PLWD and I compared the composition of the IPC teams in the included research studies. Interprofessional collaborative teams in the included research studies were demonstrative of team-based care. It is evident that the theory of goal attainment is applicable to this project because the health care professionals in these research studies represent social systems that are working toward the common goal of better health for PLWD. The roles of nurses in these research studies included diabetes educators, prescribers as advance practice nurses, care coordinators, and physician office nurses.

This demonstration of multiple roles that nurses can contribute as members of interprofessional collaborative care team is aligned with the DNP Essential 6: IPC for Improving Patient and Population Health Outcomes. This essential emphasizes a DNP graduate's ability to play a central role establishing, participating in, and leading interprofessional collaborative teams (AACN, 2006).

Four of the five research studies I reviewed included discussions of the integration of pharmacists into the interprofessional collaborative team. Pharmacists are instrumental in the management of PLWD because they can provide medication therapy management and promote patient medication compliance (Davis, Ross, & Bloodworth, 2017; Santschi, Chiolero, Paradis, Colosimo, & Burnand, 2012; Renfro, Fereri, & Foley, 2018). A systematic review (Level 2a) of five studies about pharmacists' interventions that impacted the cardiovascular disease risk factor of body mass index in PLWD (N = 751) included medication management, patient education, and feedback to physicians. Two studies showed that pharmacists' care had a statistically significant benefit for the study population. The pooled estimate showed the body mass index had a significant reduction (weighted mean difference -0.9kg/m^2 [-1.7 to-0.1], p = 0.026) (Santschi et al., 2012). The authors also identified that weight loss, as evidenced by a decrease in body mass index, is challenging to achieve but important among PLWD because it reduces cardiovascular disease risk and improves blood glucose control (Santschi et al., 2012).

A prospective cohort study (N = 64) reviewed the care provided by pharmacists who were integrated into interprofessional collaborative teams, which included physicians, nurse practitioners, diabetes educators (including both dieticians and

registered nurses), and clinical pharmacists (Davis et al., 2017). The integration of pharmacists in this research study demonstrated that health outcomes of the study patients (N = 64) yielded a statistically and clinically significant reduction in hemoglobin A1c of an average of 1.2% (p < .001). The body mass index of the subjects in this study was unchanged. Davis et al. (2017) also identified that 23.4% of the participants met their goal hemoglobin A1c and 37.5% of patients achieved a final hemoglobin A1c of 7.1% to 8.0%, which was viewed as clinically significant since their baseline mean hemoglobin A1c was 9.2%.

In another pharmacist-related study, Renfro, Ferreri, Barber, and Foley (2018) focused on the development of a communication strategy between community pharmacists and a family medicine practice via an electronic health record that assessed the effect on participants' hemoglobin A1c percentages. The sample size was small (N = 3), the changes in hemoglobin A1c for two of the participants were 10.1% to 9.5% and 9.4% to 8.6%, respectively, and a third participant had a diagnosis of hypertension and therefore was monitored for blood pressures changes and not hemoglobin A1c (Renfroe et al., 2018). There was no further statistical analysis of the findings.

In a descriptive research study, Conca et al. (2018) used the technique of process mining from retrospective chart reviews to identify IPC patterns and the subsequent impact on patients' (N = 231) hemoglobin A1c. The study results indicated that health care processes that included equal and comprehensive involvement with physicians, nurses, and dieticians resulted in fewer patients with higher hemoglobin A1c percentages. Health care processes that were identified as *participatory* included three disciplines that

participated equitably, but without a designated leader resulted in a lower percentage of patients who showed no improvement or maintained a hemoglobin A1c measurement of over 9% when compared to the total population (3% vs. 16%, $p = 0.03$; Conca et al., 2018).

In another descriptive study, Congdon, Eldridge, and Truong (2013) examined the implementation of a navigator-facilitated care coordination program for PLWD. An algorithm was used to direct patients who lived with uncontrolled diabetes into group or individual diabetes self-management education class or medication therapy management directed by a clinical pharmacist. The interprofessional teams consisted of volunteer physicians and support staff, registered nurses, registered dieticians, and clinical registered clinical pharmacists. The results of this project demonstrated that an average hemoglobin A1c for the patients ($N = 45$) decreased from 10.6% to 8.8% (Congdon et al., 2013). Seventy one percent of the study participants were Latino, which was significant because Latino patients often lack access to appropriate health care services to adequately manage their health care conditions (Rotberg, Greene, Ferez-Pinzon, Mejia, & Umpierrez, 2016).

