Fall 2013

Implementation of the physician-pharmacist collaborative model in primary care clinics

Elizabeth H. Chang
University of Iowa

IMPLEMENTATION OF THE PHYSICIAN-PHARMACIST COLLABORATIVE MODEL IN PRIMARY CARE CLINICS

by

Elizabeth H. Chang

A thesis submitted in partial fulfillment
of the requirements for the Doctor of
Philosophy degree in Pharmacy
(Pharmaceutical Socioeconomics)
in the Graduate College of
The University of Iowa

December 2013

Thesis Supervisor: Professor William R. Doucette

Graduate College
The University of Iowa
Iowa City, Iowa

CERTIFICATE OF APPROVAL

_____

PH.D. THESIS

_____

This is to certify that the Ph.D. thesis of

Elizabeth H. Chang

has been approved by the Examining Committee
for the thesis requirement for the Doctor of Philosophy
degree in Pharmacy (Pharmaceutical Socioeconomics)
at the December 2013 graduation.

Thesis Committee: _____
William R. Doucette, Thesis Supervisor

_____
Barry L. Carter

_____
Julie M. Urmie

_____
Mark W. Vander Weg

_____
Thomas E. Vaughn

ACKNOWLEDGMENTS

I would like to thank my advisor, Dr. William Doucette, for his mentorship and encouragement throughout my entire graduate school experience. I could not have completed this dissertation without his guidance and assistance with recruiting clinics, obtaining funding support, and many other aspects of the work. I would also like to thank my committee members – Drs. Barry Carter, Julie Urmie, Thomas Vaughn, and Mark Vander Weg – for their insight and inspiration into this project. I would especially like to thank Dr. Barry Carter for suggesting and allowing me to use data from the CAPTION Trial for my dissertation.

I would like to acknowledge the staff assistance from the CAPTION Clinical Coordinating Center (Drs. Gail Ardery and Christopher Parker) and Data Coordinating Center (Dr. Christopher Coffey and Liz Uribe). Dr. Ardery oriented me to the CAPTION trial and provided tremendous assistance and encouragement over the last year and a half. She also conducted all the interviews with Dr. Parker and helped audit the analyses in Study Two. Dr. Coffey and Ms. Uribe helped me obtain data files needed for my studies.

In addition, data collection from the field was not possible without the numerous individuals who participated in Study Three. I would like to acknowledge the individuals who helped with recruitment: Dr. Daniel Touchette at the American College of Clinical Pharmacy Practice-Based Research Network (ACCP PBRN), Dr. Jon Schommer at the Minnesota Pharmacy Practice-Based Research Network (MPPBRN), and additional faculty members in the colleges of pharmacy in the Midwest. I would like to thank the participating pharmacists and clinic managers who helped set up my site visits. In addition, I would like to acknowledge the assistance I received from Caitlin Lickteig (transcribing), Yiran Zhang (transcribing), and Dr. Ben Urick (analysis).

I am lucky to have the camaraderie with my peers in the PSE graduate program. They are Dr. Brandon Patterson, Dr. Matthew Witry, Puttarin Kulchaitanaroaj, Jayoung Han, Yuexin Tang, Yu-Yu Tien, Cole Chapman, Chien-Hsun Li, Yiran Zhang, Yan Zhang, Ziqian Chen, Dr. Ben Urick, Jacob Simmering, Aaron Miller, and Ali Al Jumaili. We studied, we played, we ate, we fought, we sang, and we supported each other over the last several years of graduate studies. I will forever remember the fun times we had together.

Being away from family, I am fortunate to have friends that supported me in bad times and good times. They are Ying-Ling Jao, Shan-Ju Lin, Yu-Yu Tien, Chien-Hsun Li, Yu-Hsin Lin, Hsiu-Yin Chiang, Hung-Lin Chen, Yaleng Lin, and Su-Mei Chen. I will miss the meals we cooked, the games we played, the stories we shared, and the study groups we had.

I am grateful for the funding support I have received during my graduate studies, including the University of Iowa Presidential Fellowship, the Pre-doctoral Fellowship from the American Foundation for Pharmaceutical Education, a research grant from the Partnership of Student Governments at Iowa, and funding from the University of Iowa College of Pharmacy.

Last but not least, I am indebted to the love and support by my parents, my brother, and my fiancée. Thank you for always believing in me and encouraging me to complete my dreams, even when we are on opposite sides of the globe. I will be home soon!

ABSTRACT

In the modern society, chronic diseases have become the leading causes of death. With early recognition and proper management, however, many of the complications from chronic diseases could be prevented or delayed. Taking such a proactive approach in managing a population often requires the use of team-based approaches and delegation of certain clinical and nonclinical tasks to nonphysician team members. This three-study dissertation used a combination of methods to explore contextual factors that influence primary care teamwork and physician-pharmacist collaboration. The first study quantitatively examined baseline barriers and facilitators of physician-pharmacist collaboration in clinics participating in the Collaboration Among Pharmacists and Physicians To Improve Outcomes Now (CAPTION) Trial. Pharmacist expertise and clinic staff support were found to be the most important facilitators for physicians, while insurance reimbursement and task design factors were important for pharmacists. The second study characterized clinic personnel experience participating in the CAPTION trial and explored determinants of disease state control. Higher proportions of indigent and minority populations and higher baseline pharmacy structure scores were found to be associated with lower blood pressure control. The third study qualitatively examined organizational influences on primary care team effectiveness and the roles of pharmacists in a separate sample of primary care clinics. A lack of organizational rewards for teamwork in primary care was identified and pharmacists were integrated into clinic workflow in various degrees. These findings will be informative for practice managers and health care professionals seeking to redesign their practice to meet increasing needs of patients with chronic diseases.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE:
INTRODUCTION

In the U.S., more than half of the population has one or more chronic diseases, which have become the leading causes of mortality and disability (DeVol et al., 2007; Miniño, Murphy, Xu, & Kochanek, 2011). The economic impact of chronic diseases has been estimated to be $1.3 trillion in 2007 and is expected to continually rise as the population's average life expectancy increases (DeVol et al., 2007). While many chronic diseases can be effectively managed to prevent morbidity and disability, the current health care system is not ideal for managing chronic diseases, as physicians often have limited time and resources to focus beyond making diagnoses and giving curative or symptom-relieving treatments (Wagner, Austin, & Von Korff, 1996). In addition, the fragmented system has led to inefficient health care processes that lack coordination between health care providers (Institute of Medicine (IOM), 2001).

One solution to this problem is to redesign practice and enhance team-based care (IOM, 2001; Joint Commission on Accreditation of Healthcare Organizations, 2003; King et al., 2008; Wagner et al., 1996). The IOM (2001) report – *Crossing the Quality Chasm* – recommended that "cooperation among clinicians" should be one of the rules to follow as organizations revamp the health care processes. The Joint Commission (2003) also emphasized the team approach with standards that addresses interdisciplinary care and coordination. More recently, the Patient Protection and Affordable Care Act (2010) has included provisions encouraging the adoptions of patient-centered medical home (PCMH) principles in primary care practice models, where a community-based interprofessional team provides coordinated and integrated care using a whole person orientation. All of these policies speak to the importance of team-based approaches and interprofessional collaboration.

As the use of medications is an essential element in chronic disease management, it is expected that pharmacists can play an important role in primary care teams by managing medication therapies. The responsibilities of a pharmacist may include taking medication histories, identifying and resolving drug therapy problems, providing patient education, and answering drug information questions from other health care professionals. A recent meta-analysis showed that pharmacist interventions on managing diabetes, hypertension, cholesterol, and adverse drug events provided favorable patient outcomes (Chisholm-Burns et al., 2010). What remains unclear, however, is how to implement and disseminate these pharmacist interventions in ambulatory care settings, where pharmacists collaborate with other health care providers to provide direct patient care. This dissertation addresses this gap by understanding the facilitators and barriers to physician-pharmacist collaboration practices for chronic diseases in primary care clinics.

Statement of the Problem

The concept of teamwork and interprofessional collaboration in health care is not novel. A review has examined the effect of team care compared to non-team approaches and provided evidence that team care is associated with better patient outcomes and satisfaction (Lemieux-Charles & McGuire, 2006). Similar favorable outcomes are found in studies involving collaboration between pharmacists and physicians for the management of hypertension (Carter et al., 2009; Hunt et al., 2008; Weber, Ernst, Sezate, Zheng, & Carter, 2010).

However, to effectively implement and disseminate these interventions in practice settings requires an understanding of the context that may be facilitators or barriers for the translation of evidence established from randomized controlled trials. In particular, studies evaluating implementation of new practice models have indicated that organizational support is important for successful implementation (IOM, 2001; P. A. Nutting et al., 2010; Yano, 2008). Yet few studies have examined the influence of

organizational characteristics on the team effectiveness and analyzed them at the organizational-level, rather than the team-level (Lemieux-Charles & McGuire, 2006; Mathieu, Maynard, Rapp, & Gilson, 2008; San Martin-Rodriguez, Beaulieu, D'Amour, & Ferrada-Videla, 2005). As a result, it is unclear what organizational designs and resources are needed and what are their mechanisms in influencing team and organizational outcomes. There is a critical need for empirical evidence of the effect of these organizational characteristics, as the evidence could guide health care policies to stimulate and expand the use of healthcare teams, and provide more effective and efficient management of chronic diseases. This is an important problem because until the need is met, primary care organizations may be wasting dollars implementing futile interventions, and frontline healthcare team members may be frustrated with unmet needs to improve their practice.

Moreover, the understanding of contextual characteristics of practice models incorporating pharmacists in ambulatory care clinics and offices is needed to identify factors that would facilitate the institutionalization of such practice models. In his Whitney Award Lecture, Abramowitz (2009) identified ambulatory care pharmacy as "the next metamorphosis" of pharmacy practice models and predicted that "in the community, most pharmacy care will be provided by pharmacists located in interdisciplinary ambulatory clinics of all sizes." While there has been evidence of the role of ambulatory care pharmacists in academic (Haines et al., 2011), government (Ellis et al., 2000; Malone et al., 2000; Reynolds, Boyce, Haxby, Goldberg, & Stennett, 2000), and managed care settings (Lu, Ross-Degnan, Soumerai, & Pearson, 2008), relatively few studies have examined the role of pharmacists in physician solo or group practices, where roughly three quarters of physicians practice (Boukus, Cassil, & O'Malley, 2009). Whether Abramowitz's prediction will be realized in the future is unknown; however, this dissertation provided a piece of evidence by addressing the following research questions.