Collectively, these three studies supported the addition of pharmacists and/or dieticians to health care teams that include physicians and nurses for a positive impact on some diabetes health outcomes. I expected that nursing would play a larger role in the implementation of interprofessional collaborative care teams; however, the studies that met the inclusion criteria focused more on the integration of pharmacists in primary care

teams caring for PLWD. Positioning members of an interprofessional collaborative team should be matched to best meet the individual needs of the PLWD.

Communication in Interprofessional Collaborative Teams

Purposeful communication and opportunistic dialogue were also common themes I noted in the selected articles. Opportunistic dialogue exists when health care professionals work in a shared space and communication is improved due to proximity of the professionals. Davis et al. (2017) discussed communication in the form of guideline-based therapeutic recommendations to the providers regarding medication therapy as a part of a comprehensive patient visit. At one point during the visits the provider, pharmacist, and patient were all present to discuss the plan of action for the patient. Renfroe et al. (2018) developed a communication strategy that included face-to face meetings with prescribers, pharmacists, and office staff to discuss a strategy that would use the practice's electronic health record to identify shared patients who were co-managed by the pharmacy and the practice. This level of communication resulted in the identification of a small number of patients ($N = 3$) who were referred to the pharmacy for longitudinal follow-up that included an initial comprehensive medication review, a face-to-face visit with the patient and or the patient's caregiver, review of the patient's self-monitoring blood glucose (SMBG) log, and the establishment of a SMBG plan (Renfroe et al., 2018).

Congdon et al. (2013) studied the development of a facilitator-led care coordination project, which included cross-discipline discussions and the development of shared action plans designed to contact and assist patients who did not show an

improvement in their health outcomes. Over the course of the project, the average hemoglobin A1c of the participants (N = 45) demonstrated a decrease from 10.6% to 8.8% (Congdon et al., 2013). This study included team reviews of patient information about patients that the team shared. Through these reviews, there was an opportunity for discussions across the disciplines and the development of shared action plans. The implementation of new communication avenues or the enhancement of existing communication positively impacted the patients in these study populations. Opportunistic dialogue is beneficial when providers share the same space, but in the absence of that, electronic health records are a useful tool to facilitate communication about patient issues.

Integration of Electronic Health Records

As I mentioned in the previous chapter, the chronic care model's fourth core element is the use of patient registries to support the provision of patient-focused and population-based care (Wagner et al., 2001). In three of the included research studies, interprofessional collaborative teams integrated the use of electronic health records as a patient registry and/or tool to enhance data collection or communication. Congdon et al. (2013) used a clinic computerized registry to generate reports that identified patients with a hemoglobin A1c greater than 9%. The study participants were identified as candidates who would benefit from care enhancement by the interprofessional collaborative team. The patient population was mainly comprised Latino patients with uncontrolled diabetes who were defined as underserved due to lack of health insurance, English as a second language, having less than a high school education, and working in low paying service or

construction jobs (Congdon et al., 2013). Renfroe et al. (2018) devised two-way communication strategies using the electronic heath record between the community pharmacists and the physician practice to support the sharing of patient data in a secure and cost-effective manner. Conca et al. (2018) used the mining method to study health care processes and identify which collaboration patterns yielded the greatest positive improvement in patient outcomes of hemoglobin A1c. The use of information systems to record data, follow trends in patient data, and develop algorithms hold the potential for a greater in-depth analysis of best practices grounded in evidence gleaned from electronic health records.

One limitation of the systematic literature review was that the articles that were included did not assess the impact of IPC on patient satisfaction, hospitalization and re-hospitalization rates, or improvement in patient knowledge of the management of diabetes. The health outcomes that were included in the research articles were hemoglobin A1c and body mass index. Further research about patient interpersonal systems and how it impacts the improvement of the patient's overall health outcomes is needed. The findings of the systematic review are useful information for health care professionals who practice in primary care settings.

Overall, the studies which included pharmacists as an integrated part of the interprofessional collaborative care team had a favorable impact on the health outcomes of PLWD. Including pharmacist services in primary care settings is important to consider as an intervention to improve patient health outcomes of PLWD. Using health information systems to collect, analyze, and share data among all members of the

interprofessional collaborative team is helpful in the management of care of PLWD. Knowledge about patients' outcome data, such as hemoglobin A1c and body mass index is useful for clinical decision support.

The implications for positive social change were most evident in the Congdon et al. (2013) project, which targeted low-income, uninsured patients with uncontrolled diabetes. Health disparities exist for some populations in the United States and coordination of health care services of members of the interprofessional collaborative team is important to maximize access to health care services for those patients. A navigator-facilitated care coordination model of care for patients who do not meet their health outcome goals may improve compliance with care recommendations. This type of intervention addresses health disparities in populations that may experience less favorable health outcomes.

Recommendations

Based upon the results of this systematic review, the integration of pharmacists and electronic health records are promising interventions to consider in meeting the needs of PLWD in the primary care setting. Further research is needed to evaluate what level of involvement of pharmacists produces the greatest improvement in health outcomes of PLWD. Additional research is needed to evaluate the most efficient integration of technology into IPC teams for gathering and analyzing patient data to track and act upon indicators of declining health for PLWD. It is also recommended that further research is needed on the role that nursing plays IPC.

Contribution of the Doctoral Project Team

The doctoral project team consisted of the DNP student, a second reviewer, Project Chair, and DNP committee members. The Project Chair was instrumental in providing support and guidance to ensure that the proposal and final project were implemented appropriately and met the standards of Walden University's Institutional Review Board. The second reviewer provided valuable insight into the systematic review process and increased the rigor of the systematic review. The DNP committee members were supportive in the review and final approval of the project.

Strength and Limitations of the Project

A strength of the doctoral project is that it followed the prescribed steps of a high-quality systematic review as outlined by the Walden University Manual for Systematic Review and the JBI. The first limitation of the project was a limited number of systematic reviews included in the literature review that met the inclusion criteria. A second limitation of the review was the small sample sizes within the studies that met inclusion criteria. A third limitation was the sole use of the Walden University Library journal databases. One peer-reviewed journal that focused on interprofessional care had an 18-month delay for article availability in the Walden database, which subsequently resulted in applicable articles not being included in the search results. This limitation was resolved because the second reviewer shared articles with me. A search of more current articles may have provided additional articles that met the inclusion criteria. Future projects which address IPC in pre-licensure nursing and pharmacy programs may be beneficial to

support nursing and pharmacy professions to produce graduates familiar with interprofessional collaborative care and how it impacts patient outcomes.

Declaration of Conflict of Interest

There are no conflicts of interest declared with this project. The purpose was for the fulfillment of the requirements of the Doctor of Nursing Practice degree of Walden University. No funding or financial support were provided for this systematic review.

Summary and Conclusions

In conclusion, in this systematic review I reviewed the results of studies about IPC in primary care settings. The researchers reported an improvement in the health outcomes of hemoglobin A1c and body mass index in PLWD when they received care from an interprofessional collaborative care team. There was no statistically significant improvement in patient satisfaction, hospitalization and re-hospitalization rates, or patient knowledge about the management of diabetes in the participants included in the systematic review.

Pharmacists who are added to primary care teams can provide medication therapy management, feedback to prescribers, and medication education to PLWD. This IPC intervention has a positive impact on patient's hemoglobin A1c. Electronic health records are useful to collect, analyze patient health data to track patient outcomes, develop patient registries, and analyze health care processes to determine the efficacy of interprofessional collaborative care models. Further research using larger sample sizes is needed to determine the effectiveness of interprofessional collaborative care teams on health outcomes of PLWD on a broader scale.

Section 5: Dissemination Plan

Dissemination Plan

The plan for dissemination of this work includes submission to ProQuest as a requirement of the Walden University Doctor of Nursing Practice program. The systematic review will also be submitted for publication to the Journal of Interprofessional Care. I will seek other opportunities to disseminate this information through professional organizations such as the Sigma Theta Tau International- Phi Nu Chapter and the National Center for Interprofessional Practice and Education. Another audience that is appropriate to target for dissemination of this systematic review is safety net providers for patients who do not have health insurance or access to regular primary care providers. Educators in nursing and pharmacy school programs would benefit from the information contained in this project.

Analysis of Self

In this systematic review I was able to apply the methodology and principles I learned while matriculating through the Walden University DNP program. I pushed past my insecurities about the daunting task of completion of this project. The process included hours of reading research articles, developing tables to organize the findings, grading, and synthesizing the data to present in this project. I understand the importance of rigorous review of research findings to determine the appropriateness of its use in clinical practice. This experience will enhance my future efforts to appraise research studies.

Summary

This doctoral project is an analysis and synthesis of current evidence about IPC and the impact on health outcomes of PLWD. This systematic review provides important information on which professionals should comprise an interprofessional collaborative team and descriptions of programs and strategies that support improved patient health outcomes. This project validates that effective communication, integration of electronic health records, and appropriate composition of interprofessional collaborative care teams have a positive impact on health outcomes of decreased hemoglobin A1c and body mass index of PLWD.