Research Questions (RQ)

1. What is the nature of teamwork in primary care clinics incorporating clinical pharmacists?
    A. What are differences between perspectives from physicians and pharmacists regarding facilitators and barriers of physician-pharmacist collaboration? (Study 1)
    B. What is the experience of physicians, pharmacists, clinic administrators, and study coordinators participating in a physician-pharmacist collaboration intervention trial? (Study 2)
    C. What are the roles of clinical pharmacists in primary care clinics? (Study 3)
    D. What types of teams exist in primary care clinics? (Study 3)
2. What factors influence the effectiveness of primary care teams incorporating clinical pharmacists?
    A. What factors distinguish successful collaborative working relationships from less successful ones? (Study 1)
    B. What factors distinguish intervention clinics with more patients meeting treatment goals from those with fewer patients meeting goals? (Study 2)
    C. How do organizational characteristics influence the effectiveness of primary care teams incorporating clinical pharmacists? (Study 3)

Overview of Dissertation

Three individual studies were conducted for this dissertation. Chapter One (Introduction) and Chapter Two (Literature Review) provide overarching information of the dissertation, while Chapters Three, Four, and Five cover the background, methods, results, and discussion for the three respective studies. All three studies addressed RQ-1 and RQ-2; however, the three studies varied in sample selection, data sources, and research approaches. This multi-method approach allowed for triangulation between

different studies to strengthen the findings (Morse, 1991), and discussion of the combined results is provided in Chapter Six.

The three individual studies were linked by a common conceptual framework that included domains of organizational context, team inputs, team processes, team psycho-social traits, and team outcomes (**Figure 2-2**).This framework was based on the input-process-outcome (IPO) framework in the social psychology literature (J. E. McGrath, 1964), as well as a model adapted for use in health care teams, the Integrated (Health Care) Team Effectiveness Model (ITEM) (Lemieux-Charles & McGuire, 2006). These comprehensive models have been commonly used to study team effectiveness in businesses and health care organizations (Lemieux-Charles & McGuire, 2006; Mathieu et al., 2008). Further discussion of this framework is provided in Chapter Two.

Studies One and Two involved analysis of data from the Collaboration Among Pharmacists Physicians To Improve Outcomes Now (CAPTION) trial (Carter et al., 2010). The CAPTION trial was a prospective, cluster-randomized, multi-center trial testing the effectiveness of a physician-pharmacist collaborative model (PPCM) for improving blood pressure (BP) control. The three intervention arms included a 9-month BP intervention group (11 clinics), a 24-month BP intervention group (9 clinics), and a control group with a distractor intervention for asthma (12 clinics). The pharmacist interventions involved reviewing patient medical records, taking medication history, assessing patient knowledge, providing treatment recommendations based on guidelines, and providing monitoring in patient follow-up visits.

Study One addressed RQ-1, RQ-1A, and RQ-2A through analysis of baseline surveys administered to all physicians and pharmacists at the 32 participating clinics. First, the processes of collaboration – operationalized as the frequencies of physician referrals to pharmacists, physician acceptance of pharmacist-developed care plans, as well as the extent of staff support – were characterized (RQ-1). Next, physician and pharmacist perceptions of facilitators and barriers (inputs) were contrasted to identify

areas where there were discordant views (RQ-1A). Finally, facilitators and barriers (inputs) that predicted the degree of collaborative working relationships (processes) were identified (RQ-2A).

Study Two addressed RQ-1B and RQ-2B in a multiple-case study using 9-month BP data, 9-month asthma control data, and end-of-study phone interview data with physicians, pharmacists, clinic administrators, and study coordinators participating in the CAPTION trial. First, the inputs, processes, and outcomes experienced by clinic personnel during the intervention were characterized by analysis of interview data at the clinic level (RQ-1B). Then, based on the percentage of patients having BP control or asthma control at 9 months, clinics were stratified into higher control or lower control groups for each outcome. Through cross-case analysis of clinic-level data, input, process, and subjective outcome variables that distinguished higher control and lower control groups were identified and characterized (RQ-2B).

Study Three addressed RQ-1C, RQ-1D, and RQ-2C. This multiple-case study used a separate sample of ambulatory care clinics that incorporated clinical pharmacists in their practices. The main distinctions from the first two studies were two-fold: First, the focus was on organizational characteristics, such as goals, rewards, structure, resources, training, and space allocation. Second, the sampling approach of Study Three incorporated clinics that were not associated with medical residencies. This was in contrast with the CAPTION clinics that were either hosts of medical residency programs or medical faculty practices, and allowed for comparisons of practices with differences in organizational goals regarding education. During on-site visits lasting one to three days at each of the seven primary care clinics enrolled, a mix of methods were employed at each clinic, including (1) individual interviews with clinic staff members; (2) document reviews of collaborative practice agreements; (3) observations of care processes and staff meetings; and (4) questionnaires. This data collection approach allowed for triangulations between different informants and data sources, which strengthened the evidence of

findings. Both within-case and cross-case analysis were conducted to provide narrative descriptions corresponding to RQ-1C and RQ-2C.

CHAPTER TWO:
LITERATURE REVIEW

This chapter provides a literature review of chronic disease management and the role of pharmacists in primary care clinics, followed by a review of frameworks of interprofessional collaboration and health care team effectiveness. The conceptual framework and research objectives used in this dissertation are provided at the end of this chapter.

Chronic Disease Management

With the aid of modern medicine, the average life expectancy has been prolonged significantly and chronic diseases are now the most common and costly health problems in the United States (Centers for Disease Control and Prevention (CDC), 2012). However, the current health care system is not designed to meet the demands of patients with chronic diseases, whose care require long-term, coordinated multidisciplinary processes (IOM, 2001).

Wagner, Austin, and Korff (1996) hypothesized four reasons explaining why the chronically ill are receiving suboptimal care: (1) incomplete assessments or inadequate follow-up leading to delays in detection of declining health status; (2) inadequate or inconsistent patient assessment, education, motivation, and feedback leading to failures in self-management; (3) omission of effective interventions or commission of ineffective interventions; (4) ignoring or inadequately managing psychosocial distress.

To fully address these deficiencies, redesign of the health care system is necessary (IOM, 2001; Wagner et al., 1996). Two practice models that have been substantiated by empirical evidence and received widespread attention are discussed in the following.

Chronic Care Model (CCM)

Following a review of comprehensive approaches to improve outcomes of the chronically ill, Wagner and colleagues at the Group Health Cooperative proposed the Chronic Care Model (CCM) as a systematic approach to improve ambulatory care (Coleman, Austin, Brach, & Wagner, 2009; Wagner et al., 1996; Wagner, 1998; Wagner et al., 2001). The six main domains are healthcare organization, community resources, self-management support, delivery system design, decision support, and clinical information systems. Briefly, healthcare organizations need to create an environment that promotes safe and quality care; community resources need to be deployed to improve patient access to care; support is needed to empower and prepare patients to care and monitor their own disease states; delivery systems need to be redesigned to promote efficient and effective care; decision support for providers is needed to improve evidence-based practices; and clinical information systems are needed to organize care based on patient and population data. Together they should stimulate productive interactions between prepared, proactive practice teams and informed, activated patients, leading to improved functional and clinical outcomes.

Over the last decade, a number of studies have assessed different components of the CCM. A review by Coleman, Austin, Brach, and Wagner (2009) summarized 82 studies using four or more of the CCM components in primary care practices between 2000 to 2008, including randomized controlled trials, quasi-experimental studies, observational evaluations, studies examining relationships between organizational characteristics and quality improvement, cost-related studies, and reviews or meta-analyses. Overall they found that primary care practices participating in quality improvement (QI) collaboratives were able to implement and sustain multiple practice changes (M. L. Pearson et al., 2005) and improve the quality of care in terms of processes and outcomes for patients with heart failure, asthma, and diabetes (Asch et al., 2005; Mangione-Smith et al., 2005; Vargas et al., 2007). While there were studies with negative

results, such as no changes in care processes or intermediate clinical outcomes for patients with asthma and diabetes (Homer et al., 2005; Landon et al., 2007), possible reasons such as short follow-up periods were provided and confirmed in a three-year study where positive clinical outcomes were realized (Chin et al., 2007).

However, because the complex multicomponent CCM is costly to implement and savings from prevention of hospitalizations and emergency room visits take time to be shown, studies evaluating the cost-effectiveness of CCM are limited (Coleman et al., 2009). In one study examining diabetes care in community health centers, the CCM interventions were found to be cost-effective from a societal perspective with an incremental cost-effectiveness ratio of $33,386 per quality-adjusted life year (Braithwaite, Meltzer, King, Leslie, & Roberts, 2008; Huang et al., 2007; Weinstein, 2008).

Patient-Centered Medical Home (PCMH)

Another practice model closely related to the CCM is the patient-centered medical home (PCMH). Tracing back its roots, the term "medical home" originated from the American Academy of Pediatrics (AAP) in 1967, where it was first referred as a "central source of a child's pediatric records" (AAP, Council on Pediatric Practice, 1967; Sia, Tonniges, Osterhus, & Taba, 2004). As the concept evolved into an approach to provide community-based primary care, four major primary care societies came together in 2007 and released joint principles of the PCMH (American Academy of Family Physicians (AAFP), AAP, American College of Physicians (ACP), & American Osteopathic Association (AOA), 2007). These principles include a personal physician with ongoing relationships with patients, a physician-directed, team-based medical practice, a whole person orientation of care that takes into account all health care needs at all stages of life, coordinated and/or integrated care across the health care system and community,

practices that highlight quality and safety, enhanced access to care, and payment that recognizes the value PCMH provides.

PCMH has received wide recognition in health care policies. Most of the joint principles were included in the medical home provisions in the Patient Protection and Affordable Care Act (2010). In addition, national standards for organizations adopting PCMH principles have been developed by the National Committee for Quality Assurance (NCQA), the Agency for Healthcare Research and Quality (AHRQ), the Accreditation Association for Ambulatory Health Care (AAAHC), the Joint Commission, and the Utilization Review Accreditation Commission (URAC) (Abrons & Smith, 2011).

One of the most popular national standards is the NCQA-PCMH Recognition Program (NCQA, 2013). It is based on a points system covering six standards, and practices may seek to achieve Level 1, Level 2, or Level 3 recognition, with Level 3 being the highest level of recognition. The 2011 standards included six domains of enhance access and continuity, identify and manage patient populations, plan and manage care, provide self-care support and community resources, track and coordinate care, and measure and improve performance.

Several empirical studies regarding PCMH have been carried out. The 2-year National Demonstration Project (NDP) randomized 36 family practices into facilitated and self-directed practices (Crabtree et al., 2010). Using a multimethod approach, researchers were able to evaluate the effectiveness, feasibility, and experience of PCMH practices (Jaen et al., 2010). At 26 months, more PCMH components were adopted in facilitated practices compared to self-directed practices (10.7 vs. 7.7 components, $p = 0.005$), and the adoption of PCMH components was associated with better access, better prevention, and better clinical care in terms of process measures (Jaen, Ferrer et al., 2010). Other studies have found that PCMH implementation led to small but statistically significant improvements in blood pressure and cholesterol levels (Gabbay, Bailit, Mauger, Wagner, & Siminerio, 2011), improved patient satisfaction and less provider

burnout (Reid et al., 2010), as well as reduced hospitalizations and emergency room visits (Harbrecht & Latts, 2012).