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Appendix A: Search Strategy

Database	**Years of Search**	**Search Terms Boolean Operators**	**MeSH Terms**	**Peer - Reviewed**	**Language**
CINAHL Plus	2012-2018	Interprofessional Collaboration AND Diabetes AND Outcomes	n/a	Yes	English
Cochrane Collaboration	2012-2018	Interprofessional Collaboration AND Diabetes AND Outcomes	n/a	Yes	English
Joanna Briggs Institute EBP Database	2012-2018	Interprofessional collaboration AND diabetes AND outcomes	n/a	Yes, systematic reviews only	English
ProQuest Nursing & Allied Health Source	2012-2018	Interprofessional Collaboration AND Diabetes AND Outcomes	Diabetes	Yes	English
PsychINFO	2012-2018	Interprofessional Collaboration AND diabetes	n/a	Yes	English
PubMed	2012-2018	Interprofessional AND collaboration AND diabetes AND outcomes	n/a	Yes	English

Appendix B: JBI Critical Appraisal Checklist for Systematic Review and Research Syntheses

JBI Critical Appraisal Checklist for Systematic Reviews and Research Syntheses

Reviewer_____Date_____

Author _____Year_____Record Number_____

	Yes	No	Unclear	Not applicable
1. Is the review question clearly and explicitly stated?	☐	☐	☐	☐
2. Were the inclusion criteria appropriate for the review question?	☐	☐	☐	☐
3. Was the search strategy appropriate?	☐	☐	☐	☐
4. Were the sources and resources used to search for studies adequate?	☐	☐	☐	☐
5. Were the criteria for appraising studies appropriate?	☐	☐	☐	☐
6. Was critical appraisal conducted by two or more reviewers independently?	☐	☐	☐	☐
7. Were there methods to minimize errors in data extraction?	☐	☐	☐	☐
8. Were the methods used to combine studies appropriate?	☐	☐	☐	☐
9. Was the likelihood of publication bias assessed?	☐	☐	☐	☐

10. Were recommendations for policy and/or practice supported by the reported data?	☐	☐	☐	☐
11. Were the specific directives for new research appropriate?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