While more PCMH studies are under way, qualitative studies provide insights that implementation is not straightforward, and changes in roles and mental models are required to accomplish practice transformation (P. A. Nutting et al., 2009; P. A. Nutting et al., 2010; P. A. Nutting, Crabtree, & McDaniel, 2012). Specifically, researchers have observed that primary care physicians are used to working "within a bubble of frantic activity" with few interactions with other members of the healthcare team (Chesluk & Holmboe, 2010; P. A. Nutting et al., 2012). Nutting, Crabtree, and McDaniel (2012) also pointed out midlevel clinicians in small primary care practices are typically employed to increase clinic revenue by doing similar work as physicians, i.e., seeing their own patients, but not providing additional value-added services such as coordination of care or patient education as seen in large system practices. Clearly, there is a steep learning curve if primary care clinics are to adopt team-based practices, in addition to implementing other elements of the PCMH.

Role of Pharmacists in Primary Care Clinics

The role of pharmacists in patient care has evolved substantially over the past six decades. While traditional responsibilities of medication dispensing remain a major work activity for pharmacists (W. R. Doucette, Gaither, Kreling, Mott, & Schommer, 2010), new roles in patient care have been developed and implemented in a variety of settings, ranging from hospital intensive care units (Horn & Jacobi, 2006), medical-surgical units (Kaboli, Hoth, McClimon, & Schnipper, 2006), emergency departments (V. Cohen, Jellinek, Hatch, & Motov, 2009), outpatient clinics, physician offices, community pharmacies (Nkansah et al., 2010), to nursing homes (Verrue, Petrovic, Mehuys, Remon, & Vander Stichele, 2009) and home care (American Society of Health-System Pharmacists, 2000). The core provision in many of these clinical services is

pharmaceutical care, where pharmacists are responsible for optimizing drug therapy to achieve better patient outcomes by identifying, resolving, and preventing drug-related problems (Hepler & Strand, 1990). These drug-related problems may include unnecessary drug therapy, needs for additional drug therapy, ineffective drug, adverse drug reaction, dosage too low, dosage too high, as well as compliance issues (Strand, Morley, Cipolle, Ramsey, & Lamsam, 1990). Given the substantial burden of drug-related morbidity and mortality in today's health care system (Ernst & Grizzle, 2001), pharmacists have significant potential to improve patient outcomes and reduce health care costs, especially in ambulatory care settings where there is great need for managing chronic diseases.

Documentation of pharmacist involvement in ambulatory care clinics beyond medication dispensing activities appeared as early as 1968, where pharmacists were responsible for obtaining medication history and providing patient education regarding medication use in a neurology outpatient clinic (Lesshafft, 1970). Over the last four decades, more research studies examining innovative practices in ambulatory care settings have been reported. A systematic review and meta-analysis including studies up to 2007 examined the effect of outpatient pharmacists' direct patient care roles on patient outcomes and prescribing patterns (Chisholm-Burns et al., 2010). The inclusion criteria for the systematic review were discernible pharmacist contribution in direct patient care, presence of a control group, and measurement of patient outcomes. The meta-analysis only included randomized controlled trials. Compared to control groups, pharmacist interventions on average were associated with 1.8% reduction in hemoglobin A1c, 6.3 mg/dL reduction in LDL cholesterol, 7.8 mmHg reduction in systolic BP, 2.9 mmHg reduction in diastolic BP, and a 47% reduction in the odds of adverse drug events, all of which were statistically significant ($p < 0.05$). Pharmacist interventions were also significantly associated with better medication adherence, patient knowledge, and general health status, but not patient satisfaction, nor the physical or mental health components of

quality of life. Of note, heterogeneity was observed in meta-analyses of blood pressure, LDL, hemoglobin A1c, medication adherence, and patient knowledge, though removal of individual studies did not change the significance of meta-analysis findings. The authors attributed the heterogeneity in study outcomes to variable potency of interventions and variable degrees of adoption of intervention protocols. Future studies are needed to further investigate the causes of the heterogeneity across pharmacist intervention studies.

Despite clinical studies demonstrating the benefits from having clinical pharmacists in roles providing direct patient care, pharmacists are typically underused in primary care settings, and they are not always incorporated in discussions of new practice models, such as PCMHs (Abrons & Smith, 2011; Kaldy, 2010; Smith, Bates, Bodenheimer, & Cleary, 2010). In addition to organizational barriers and payment issues commonly found in studies implementing practice change, pharmacists also face the stereotype of a shopkeeper rather than a health care professional (Bryant, Coster, & McCormick, 2010), and primary care team members may have had limited experience working with pharmacists beyond routine refill requests from dispensing pharmacies.

Examples of pharmacists working closely with or inside primary care practices are not without precedent. In fact, most of the studies included in Chisholm-Burns's systematic review of pharmacist interventions were conducted in outpatient clinics, where pharmacists are co-located with physicians and other healthcare providers (Chisholm-Burns et al., 2010). Two examples from the U.S. regarding integration of pharmacists in primary care teams are also available in the literature. Scott, Hitch, Ray, and Colvin (2011) reported the experience of pharmacist integration in a family medicine residency training program in North Carolina. The practice was recognized as a Level-3 PCMH by NCQA, and its quality data were shared with an outside QI initiative and a PCMH Collaborative involving several primary care teaching clinics. In that training program, pharmacists practiced collaboratively with physicians, nurses, nutritionists, care managers, translators, and behavioral medicine specialists providing patient care services,

such as medication therapy management clinics, anticoagulation clinics, osteoporosis clinics, vaccination programs, and care transitions.

Kozminski et al. (2011) conducted a qualitative evaluation of the acceptance and attitudes of pharmacists, physicians, clinic staff, and patients during integration of two pharmacists into a PCMH of four practices. Based on interviews with all parties, patient surveys, pharmacist log books and observations, five themes emerged: all types of providers and patients reported positive feelings regarding pharmacist integration; clinical, educational, and logistical (time-saving) benefits were perceived; there were challenges to understand the new role of pharmacists; flexibility and motivation of pharmacists were perceived to improve workflow and the integration process; suggestions were made to increase pharmacist time at the clinics. While there appears to be overwhelming positive acceptance and attitudes from providers and patients, there were a few limitations to the study. First, even though the interviews were not conducted by the PCMH pharmacists, the two interviewers were both pharmacy residents at the time, and the physician and staff responses may have been affected by social desirability bias to give positive comments. Second, there may have been variations in acceptance and attitudes across the four physician offices, especially regarding workflow, which can be further investigated through office-level analyses. Third, as the authors acknowledged, the data collection spanned over three months, and it is unclear whether the acceptance and attitudes changed over the course of the integration process. Finally, also acknowledged by the authors, the study was limited to two pharmacists in four offices, and the study findings may have been attributed to the personality and motivation of the pharmacists and may not be generalized to any pharmacist. Future study expanding different types of offices will be helpful in improving the transferability of the results.

A number of studies from Canada also evaluated the integration of pharmacists into family health teams. Pottie, Farrell and their colleagues conducted qualitative investigations of physician and pharmacist experiences of integrating pharmacists into

family practices (B. Farrell et al., 2010; B. Farrell et al., 2008; Pottie et al., 2008; Pottie, Haydt et al., 2008; Pottie et al., 2009). All studies were part of the Integrating Family Medicine and Pharmacy to Advance Primary Care Therapeutics (IMPACT) project. Pharmacist monthly narrative reports over nine months of integration were used to document experiences of integration and adaption into family practice settings (B. Farrell et al., 2008; Pottie, Haydt et al., 2008; Pottie et al., 2009). During the initial four months, pharmacists documented emotional challenges, their processes of building relationships with everyone, the new skills acquired, such as documentation, patient assessment, and dealing with patient complexity, and their strategies for being integrated into the practice (B. Farrell et al., 2008). Subsequent reports illustrated that pharmacists felt being seen as a team player, were able to see patients in more holistic ways and dealt with some of the challenges they perceived earlier (Pottie et al., 2009). The authors suggested that pharmacist identity formation was likely influenced by settings, skills, and perspectives.

Two studies documented the changes in physician perspectives of integrating pharmacists into family teams for the IMPACT project (B. Farrell et al., 2010; Pottie et al., 2008). The first study used exploratory focus groups at 3 months into the project and semi-structured interviews at 12 months into the project (Pottie et al., 2008). Data from early focus groups showed that physicians had concerns delegating patient care to other people, and they believe physicians should have the final decisions on patient care. Data from semi-structured interviews yielded four major themes, including operational challenges, developing security, as well as clinical- and practice-level benefits. The initial concerns physicians had were no longer major issues, but finding time to work together and adjusting physician routines were persistent challenges. The second study focused on physician perceptions of the pharmacists' and their own contributions regarding medication use processes using self-administered questionnaires at 3, 12, and 19 months into the project (B. Farrell et al., 2010). Initially, physicians rated their contributions in diagnosis and prescribing, administrative/documentation, and monitoring significantly

higher than those of pharmacists, while physicians' contributions in medication review was similar and contributions in education was lower than pharmacists'. Later on, physicians' rating of pharmacist contributions increased in the domains of diagnosis and prescribing, medication review, and monitoring, while ratings of physician contributions decreased in diagnosis and prescribing, as well as education. These findings were consistent with earlier studies that pharmacist roles and physician perceptions change over the course of pharmacist integration.

A separate study conducted by Farrell et al. (2013) examined the roles and routines of pharmacists at six newly formed family health teams in Ontario, using a mix of observations, interviews, and document analysis. Two types of pharmacist roles emerged: a physician-oriented reactive role and a patient-centered proactive role, working at multiple interactions. The authors suggested that pharmacist ideological philosophy and individual characteristics may be primary reasons shaping the different roles. While this study provided enlightening and enriched descriptions of the two roles, the main limitation was the small sample size. Future studies are needed to replicate the findings and further investigate the ideological philosophy and individual characteristics.

In summary, there has been a major shift of pharmacist roles from primary traditional dispensing functions to increased direct patient care activities. The efficacy of pharmacist interventions in direct patient care roles has been confirmed in many of the randomized controlled trials, and incorporation of pharmacists into primary care teams has been proposed to contribute to improved patient-centered care. However, moving from controlled settings into practices in the real world, there are more organizational, team, and individual factors to consider in order to achieve successful incorporation of pharmacists and improved patient outcomes. A number of qualitative studies associated with demonstration projects began to examine these factors and provided enriched descriptions of different perceptions, roles, as well as facilitators and barriers (B. Farrell et al., 2010; B. Farrell et al., 2008; B. Farrell et al., 2013; Kozminski et al., 2011; Pottie et

al., 2008; Pottie, Haydt et al., 2008; Pottie et al., 2009; M. A. Scott et al., 2011). Nevertheless, there were limitations in methods, sample size, and settings that confine our understanding of the subject. Future studies are needed to replicate and advance the findings from previous research.

Frameworks for Evaluating Collaboration and Teamwork

There is a proliferation of literature regarding interprofessional collaboration and teamwork in health care stemming from a variety of disciplines, such as social psychology, management, marketing, nursing, social work, pharmacy and many others (Chang & Doucette, 2012). D'Amour, Ferrada-Videla, San Martin-Rodriguez, and Beaulieu (2005) conducted a review of core concepts and theoretical frameworks regarding interprofessional collaboration, and they observed a "plurality of concepts" regarding collaboration from discipline to discipline. Among the various approaches, the theories underlying these frameworks originated from organizational theory, social exchange theory, organizational sociology, or grounded theory based on empirical data.

In the following, three frameworks that can be used to study interprofessional collaboration will be described, and their limitations will be noted. The first two are the Input-Process-Outcome (IPO) framework and its subsequent variations based on organizational theory (Lemieux-Charles & McGuire, 2006; J. E. McGrath, 1964), and the Interprofessional Education for Collaborative Patient-Centred Practice (IECPCP) Model developed based on literature reviews and research work done for Health Canada (D. D'Amour & Oandasan, 2005). In addition, the Collaborative Working Relationship (CWR) Model developed specifically for physician-pharmacist collaborations based on social exchange theory, buyer-seller relationships, and nurse-physician collaborations will also be discussed (McDonough & Doucette, 2001).

Input-Process-Outcome (IPO) Framework

The IPO Framework has been used in organizational studies for many years as an approach to study teams. McGrath (1964) proposed that the inputs consist of group composition, group structure, as well as the task and environment; the processes consist of member interactions; and the outcomes consist of group development, task performance, and effects on members. Group composition regards the configurations of member characteristics in terms of combined individual features, similarity among members, or compatibility between members. Group structure refers to "relationships among members" in terms of friendships or roles. As the group exists within organizations and outer influence, the environment is included in the framework, as well as the tasks of the group in terms of group goals. Finally, not only do the effects of the groups have an influence on task performance, but also on internal members, leading to group development in terms of role changes. The framework as a whole has been conceptualized to be a recurrent cycle.

Many subsequent iterations of the general IPO Framework have been proposed, and the relationships between concepts within the framework have been further investigated in the following years (Campion, Medsker, & Higgs, 1993; S. G. Cohen & Bailey, 1997; Lemieux-Charles & McGuire, 2006; Mathieu et al., 2008). Campion, Medsker, and Higgs (1993) proposed five themes that directly affect work group effectiveness and tested them in 80 work groups within a large financial services company. These were job design, interdependence, composition, context, and process, and they generally correlated positively with productivity, employee satisfaction, and manager judgments. In particular, process variables tended to correlate stronger with group effectiveness, and context variables had weaker correlations.

In Cohen and Bailey's review (1997), they defined a team as:

"A collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems (for example, business unit

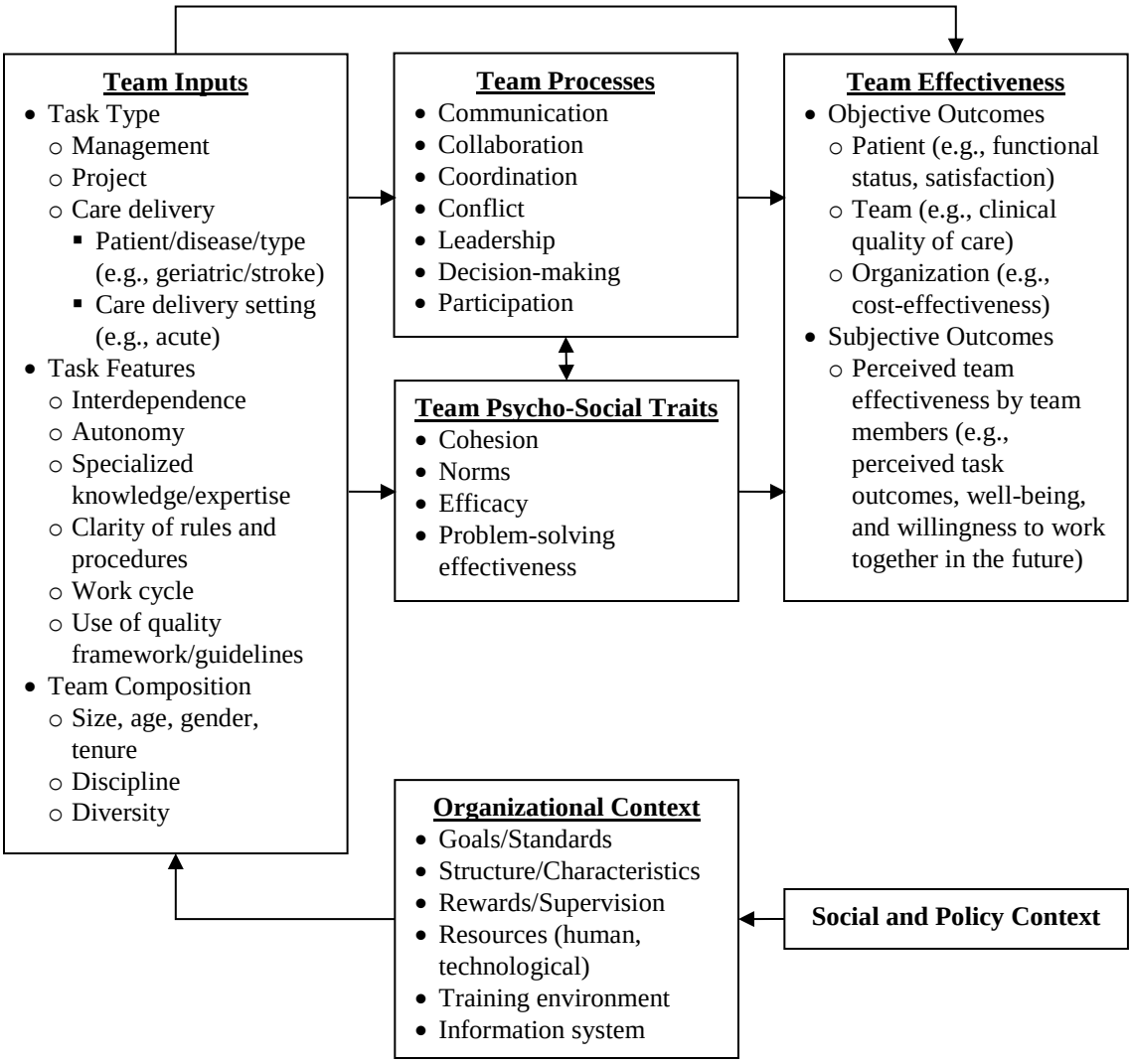
or the corporation), and who manage their relationships across organizational boundaries" (p.241)

The team effectiveness model they proposed mimicked the IPO Model more closely, where inputs included environmental factors, task design, group composition, and organizational context; processes included both internal and external processes; group psychosocial traits such as norms were separated from the explicit processes; and effectiveness included performance, attitudinal, and behavioral outcomes.

They also offered a typology of teams, including work teams, parallel teams, project teams, and management teams (S. G. Cohen & Bailey, 1997). Work teams are units in charge of manufacturing or providing services with generally stable membership. A specific type of work team is self-managing work teams, such as patient care teams, where they are given more autonomy to organize and provide their services (S. G. Cohen, Ledford, & Spreitzer, 1996). Parallel teams are groups assembled from members of different units to perform specialized tasks, such as quality improvement. Project teams are similar to parallel teams, except that they are usually of short-term existence performing one-time tasks, such as implementation of new technology. Finally, management teams are assembled from members with authority, and they are responsible for overall performances of their units.

Mirroring Cohen and Bailey's model, Lemieux-Charles and McGuire (2006) proposed the Integrated Team Effectiveness Model (ITEM) specifically for use in health care (**Figure 2-1**). The unique features of this framework are that team effectiveness can be divided into objective outcomes such as patient, team, and organizational outcomes, and subjective outcomes, such as perceived team effectiveness. In addition, there is a need to differentiate the type of care delivery teams in terms of patient population and care delivery setting.

Figure 2-1. The Integrated (Health Care) Team Effectiveness Model



Reference: Lemieux-Charles & McGuire, 2006.

In their review of field studies examining team effectiveness in health care, Lemieux-Charles and McGuire (2006) identified that a substantial number of studies have confirmed the positive relationships between team processes and team effectiveness, and they suggested that more attention should be focused on "how to create and maintain high-functioning teams in different work settings." This is also consistent with national discussions of health care reform in finding practice models that improve the quality and

safety of patient care (IOM, 2001). The few organizational studies included in Lemieux-Charles and McGuire's review have shown that the solo physician practice structure and ethnic concordance between patients and staff were positively associated with objective outcomes; the dispersion of services across locations was negatively associated with objective outcomes; the adequacy of resources and organizational culture were positively associated with subjective outcomes. Beside the limited number of studies, other organizational characteristics proposed in the ITEM have not been examined, such as organizational goals, rewards, information technology, and organizational settings.

A complexity of studying the relationships of organizational characteristics and team effectiveness, however, is the multi-level influences. While there are statistical techniques to control for mixed level analyses, the number of groups required to meet the statistical power for comparison is sometimes not easy to meet because of recruitment difficulties, especially when data collected for purposes other than research are not readily available. Nevertheless, suggestions have been made in the literature to use mixed qualitative, quantitative, and archival data to investigate adjacent levels in team effectiveness research (Hackman, 2003; Lemieux-Charles & McGuire, 2006), which will inform researchers regarding mixed level influences.

While most studies have examined specific relationships within the IPO Framework, using the framework as a whole is not without precedent in the literature. A research team commissioned by the Department of Health in the United Kingdom conducted a large scale evaluation of the effectiveness of health care teams in the National Health Service (Borrill et al., 2001; West, Borrill, & Unsworth, 1998), and examined multiple inputs and processes that contribute to team effectiveness. The investigation involved around 400 health care teams over the course of three years, mostly through quantitative data collection and additional in-depth qualitative studies in sub-samples of teams. Some of the key findings were that (1) clarity of objectives, team participation, commitment to quality, and support for innovation were all associated with

team effectiveness and innovation; (2) the percent of staff working in teams was negatively associated with hospital mortality; (3) staff working in high functioning teams were more likely to stay at the same setting, compared to those working in poor functioning teams; (4) leadership and communication are important for improving effectiveness. Overall, the IPO Framework was helpful in assessing the multiple constructs of determinants of healthcare team effectiveness.