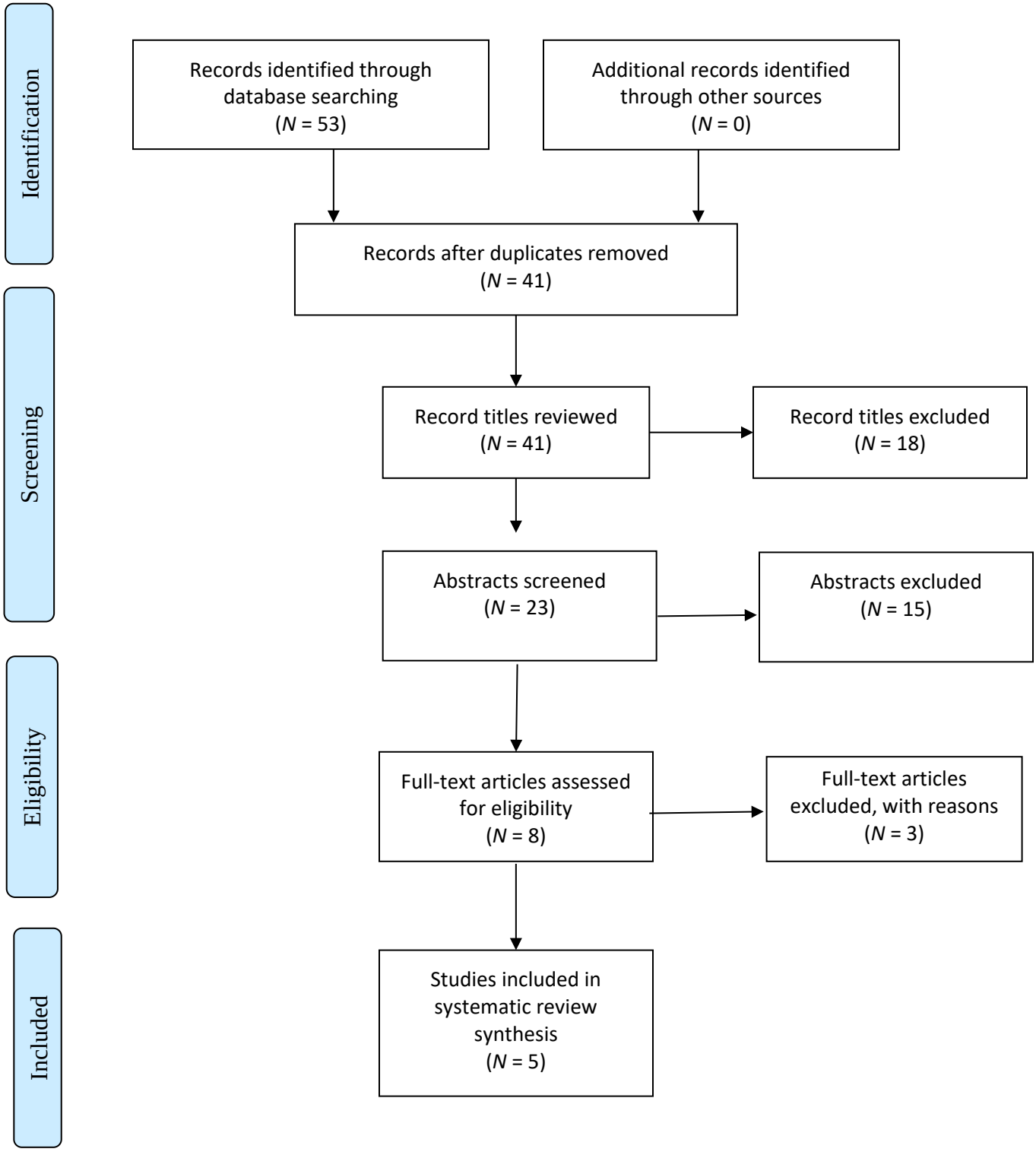
_____

_____

_____

Appendix C: PRISMA Flow Diagram

PRISMA Flow Diagram



Appendix D: PRISMA-P 2015 Checklist

PRISMA-P 2015 Checklist This checklist has been adapted for use with protocol submissions to *Systematic Reviews* from Table 3 in Moher D et al: Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews* 2015 4:1

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
ADMINISTRATIVE INFORMATION					
Title					
Identification	1a	Identify the report as a protocol of a systematic review	☐	☐	
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	☐	☐	
Registration	2	If registered, provide the name of the registry (e.g., PROSPERO) and registration number in the Abstract	☐	☐	
Authors					
Contact	3a	Provide name, institutional affiliation, and e-mail address of all protocol authors; provide physical mailing address of corresponding author	☐	☐	
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	☐	☐	
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	☐	☐	

Support					
Sources	5a	Indicate sources of financial or other support for the review	☐	☐	
Sponsor	5b	Provide name for the review funder and/or sponsor	☐	☐	
Role of sponsor/funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	☐	☐	
INTRODUCTION					
Rationale	6	Describe the rationale for the review in the context of what is already known	☐	☐	
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	☐	☐	
METHODS					
Eligibility criteria	8	Specify the study characteristics (e.g., PICO, study design, setting, time frame) and report characteristics (e.g., years considered, language, publication status) to be used as criteria for eligibility for the review	☐	☐	
Information sources	9	Describe all intended information sources (e.g., electronic databases, contact with study authors, trial registers, or other grey literature sources) with planned dates of coverage	☐	☐	
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	☐	☐	

STUDY RECORDS					
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	☐	☐	
Selection process	11b	State the process that will be used for selecting studies (e.g., two independent reviewers) through each phase of the review (i.e., screening, eligibility, and inclusion in meta-analysis)	☐	☐	
Data collection process	11c	Describe planned method of extracting data from reports (e.g., piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	☐	☐	
Data items	12	List and define all variables for which data will be sought (e.g., PICO items, funding sources), any pre-planned data assumptions and simplifications	☐	☐	
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	☐	☐	
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	☐	☐	
DATA					
Synthesis	15a	Describe criteria under which study data will be quantitatively synthesized	☐	☐	
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data, and methods of combining data from studies, including any planned exploration of consistency (e.g., I^2, Kendall's tau)	☐	☐	

	15c	Describe any proposed additional analyses (e.g., sensitivity or subgroup analyses, meta-regression)	☐	☐	
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	☐	☐	
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (e.g., publication bias across studies, selective reporting within studies)	☐	☐	
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (e.g., GRADE)	☐	☐	

Appendix E: Excluded Studies

Author, Year Reference	Title	Rationale for Exclusion
Reeves, S., Perier, L., Goldman, J., Freeth, D., Zwarenstein, M. (2013)	Interprofessional education: Effects on professional practice a health care outcomes (update)	Focused on interprofessional education
Brown, J. et al. (2017)	Lifestyle interventions for the treatment of women with gestational diabetes	Focused on gestational diabetes
Carnell, D. et al. (2013)	The effectiveness of medication reconciliation strategies to reduce medication errors in community dwelling older adults: A systematic review	Not focused on diabetes
Mercer, C., Byrth, J., & Jordan, Z. (2014)	The experiences of Aboriginal health workers and non-Aboriginal health professionals working collaboratively in the delivery of health care to Aboriginal Australians: A systematic review	Not focused on diabetes
Walters, S.J., Stern, C., & Robertson-Malt, S. (2016)	The measurement of collaboration within health care settings: A systematic review of measurements properties of instruments.	Focused on measurement of collaboration, but not focused on outcomes
Adams, T.L., Orchard, C., Houghton, P. & Ogrin, R. (2014)	The metamorphosis of a collaborative team: From creation to operation.	Focused on team formations not patient outcomes
Wang, J., Hu., X., Liu, J. & Li, L. (2016)	Pharmacy students' attitudes toward physician-pharmacist collaboration: Intervention effect of integrating cooperative learning into an interprofessional team-based community service.	Focused on interprofessional education
Tobe, S et al. (2014)	Canadian Cardiovascular Harmonized National Guidelines Endeavour (C-CHANGE): 2014 update.	Not focused on diabetes