Nevertheless, there have been critiques of the IPO Framework that warrant attention (Mathieu et al., 2008). Ilgen, Hollenbeck, Johnson, and Jundt (2005) identified three limitations: First, there is a need to differentiate between real processes that involve actions and mediators that are emergent cognitive or affective states. For example, team cognition and psychological safety should be considered as emergent states rather than processes because they are not considered as actions. Second, the recurrent cycle of inputs, processes, and outcomes is often neglected despite being conceptualized early on. Finally, the linear model deemphasizes the possibilities of interactions between inputs, processes, and outcomes. The authors proposed an input-mediator-output-input (IMOI) model to address the limitations mentioned.

Interprofessional Education for Collaborative Patient-Centered Practice (IECPCP) Model

The Interprofessional Education for Collaborative Patient-Centered Practice (IECPCP) Model was developed by a group of researchers commissioned by Health Canada to enhance interprofessional education and collaborative practice (D. D'Amour & Oandasan, 2005; I. Oandasan et al., 2004). Extensive literature reviews and environmental scans through surveys, focus groups, and in-depth interviews were used to identify theoretical, empirical, and political evidence of determinants of interprofessional education and collaborative practice.

In the IECPCP Model, interprofessional education and collaborative practice each compose a circle and are both influenced by systemic factors such as policies and accreditations at the macro level. Interprofessional education is centered on learners, who are mutually influenced by educators' professional beliefs and attitudes regarding collaborative practice. The outer circles surrounding the educator beliefs and attitudes include micro-level teaching factors such as learning context and faculty development, as well as meso-level institutional factors such as leadership, resources, and administrative processes.

Similarly, collaborative practice is centered on patients, and influenced by professionals and task complexity. The outer influences include micro-level interactional factors such as shared goals, sense of belonging, as well as meso-level organizational factors such as governance and structure of clinical care. This portion of the model was based on prior work of D'Amour, with theoretical roots from organizational sociology (D. D'Amour, Goulet, Labadie, Martin-Rodriguez, & Pineault, 2008).

While the IECPCP Model can serve as a framework for evaluating collaborative practice, it was not chosen for this dissertation because of three reasons. First, the emphasis of the model was to link the educational and professional systems in a common framework, but evaluating the educational system is beyond the scope of this dissertation. Second, although the collaborative practice portion of the model is somewhat informative of determinants of successful patient-centered practice, it tends to oversimplify the complex interactions within teams and the influences from organizations, which would not be suitable for the in-depth investigation of primary care teamwork and physician-pharmacist collaboration in this dissertation. Finally, given the novelty of the model, few empirical studies have applied this ecological framework, and its utility for use in research remains to be seen.

Physician-Pharmacist Collaborative Working Relationship (CWR)

McDonough and Doucette (2001) developed a five-stage theoretical framework for forming physician-pharmacist collaborative working relationships (CWR). Professionals develop mutual awareness and recognition at stage 0 and stage 1, begin exploration and trial at stage 2, expand professional relationship at stage 3, and eventually commit to the CWR at stage 4. According to the CWR Model, collaborative practice is influenced by individual, context, and exchange characteristics (Brock & Doucette, 2004; McDonough & Doucette, 2001). Individual characteristics include demographics, specialty, familiarity with other professionals, and practitioner confidence. Context characteristics include practice features, proximity of practices, volume of interactions, and organizational system. Exchange characteristics include attraction, communication openness, power, norm and expectation development, performance assessment, and conflict and its resolution.

Empirical studies of the CWR model showed that compared to individual and context characteristics, exchange characteristics including relationship initiation, trustworthiness, and role specification were the strongest predictors of collaborative practice (W. R. Doucette, Nevins, & McDonough, 2005; Zillich, McDonough, Carter, & Doucette, 2004). As such, these exchange characteristics have often been measured in studies as an index – the Physician-Pharmacist Collaboration Index (PPCI) – to assess the extent of CWR between physicians and pharmacists (Liu, Doucette, & Farris, 2010; Liu & Doucette, 2011; Snyder et al., 2010; Zillich, Doucette, Carter, & Kreiter, 2005; Zillich, Milchak, Carter, & Doucette, 2006). For example, as part of a randomized trial of pharmacist intervention for patients with uncontrolled blood pressure, the PPCI instrument was administered to participating community pharmacists in both the high intensity and low intensity arms at baseline and the end of the study (Zillich et al., 2006). As expected, the increase in PPCI was significantly higher in the high intensity arm,

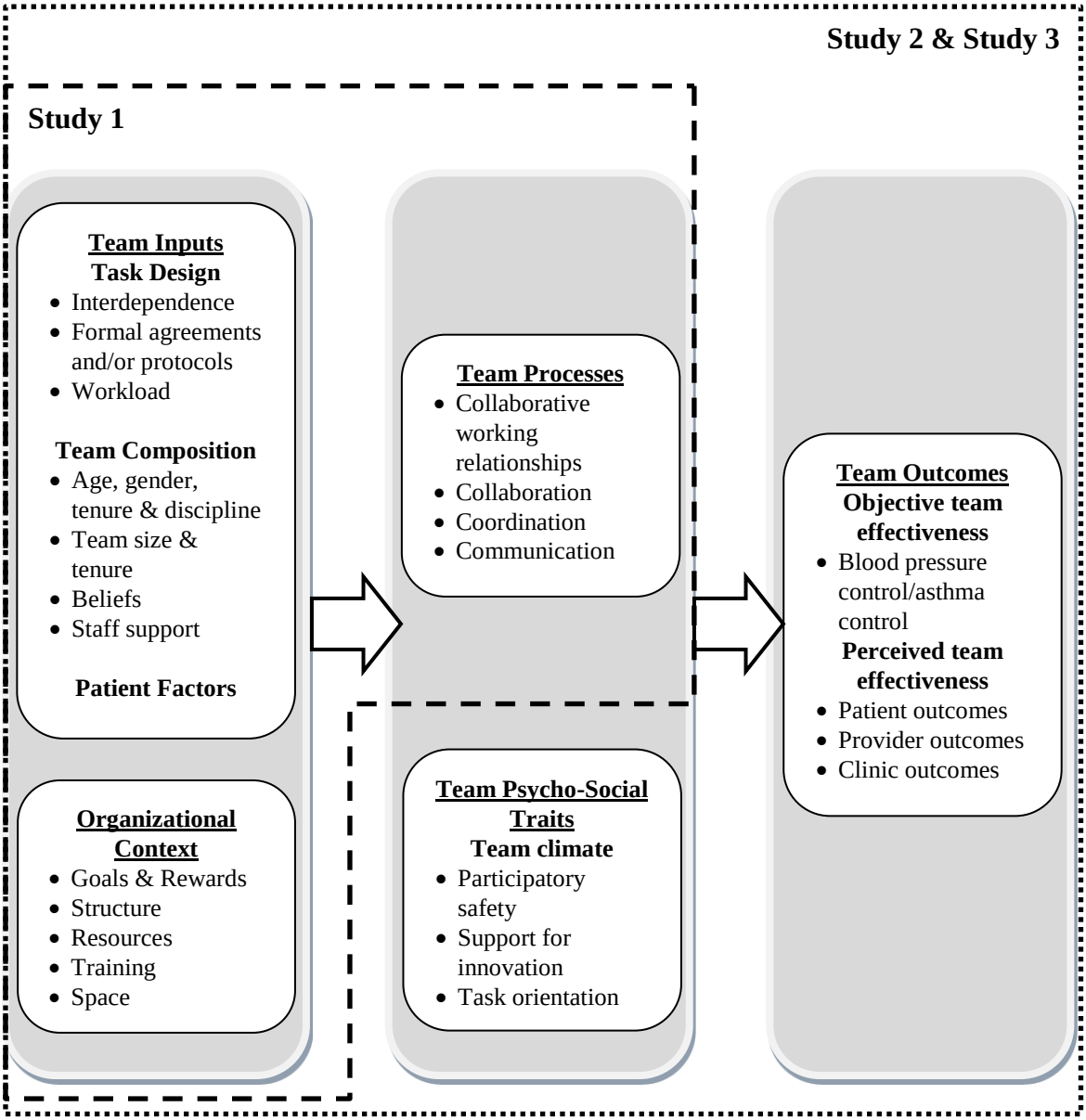
where pharmacists actively worked with physicians to manage patient blood pressure, compared to the low intensity arm, where pharmacists simply referred uncontrolled patients to their physicians. This study further verified the sensitivity and validity of the PPCI instrument.

As the CWR Model was developed specifically for physician-pharmacist collaborations, it can be useful in informing relational aspects of this dissertation. However, there are at least two limitations for using this model alone: First, the model was developed and tested based on the relationships between community pharmacists and physicians, where they are rarely located in the same facility. It is possible that pharmacists working in primary care clinics already have high working relationships with physicians, and that little variability in exchange characteristics will be identified. Additionally, team effectiveness in clinics can be influenced by variations in organizational context, which was not characterized as extensive in the CWR Model. To investigate the facilitators and barriers of physician-pharmacist collaboration, additional models are needed to build upon the current CWR Model.

Conceptual Framework of Present Dissertation

Informed by the IPO and ITEM Framework, the CWR Model, and Andersen & West's team climate concept, the conceptual framework guiding this dissertation is presented in **Figure 2-2**. This framework consists of five major domains, including organizational context, team inputs, team processes, team psycho-social traits, and team outcomes. The first study quantitatively examined the relationships between team inputs, organizational context, and team processes. The next two studies used the full framework and qualitatively examined the relationships in between domains. A literature review for specific concepts within the framework is provided in the following, and a summary of expected findings is summarized in **Table 2-1**.

Figure 2-2. Conceptual Framework of Overall Dissertation



Inputs

Organizational Context

Goals

Organizational goals have been defined as "desired state of affairs which the organization attempts to realize" (Etzioni, 1964), and may be reflected in organizational mission statements (Fairhurst, Jordan, & Neuwirth, 1997). One example is the teaching status of the organization. Academic settings with an education mission are often willing to participate in interdisciplinary training programs and practice redesign demonstration projects to improve the effectiveness of patient care (Haines et al., 2011; Reuben et al., 2004), despite the potential loss in efficiency of care (Ducanis & Golin, 1979).

Rewards

Organizational reward for teamwork has also been found to impact team functioning if absent or insufficient (Reuben et al., 2004), especially when extra time and efforts are required to attend team meetings with increased workload (Cashman, Reidy, Cody, & Lemay, 2004; Gladstein, 1984; Xyrichis & Lowton, 2008)

In the pharmacy literature, the lack of financial rewards for pharmacists providing cognitive services has often been cited as a major barrier to incorporation of pharmacists in care teams (Beatty et al., 2012; Campbell & Saulie, 1998; Oladapo & Rascati, 2012). Given that pharmacists do not have provider status in many regions, the clinic pharmacist often needs to use a low-level "incident to" billing code associated with a precedent physician service or a facility fee, rather than using direct billing (Beatty et al., 2012). In certain practice settings with salaried pharmacist positions, however, billing for services is less of a concern and does not serve as a barrier for pharmacist participation in direct patient care activities (Beatty et al., 2012).

Structure

Organizational structure has been proposed to impact team functioning through bureaucracy (Ducanis & Golin, 1979) and has been shown to impact the quality of chronic care management (Rittenhouse & Robinson, 2006; Russell et al., 2009; Shi, Starfield, Xu, Politzer, & Regan, 2003; Shi, Lebrun, Tsai, & Zhu, 2010; Starfield et al., 1994). In a study conducted in Ontario, community health centers (CHCs) which have extensive multidisciplinary teamwork helping the underserved were found to be associated with better performance on diabetes process measures, when compared to fee-for-service, family health network, and health service organization models (Russell et al., 2009). Similar findings were seen in a U.S. study comparing patient experiences in CHCs with those in health maintenance organizations (HMOs) (Shi et al., 2003). While there may be many patient-level reasons explaining the differences, the organizational context and dynamics of teamwork may play a role and will be further explored in this dissertation.

Resources

Resources in terms of perceived resource availability and the degree of training have both been found to influence team effectiveness (Gladstein, 1984; Temkin-Greener, Gross, Kunitz, & Mukamel, 2004), but perhaps clinical information system is the infrastructure that has been studied most often in regards to its ability to improve patient outcomes (Coleman et al., 2009; Fleming, Silver, Ocepek-Welikson, & Keller, 2004; M. L. Pearson et al., 2005; Si et al., 2005). A recent survey showed that 62% of medical offices had fully implemented electronic records (Sorra et al., 2012); however, how the implementation of electronic records influences teamwork in primary care offices is less clear. For certain users, using EMR with the ability to send messages to providers electronically has been preferred over using traditional slips of paper attached to paper charts (Brown et al., 2009).

In the pharmacy literature, roughly one-third of ambulatory care pharmacies in health systems reported having integrated EMRs in 2004 (K. K. Knapp, Okamoto, & Black, 2005), and from a more recent survey in 2009, two-thirds of pharmacists participating in a clinical pharmacy practice-based research network reported using EMRs in their practice (Marinac & Kuo, 2010). EMRs have been regarded as beneficial in facilitating communications between providers, especially when the pharmacist is not on site full time (Kozminski et al., 2011).

Training

It has been recognized that optimal teamwork does not automatically happen by putting people in groups and that team skills can be learned through training programs (Clancy & Tornberg, 2007; IOM, 2001). One of the largest healthcare team training programs in the U.S. is the TeamSTEPPS® program developed by the Agency for Healthcare Research and Quality (AHRQ) (Clancy & Tornberg, 2007). Implementation of the program has been found to be associated with improved team attributes and outcomes, such as improved operating room, trauma care, and intensive care unit performance, decreased medication errors, improved patient safety culture, and improved team knowledge, skills, and attitudes (Armour Forse, Bramble, & McQuillan, 2011; Capella et al., 2010; Castner, Foltz-Ramos, Schwartz, & Ceravolo, 2012; Deering et al., 2011; Mahoney, Ellis, Garland, Palyo, & Greene, 2012; Mayer et al., 2011; Stead et al., 2009; Weaver et al., 2010)

However, not all empirical studies show that team training programs lead to positive results, potentially because of the variability in training intensity, care settings, and team types. For example, one study found that only nine out of 25 teams participating in a training program for continuous quality improvement methods had improved patient care (Doran et al., 2002; Lemieux-Charles & McGuire, 2006). The authors attributed

reasons for their findings to the number of training sessions and outside influence unrelated to the training program leading to improved care in some teams.

Space

From ethnographic studies, the design of space and time is beginning to receive more attention in regards to how it affects interprofessional teamwork in health care settings (I. F. Oandasan et al., 2009; Rapport, Doel, Greaves, & Elwyn, 2006; Rapport, A Doel, & Elwyn, 2007). In the pharmacy literature, designated space to meet with patients was found to facilitate private and potentially more effective pharmacist-patient interactions (Baker, 1979; D. A. Knapp, 1979; Raisch, 1993); however, the literature has also noted the importance of proximity to physicians to enhance formal and informal communications between health care team members (Bradley et al., 2008; Goldman, Meuser, Rogers, Lawrie, & Reeves, 2010; I. F. Oandasan et al., 2009).

Task Design

Interdependence

Task interdependence has been defined as how frequently team members rely on each other to complete team tasks, and has been associated with patient-centered care (Weinberg, Cooney-Miner, Perloff, Babington, & Avgar, 2011). It is also related to the design of workflow, such as arrangement of patient schedule and utilization of provider time.

Driven by fee-for-service reimbursements, maintaining patient flow and efficiency is usually a priority for clinic administrators (P. A. Nutting et al., 2012). As the newest addition to clinic staff, pharmacists typically find ways to incorporate their roles into established clinic workflow and save time for physicians (Kozminski et al., 2011; Pottie et al., 2008). Limited space in the clinic, however, can decrease pharmacist

efficiency and limit communications with physicians especially when separated on different clinic floors (Legault et al., 2012; Pottie et al., 2008).

Use of Formal Agreements and/or Protocols

Another factor influencing physician-pharmacist collaboration is the presence of a formal practice agreement for pharmacist initiation of drug therapy adjustments. A practice agreement can take the form of a collaborative drug therapy management (CDTM) protocol as defined by state medical and pharmacy laws or be included in clinic policy and procedures (P&P) as an internal organizational document (Hammond et al., 2003; Punekar, Lin, & Thomas, 2003; Sachdev & Kliethermes, 2012). CDTM protocols typically include the names of the organization, all referring physicians, and all participating pharmacists, as well as the scope of CDTM practice. P&P documents typically include details about processes, such as referral, scheduling, documentation, and frequency of meetings (Sachdev & Kliethermes, 2012). Roughly half of the clinics participating in the CAPTION trial reported having collaborative practice agreements in 2006 (Dickerson et al., 2007).

Workload

Both physician and pharmacist workloads can limit interactions between the two providers, potentially decreasing the intervention's impact on outcomes. For physicians, this is especially the case early on when they are developing new working relationships with a pharmacist and adjusting their routines to incorporate the new team member (Kozminski et al., 2011; Pottie et al., 2008). Pharmacist workload issues may result from divided responsibilities between different clinics, pharmacies, or other locations, though workload perceptions can vary among pharmacists as they have different time management styles and may be just learning their new roles and exploring to what extent their patient assessments should cover (Kozminski et al., 2011; Pottie, Haydt et al., 2008)

In community pharmacy settings, the prescription volume and workload have often been regarded as primary reasons pharmacists do not have time to provide more extensive counseling or medication therapy management services (Baker, 1979; D. A. Knapp, 1979; Oladapo & Rascati, 2012; Raisch, 1993). Moving into clinic settings, pharmacists typically have greater flexibility to establish their roles without being tied to dispensing responsibilities; however, incorporating pharmacists into clinic workflow becomes important (Kozminski et al., 2011). If done well, task design could be a facilitator to enhanced team effectiveness rather than a major barrier.

Team Composition

Demographics

In the pharmacy literature, it has been suggested that younger physicians and younger pharmacists may be more likely to collaborate with professionals from other disciplines (McDonough & Doucette, 2001). This may be due to lengthening of pharmacist training programs to 6-year programs as a national standard since 2000 (Accreditation Council for Pharmacy Education, 1997) and increased national interest in promoting interprofessional education (Giordano, 2009; Morison, 2004).

Beliefs

Some physicians believe that pharmacists lack the expertise needed to review and manage medication therapies, and that there is little need for enhanced pharmacist services (Bradley et al., 2008; S. H. McGrath et al., 2010). Nevertheless, physicians with more experience working with pharmacists have typically been satisfied with pharmacists' level of knowledge and have supported enhanced pharmacist services (Adamcik et al., 1986; Bradley et al., 2008; Padiyara & Rabi, 2006). It is possible that physicians' limited training in pharmacology, pharmacokinetics, and medication side

effects could facilitate collaborative practice with pharmacists (Speer & Bess, 2003), as each professional brings complementary expertise to provide better patient care.

A survey of office-based physicians showed that the respondents had moderately strong beliefs that physician-pharmacist collaboration could improve medication adherence, prevent drug therapy problems, improve physician prescribing, and increase use of cost-effective medications (Kucukarslan, Lai, Dong, Al-Bassam, & Kim, 2011). In particular, physicians' belief that collaboration could improve medication adherence was the strongest predictor of physician attitude toward community pharmacist's role in helping patients manage their medications (Kucukarslan et al., 2011). Other qualitative studies have also identified improved disease state control, improved quality of life, reduced morbidity and mortality, and increased scope of practice as physician-reported benefits regarding the outcomes of collaboration (Dey, de Vries, & Bosnic-Anticevich, 2011; Pottie et al., 2008).

Staff Support

Staff support may be provided by clerks or nurses in the clinic. Clerks have the potential to provide assistance with scheduling and facilitate the workflow in collaborative practice (Snella & Sachdev, 2003); however, some survey studies have demonstrated the potential for "turf wars" between physicians, nurses, and pharmacists, especially when expanded pharmacist roles were perceived to be overlapping with the role of another provider (Adamcik et al., 1986; Freeman, Cottrell, Kyle, Williams, & Nissen, 2012; Punekar et al., 2003; Reebye, Avery, Bissell, & van Weel, 2002). Nevertheless, qualitative studies of physician-pharmacist collaborative interventions have reported positive comments from both physicians and nurses regarding the incorporation of pharmacists (Campbell & Saulie, 1998; Kozminski et al., 2011; Pottie et al., 2008), potentially due to freeing up their time regarding medication issues.

Patient Factors

The extra time and extra visits that arise from the collaborative intervention can become inconvenient for patients (Garcia, Snyder, McGrath, Smith, & McGivney, 2009). In addition, some patients question the higher level role of pharmacists and fear of receiving contradictory recommendations from the pharmacist against their doctors' orders (Garcia et al., 2009). Nevertheless, the positive impact from physician-pharmacist collaboration has been observed by some patients and judged to be worth the tradeoff (Campbell & Saulie, 1998; Kozminski et al., 2011; Lauffenburger, Vu, Burkhart, Weinberger, & Roth, 2012)

Processes

Team Processes

Collaborative Working Relationships

As described earlier in this chapter, exchange characteristics including relationship initiation, trustworthiness, and role specification were found to be the strongest predictors of physician-pharmacist collaborative practice, and were used to construct the Physician-Pharmacist Collaboration Index (PPCI) to assess the extent of collaborative working relationships (W. R. Doucette et al., 2005; Zillich et al., 2004).