Cope, R. et al. (2015)	Evaluating the effects of an interdisciplinary practice model with pharmacist collaboration on HIV patient co-morbidities.	Not focused on diabetes
Wong, R., Breiner, P., & Mylopoulos, M. (2014)	Shifting contours of boundaries: An exploration of inter-agency integration between hospital and community interprofessional diabetes programs.	Focused on interprofessional education
Ledford., J.L. Hess, R., & Johnson, F.P. (2013)	Impact of clinical pharmacist collaboration in patients beginning insulin pump therapy: A retrospective and cross-sectional analysis	Does not include collaboration with a team that includes nursing
Gucciardi, E., Espin, S., Morganti, & Dorado. L. (2016)	Exploring interprofessional collaboration during the integration of diabetes teams into primary care	Does not include patient outcomes
Vachon, B. et al. (2015)	Combining administrative data feedback, reflection and action planning to engage primary are professionals in quality improvement: Qualitative assessment of short term program outcomes	Focused on quality improvement not patient outcomes
Najarian, J., Bartman, K., Kaszuba, J. & Lynch, C.M. (2013)	Improving glycemic control in the acute care setting through nurse education	Occurs in an acute care setting
Reichert, S.M., Harris, S. & Harvey, B. (2014)	An innovative model of diabetes care and delivery: The St. Joseph's Primary Care Diabetes Support Program (SJHC PCDSP)	A program description, not a research study
Cote, L., Normandeau, M. Maheux, B., Authier, L. & Lefort, L. (2013)	Collaboration between family physicians and community pharmacists: Opinion of graduates in family medicine.	Not focused on patient outcomes
Fortin, M. et al. (2013)	Evaluating the integration of chronic disease prevention	Study protocol not an actual research study

	and management services into primary health care.	
Dean, H.J. et al. (2014)	Elements and enablers for interprofessional education clinical placements in diabetes teams.	Focused on interprofessional education
Howard-Thompson, A. et al. (2013)	Pharmacist-physician collaboration for diabetes care: Cardiovascular outcomes	Does not included specified outcome measures
Helling, D.K. & Johnson, S.G. (2014)	Defining and advancing ambulatory care pharmacy practice: It's time to lengthen our stride.	Not focused on diabetes
Benagiano, G & Brosens, I.	The multidisciplinary approach	Focused on gynecology
Wustmann, A, Haase-Strey, C., Kubiak, T. & Ritter, C. (2013)	Cooperation between community pharmacists and general practitioners in eastern Germany: Attitudes and needs	Focused on provider attitudes not patient outcomes
Pittenger, A.L., Westberg, S., Rowan, M., & Schweiss, S. (2013)	An interprofessional diabetes experience to improve pharmacy and nursing students' competency in collaborative practice.	Focused on interprofessional education not patient outcomes
Lopes, M.H., Southerland, J.H., Buse, J.B., Malone, R.M., & Wilder, R.S. (2012)	Diabetes educators' knowledge, opinions and behaviors regarding periodontal disease and diabetes	Focused on dental and educators'
Efurd, M.G., Bray, K.K., Mitchell, T. Y., & Williams, K. (2012)	Comparing the risk identification and management behaviors between oral health providers for patients with diabetes	Focused on oral health
El Arifeen, S. et al (2013)	Community-based approaches and partnerships: Innovations in health-service delivery in Bangladesh	Not focused on diabetes