In addition, relationships with other primary care team members are also important for successful collaborative practice. Studies examining interprofessional collaboration have often identified hierarchal power differences between physicians and non-physician professionals that can strain the relationships and prevent collaboration (Baggs & Schmitt, 1997; San Martin-Rodriguez et al., 2005). An early study conducted in the 1980's found that physicians and nurses were antagonistic toward expanded clinical roles for pharmacists, especially when the activities were perceived to be within domains of their own roles (Adamcik et al., 1986). However, studies conducted more

recently in primary care settings have generally found positive comments from both physicians and nurses regarding the incorporation of pharmacists (Kozminski et al., 2011; Pottie et al., 2008), and the good relations can facilitate building trust and strengthening collaborative working relationships.

Collaboration

An examination of the frequency of physician acceptance of pharmacist recommendations can provide a snapshot of physician uptake of physician-pharmacist collaboration. Previous studies have reported physician acceptance of pharmacist recommendation between 85 to 96% based on medication reviews in primary care clinics (Carter et al., 2008; Carter et al., 2009; Krska et al., 2001; Moczygemba et al., 2011), which is significantly higher than the 49 to 54% of acceptance rates reported in studies involving community pharmacists or home visit pharmacists not co-located with the physicians (Chrischilles et al., 2004; Sorensen et al., 2004). In the later studies, the most common reasons physicians reject pharmacist recommendations have been pharmacist unfamiliarity with patients – often due to lack of access to patients' medical records – and pharmacist recommendations that were too theoretical (Bryant et al., 2010; Lauffenburger et al., 2012). These concerns are rarely seen in studies involving clinic pharmacists, as clinic pharmacists typically have access to patient clinic records and are able to discuss patient cases with the physicians more often.

Coordination

Coordination has been defined as "the process of synchronizing or aligning the activities of the team members with respect to their sequence and time" (Lepine, Piccolo, Jackson, Mathieu, & Saul, 2008; Marks, Mathieu, & Zaccaro, 2001; Wittenbaum, Vaughan, & Stasser, 1998). Previous studies have found that team coordination was associated with the use of problem management actions and strategies (Mathieu et al., 2008; Tesluk & Mathieu, 1999). In health care, interdisciplinary coordination is

especially important because of the current division of labor across patient conditions, services, and settings (Sicotte, D'Amour, & Moreault, 2002). Coordination of care has been emphasized not only in the Institute of Medicine Report – *Crossing the Quality Chasm* – but also in current PCMH initiatives (AAFP et al., 2007; IOM, 2001). Even within the same primary care clinic, coordination of care between providers and clinic staff members is needed to provide good patient experience and outcomes.

Communication

When given a choice regarding communication methods with pharmacists, physicians have typically preferred face-to-face communications in the office rather than emails or faxes (Bryant et al., 2010; Hughes & McCann, 2003; S. H. McGrath et al., 2010). Being physically present in the clinic enables pharmacists to better integrate themselves into the primary care team and to project personal skills and levels of knowledge that are distinct from the typical *shopkeeper* or *outsider* image of community pharmacists (Bryant et al., 2010; Hughes & McCann, 2003; Kozminski et al., 2011; Lauffenburger et al., 2012). In addition to increased interaction frequency and better working relationships, the appearance of physicians working with pharmacists in the clinic could also result in increased patient trust (Kozminski et al., 2011).

Team Psycho-Social Traits

Team Climate

In lieu of limitations in measuring organizational climate, Anderson and West suggested that climate measured at the proximal work group level may be more appropriate (N. R. Anderson & West, 1998). Based on their literature review and empirical work, they developed a four-factor Team Climate Inventory (TCI), including domains of vision, participative safety, task orientation, and support for innovation. Vision refers to the common goal that the group pursues, which can be analyzed by

clarity, perceived value, sharedness, and attainability; participative safety refers to the "active involvement in group interactions" in terms of information sharing, safety, influence, and interaction frequency; task orientation refers to accountability and mutual monitoring for performance appraisals; support for innovation refers to both articulated and enacted forms of supporting new ideas that can improve work (N. R. Anderson & West, 1998; N. Anderson & West, 1996).

Current empirical evidence of the relationship between team climate and outcomes is mixed with positive and negative findings (Bosch et al., 2011; Goh & Eccles, 2009; Goh, Eccles, & Steen, 2009). Some studies identified that team climate is positively associated with better patient access, satisfaction, as well as diabetes management (Bower, Campbell, Bojke, & Sibbald, 2003); however, negative findings were found in other studies and the mechanism of the relationships remains to be examined in future studies (Hann, Bower, Campbell, Marshall, & Reeves, 2007).

Outcomes

Perceived Team Effectiveness

Patient Outcomes

Specific outcomes examined in this study include provider perceptions and opinions regarding improved disease state control resulting from the collaborative intervention, patient concerns about collaboration, and the effect of the physician-pharmacist intervention on physicians' and pharmacists' relationships with patients.

Previous studies have reported that some patients are hesitant to have pharmacists rather than physicians making medication therapy recommendations, possibly because they have developed trust with their physicians and are not familiar with enhanced pharmacist roles (W. R. Doucette, Witry, Alkhateeb, Farris, & Urmie, 2007; Witry, Chang, Mormann, Doucette, & Newland, 2011). However, once the pharmacist has spent

time with the patients to gain their trust, they may become more receptive to having pharmacists managing their medication therapy in collaboration with their physicians (Lauffenburger et al., 2012).

Provider Outcomes

A desired physician outcome from physician-pharmacist collaboration is no increase or even a reduction in physician workload, so that physicians can focus their attention on patients with complex problems (Wagner et al., 1996; Wagner, 1998). Physicians appreciate the time pharmacists spend teaching patients about medications, which on average is longer than the time physicians spend on discussing medications (Kulchaitanaroaj, Brooks, Ardery, Newman, & Carter, 2012; Lauffenburger et al., 2012). However, physician workload is rarely directly measured in such studies. Subjective responses from physicians can be informative in understanding the impact of collaboration on both their practices and their patients.

Two other anticipated provider outcomes from physician-pharmacist collaboration is increased physician referrals to pharmacists and increased pharmacist influence in the clinic. Referrals and exchanges of information with pharmacists create physician expectations regarding pharmacist interventions, and when the quality of pharmacist service exceeds physician expectation, it is more likely that their professional relationships will be expanded and that pharmacists will have more influence over the provision of services (McDonough & Doucette, 2001). Therefore, increased physician referrals to pharmacists and increased pharmacist influence over service provisions can be regarded as indicators of physician-pharmacist collaborative working relationships.

Clinic Outcomes

The impact of the physician-pharmacist collaboration intervention on clinic operations can influence clinic administrator opinions about the sustainability of such activities over the long term. Since practice change is difficult, interventions with

minimal impact on clinic workflow are more likely to be welcome by administrators. Nevertheless, evidence from the Chronic Care Model and related practice models such as PCMH models suggest that substantial practice redesigns are needed in order for primary care practices to meet the demands of patients with chronic diseases (P. A. Nutting et al., 2010; Wagner et al., 1996; Wagner, 1998). While the magnitude or direction of an intervention's impact on clinic workflow does not directly point toward its success or failure, these measures can provide insights into how local practices implement such an intervention.

Billing for pharmacist services is another indicator of service institutionalization, as it suggests that a business model is in place to help sustain the service. The lack of recognition of provider status by Medicare Part B and the complexity of billing methods is often regarded as a major barrier to implementation of pharmacist services (Beatty et al., 2012; Campbell & Saulie, 1998; Lounsbery, Green, Bennett, & Pedersen, 2009; Oladapo & Rascati, 2012; Raisch, 1993; Stubbings, Nutescu, Durley, & Bauman, 2011). Clinic pharmacists, however, do have additional billing mechanisms such as facility fee under APC (ambulatory payment classification) or incident to physician services, when compared to community pharmacists. A recent survey of outpatient pharmacists showed that roughly 61-65% of pharmacists working at physician offices or health system outpatient facilities bill patients for their services (Beatty et al., 2012).

Finally, an increase in pharmacist-generated clinic revenue can be a direct measure of an intervention's impact on clinic operations in cases where clinic workflow or billing practices are changed.

Research Objectives by Study

Study 1: CAPTION Baseline Survey

1. Describe the baseline collaboration pattern between physicians and pharmacists in primary care clinics participating in the trial.

2. Compare and contrast physicians' and pharmacists' perceptions of factors facilitating or prohibiting physician-pharmacist collaboration.
3. Explore discriminating barriers and facilitators that distinguish successful collaborative working relationships from less successful ones.

Study 2: CAPTION Multiple-case Study

1. Describe the experience of physicians, pharmacists, clinic administrators, and study coordinators participating in the blood pressure and asthma intervention groups in the CAPTION trial.
2. Explore determinants of effective physician-pharmacist collaboration for blood pressure control and asthma control at 9 months.

Study 3: Multiple-case Study

1. Characterize team-based approaches in primary care clinics.
2. Describe and explain how organizational factors influence the effectiveness of healthcare teams incorporating pharmacists in primary care clinics.
3. Describe how pharmacists function in primary care clinics beyond traditional dispensing responsibilities.

Table 2-1. Hypotheses and Expected Findings by Study

Domain	Concept	Hypothesis or Expected Finding
Study 1		
Organizational context	Rewards	• The helpfulness of pharmacist billing mechanism is positively associated with collaborative working relationship.
		• The helpfulness of pharmacist compensation system is positively associated with collaborative working relationship.
	Structure	• The helpfulness of clinic staff support for scheduling pharmacist visits is positively associated with collaborative working relationship.
	Resources	• The helpfulness of communication technology is positively associated with collaborative working relationship.
	Space	• The helpfulness of available designated space is positively associated with collaborative working relationship.
Task design	Workload	• The helpfulness of patients' schedules is positively associated with collaborative working relationship.
		• The helpfulness of pharmacist's time available for meeting with patients is positively associated with collaborative working relationship.
		• The helpfulness of pharmacist workload is positively associated with collaborative working relationship.
		• The helpfulness of physician workload is positively associated with collaborative working relationship.
	Formal protocols	• The helpfulness of policies or procedures for referring patients to pharmacists is positively associated with collaborative working relationship.
Team composition	Physician	• The helpfulness of physician's level of expertise is positively associated with collaborative working relationship.
	Pharmacist	• The helpfulness of pharmacist's level of expertise is positively associated with collaborative working relationship.
Study 2		
Organizational context	Space	• Insufficient exam rooms are associated with worse disease state control at clinic level.
Task Design	Workflow	• Conducive workflow is associated with better disease state control at clinic level.
	Workload	• Heavier pharmacist workload is associated with worse disease state control at clinic level.
	Formal agreement	• Having collaborative practice agreements is associated with better disease state control at clinic level.
	Physician beliefs	• Positive physician beliefs about pharmacist's work are associated with better disease state control at clinic level.
Team composition	Staff support	• Office staff support is associated with better disease state control at clinic level.