Bernabeo, E. & Holmboe, E.S. (2013)	Patients, providers, and systems need to acquire a specific set of competencies to achieve truly patient-centered care	Focused on competencies, not patient outcomes
Yu, C.H., Lillie, E., Mascarenhas-Johnson, A., Gall, C.C. & Sraus, S.E. (2018)	Impact of the Canadian Diabetes Association guideline dissemination strategy on clinician knowledge and behaviour change outcomes.	Not specific to type 2 diabetes
Saunders, R., Dugmore, H., Seaman, K., Singer, R. & Lake, F. (2018)	Interprofessional learning in ambulatory care.	Focused on interprofessional education
Hwang, A.Y., Gums, T.H. & Gums, J.G. (2017)	The benefits of physician-pharmacist collaboration.	Not focused on diabetes
Chaitin, C. et al. (2018)	Third-year pharmacy students propose an interprofessional prediabetes educational programme: PreDiaMe (Prediabetes + Me).	Focused on interprofessional education
Brown, J. et al. (2017)	Lifestyle interventions for the treatment of women with gestational diabetes.	Focused on gestational diabetes
Markle-Reid, M. (2017)	The ACHRU-CPP versus usual care for older adults with type-2 diabetes and multiple chronic conditions and their family caregivers: study protocol for a randomized controlled trial.	A study protocol not an actual study
McCleery. E., Christensen, V., Peterson, K., Humphrey, L. & Helfand, M. (2011-2014)	Evidence brief: The quality of care provided by advanced practice nurses.	Not focused on diabetes
Vandewiele, M.N., Najor-Durack, A., Schiller, M. & Mendez, J. (2016)	The Journey of an interprofessional diabetes education student-run free clinic: Where do we go from here?	Focused on interprofessional education
Register, S.J., Harrington, K.F., Agne, A.A. & Cherrington, A.L. (2016)	Effectiveness of non-primary care-based smoking	Focused on non-primary care

	cessation interventions for adults with diabetes: A systematic literature review.	
Ledford, J.L., Hess, R. & Johnson, F.P. (2013)	Impact of clinical pharmacist collaboration in patients beginning insulin pump therapy: A retrospective and cross-sectional analysis.	Does not include nursing in collaboration
Bell, K.P., Phillips, C., Paquette, D.W., Offendbacher, S. & Wilder, R.S. (2012)	Dental hygienists' knowledge and opinions of oral-systemic connections: Implications for education.	Focused on oral health

Appendix F: Included Studies

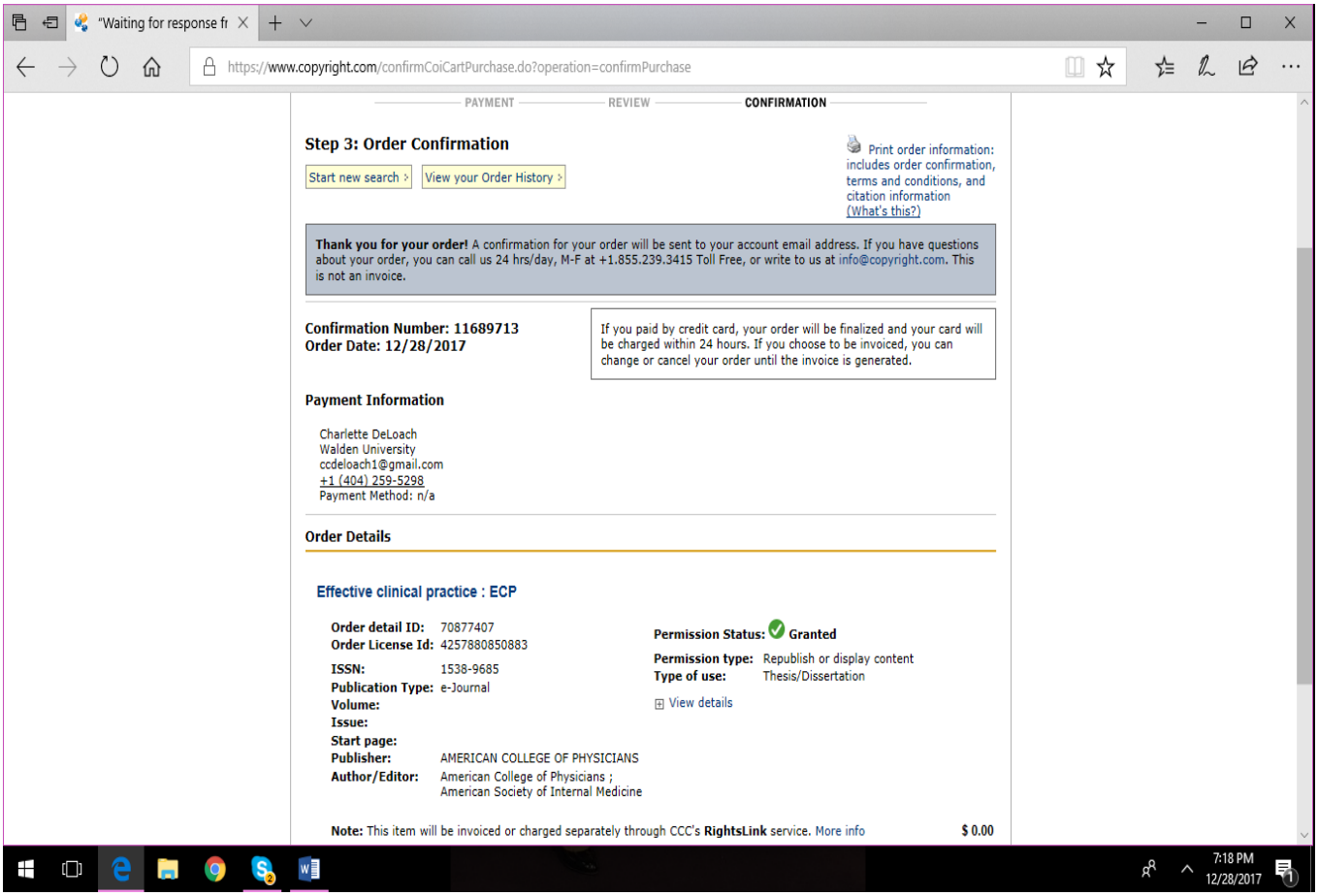
Authors	Study Objective	Research Methodology	Interventions/	Analysis/ Results	Levels of Evidence
Santschi, Y., Chiolero, A., Paradis, G Colosimo, A.L., & Burnand, B. (2012)	Assessed the effect of pharmacist care on cardiovascular disease risk factors among outpatients with diabetes	Systematic review	Medication management, educational interventions, feedback to physicians, measurement of CVD risk factors, or patient reminder systems	*N*=751 Statistically significant benefit of pharmacist reported on BMI. Pooled rate showed a significant reduction in BMI (p=0.026)	1a
Davis, C.S., Ross, L.R. & Bloodworth, L.S. (2017)	Study described clinical pharmacist involvement with clinics' health care team of physicians, nurse practitioners, diabetes educators (dieticians and registered nurses).	Prospective	Pharmacists collaborated with health care team to provide medication therapy management. Outcome measures were hemoglobin A1c, SBP, DBP, fasting cholesterol panel, body mass index, influenza vaccine, smoking status, and eye and foot exams.	*N*=64 completed the study. Mean hemoglobin A1c dropped by an average 1.2% (p<0.001). Patients enrolled demonstrated a clinically and statistically significant decrease in hemoglobin A1c with a baseline mean of 9.2% and final mean of 8.0%	2b
Congdon, H.B., Eldridge, B.H. & Truong, H. (2013)	Development and implementation of an interprofessional navigator-facilitated care coordination algorithm for low-income, uninsured, patient with uncontrolled diabetes	Descriptive	A navigator facilitated care coordination algorithm to direct patients to group or individual diabetes self-management education, nutrition counseling and /or medication therapy management	*N*=45 development of an algorithm for a navigator-facilitated care coordination with IPC had a positive impact on hemoglobin A1c as evidenced by a decrease of 2.5% points from 10.6% to 8.8%.	2b
Renfro, C.P., Ferreri, S., Barber, T.G., & Foley, S. (2018)	To design and implement a communication strategy utilizing an electronic health record as the method of communication for shared patients with hypertension and diabetes between a family medicine practice and community pharmacy	Observational Descriptive	Collaboration with community pharmacy using electronic health record to communicate about patients	Patients (*N*=3) were referred to community pharmacy. Two were diagnosed with diabetes. Hemoglobin A1c decreased from 10.1% to 9.5% and 9.4% to 8.6%, respectively	2b

Conca et al. (2018)	Proposes the use of process mining to extract from an electronic clinical record to understand if ways professionals coordinate their work effects patient outcomes	Retrospective	Electronic health record used to identify patterns of collaboration between physician, nurse, and dietician and to compare hemoglobin A1c of patients in primary care setting	Patients (*N*=231) were included and the health care processes of patients (*N*=35) receiving equitable and comprehensive participation from physician, nurse, and dietician resulted in a lower proportion of patients with hemoglobin A1c over 9% compared with the total population (3% vs 16%, p=.03)	2b

Appendix G: Levels of Evidence

1a	Systematic review of Randomized Controlled Trials (RCTs)	1
1b	Individual RCT	0
1c	All or none	0
2a	Systematic review of cohort studies	0
2b	Individual cohort study	4
2c	Outcomes research; ecological studies	0
3a	Systematic review of case-control studies	0
3b	Individual case-control study	0
4	Case series	0
5	Expert opinion without explicit critical appraisal, or based on physiology, bench research or “first principles”	0

Appendix H: Copyright Permission for Chronic Care Model



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