Table 2-1. Continued

Patient factors	Barriers	• The more barriers patients encounter, the worse disease state control at clinic level will be.
Team processes	Collaboration	• Higher acceptance of pharmacist recommendations is associated with better disease state control at clinic level.
	Communication	• Poor communication is associated with worse disease state control at clinic level.
Team outcomes	Subjective outcomes	• Higher performance on subjective outcomes is associated with better disease state control at clinic level.
Study 3		
Organizational context	Goals	• Clinics with organizational missions on healthcare professional education will have different team compositions and task designs than clinics without missions on healthcare professional education.
	Rewards	• Clinics with organizational rewards for teamwork will have better team processes and outcomes than clinics without organizational rewards for teamwork.
	Structure	• Clinics employing multidisciplinary teamwork to help the underserved (i.e., clinics with organizational structure to community health centers) will have better team outcomes.
	Resources	• Clinics with comprehensive electronic medical records will have better communications between healthcare professionals than clinics without comprehensive electronic medical records.
	Training	• Clinics with team training programs will have better team climate and team outcomes than clinics without team training programs.
	Space	• Physical proximity between team members will have a positive influence on communications.

CHAPTER THREE:
[STUDY ONE]
BARRIERS AND FACILITATORS OF PHYSICIAN-PHARMACIST COLLABORATIVE WORKING RELATIONSHIP: BASELINE RESULTS FROM THE CAPTION TRIAL

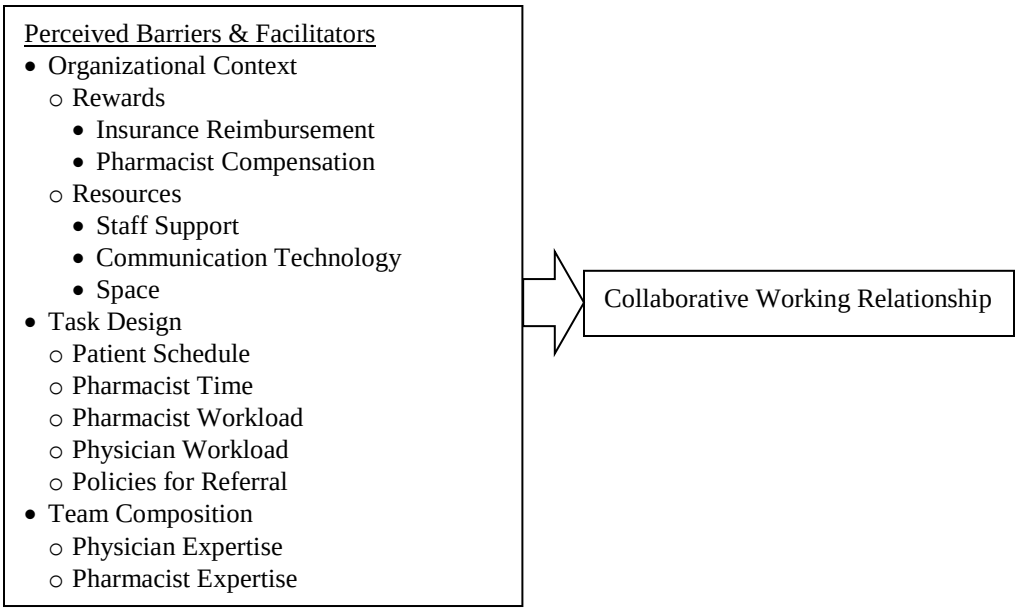
Introduction

The need for team-based care in chronic disease management has been emphasized in recent health care reform efforts, including patient-centered medical homes (PCMHs) (American Academy of Family Physicians (AAFP) et al., 2007; IOM, 2001; Joint Commission on Accreditation of Healthcare Organizations, 2003; Mitchell et al., 2012). One such team-based approach is the incorporation of pharmacists into primary health care teams (Smith et al., 2010). Previous studies have shown that physician-pharmacist collaborative models (PPCM) in primary care can improve outcomes for patients with hypertension (Carter et al., 2009; Carter, Rogers, Daly, Zheng, & James, 2009), diabetes (Choe et al., 2005; Rothman et al., 2005; D. M. Scott, Boyd, Stephan, Augustine, & Reardon, 2006), hyperlipidemia (Lee, Fan, Li, & Chau, 2009; Tsuyuki et al., 2002), and depression (Finley et al., 2003; Nkansah et al., 2010; Pyne et al., 2011). Collaboration models work especially well when pharmacists are co-located with primary care physicians, pharmacists have access to patient charts, and pharmacists are readily available for consultation with physicians (Bradley et al., 2008; Carter & Helling, 1992; Dobson et al., 2006). However, the effect of PPCM interventions is variable across studies, potentially due to variability of intervention potency or intervention adoption (Chisholm-Burns et al., 2010). Since incorporation of pharmacists into medical offices often involves practice redesign, an examination of the barriers and facilitators to collaboration can help us better understand the heterogeneity from previous studies.

Determinants of Successful Physician-Pharmacist Collaboration

The literature on team effectiveness from organization studies provides insights about the determinants of successful physician-pharmacist teamwork. The general "input-process-outcome" (IPO) framework has been commonly used to study team effectiveness in various business organizations (S. G. Cohen & Bailey, 1997; Mathieu et al., 2008; J. E. McGrath, 1964). Based on the IPO framework, the Integrated (Health Care) Team Effectiveness Model (ITEM) has been adapted for use in health care settings and guided the present study (Lemieux-Charles & McGuire, 2006). The determinants have been categorized into organizational context, task design, and team composition **(Figure 3-1)**, and each category is described briefly.

Figure 3-1. Theoretical Framework of Study One



Organizational Context

Patient care teams are typically embedded under health care organizations. Therefore, the understanding of organizational context helps us recognize the organizational support that promotes team effectiveness. Such organizational context may include financial compensation and resources to support teamwork. The lack of standardized reimbursement for pharmacists providing cognitive services or clinical interventions has often been cited as a major barrier to including pharmacists in care teams (Beatty et al., 2012; Campbell & Saulie, 1998; Oladapo & Rascati, 2012). Given that pharmacists do not have provider status in many regions, the clinic pharmacist often needs to use a low-level "incident to" billing code associated with a precedent physician service or a facility fee, rather than using direct billing (Beatty et al., 2012). In certain practice settings with salaried pharmacist positions, however, billing for services is less of a concern and does not serve as a barrier for pharmacist participation in direct patient care activities (Beatty et al., 2012).

Organizational resources such as staff support, space, and communication technology have been found to foster collaborative practice (Baker, 1979; Bradley et al., 2008; Brown et al., 2009; Goldman et al., 2010; D. A. Knapp, 1979; Raisch, 1993; Snella & Sachdev, 2003). Clerical personnel can assist with scheduling and facilitate the workflow in collaborative practice (Snella & Sachdev, 2003). Although having a designated space to meet with patients can make pharmacist-patient interactions more private and potentially more effective (Baker, 1979; D. A. Knapp, 1979; Raisch, 1993), pharmacist proximity to physicians strengthens formal and informal communications between health care team members (Bradley et al., 2008; Goldman et al., 2010; I. F. Oandasan et al., 2009).

As for communication technology, the use of electronic medical records (EMRs) has become more prevalent in recent years; roughly one-third of ambulatory care pharmacies in health systems reported having integrated EMRs in 2004 (K. K. Knapp et

al., 2005), while two-thirds of surveyed pharmacists participating in a clinical pharmacy practice-based research network in 2009 reported using EMRs in their practice (Marinac & Kuo, 2010). EMRs have been regarded as beneficial in facilitating communications between providers, especially when the pharmacist is not on site full time (Kozminski et al., 2011). In addition, using an EMR with the ability to send messages to providers electronically is often preferred over using traditional slips of paper attached to paper charts (Brown et al., 2009).

Task Design

Task design involves the design of workflow, such as arrangement of patient schedule, workload of providers, and utilization of provider time. In community pharmacy settings, the prescription volume and workload have often been regarded as primary reasons pharmacists do not have time to provide more extensive counseling or medication therapy management services (Baker, 1979; D. A. Knapp, 1979; Oladapo & Rascati, 2012; Raisch, 1993). In clinic settings, pharmacists typically have greater flexibility to establish their roles without being tied to dispensing responsibilities; however, effectively incorporating pharmacists into clinic workflow becomes important (Kozminski et al., 2011). If done well, task design can become a facilitator to enhanced team effectiveness.

Having formalized a policy or procedure regarding physician referrals to pharmacists is another potential facilitator for collaborative practice. Formalization or institutionalization of new practices is often used as an indicator of sustainability of the service (Gruen et al., 2008; Shediac-Rizkallah & Bone, 1998), and if the policies are followed, the number of patients referred to pharmacists for collaborative management could become more consistent.

Team Composition

The expertise of physicians and pharmacists is a key component of team composition that can affect team effectiveness. In the past when pharmacists primarily received a Bachelor of Science degree, cognitive barriers may have existed due to pharmacists' limited education and training (Baker, 1979; D. A. Knapp, 1979), resulting in recommendations that lack practical considerations concerning individual patients (Bryant et al., 2010). The minimum pharmacy education has been lengthened to 6-year Doctor of Pharmacy programs since 2000 (Accreditation Council for Pharmacy Education, 1997), and nearly all who practice in clinics would also complete 1-2 years of residency training. However, the expertise of pharmacists may not always be recognized by physicians due to the relative novelty of pharmacist practice in medical offices (Goldman et al., 2010). Time and a consistent pattern of positive interactions will likely be needed before a physician develops trust in the pharmacist's clinical recommendations (Bradley et al., 2008).

Conversely, physicians' limited training in pharmacology, pharmacokinetics, and medication side effects in medical schools could facilitate collaborative practice with pharmacists (Speer & Bess, 2003), as each professional brings complementary expertise to provide better patient care. The extent of collaboration between physicians and pharmacists might be influenced by how well their areas of expertise complement each other. One special case would be the collaboration between resident physicians and faculty pharmacists, which is commonly seen in family medicine residency programs (Dickerson, Denham, & Lynch, 2002). In this setting, pharmacists generally have teaching responsibilities, in addition to patient care, research, and administrative functions, and therefore there are more opportunities for physician-pharmacist collaboration (Dickerson et al., 2002).

Collaboration Pattern

Detailed descriptions of a collaboration pattern can be informative in evaluating the implementation of physician-pharmacist collaborative practice. Such characterization may include frequency or likelihood measures, such as frequency of physician referral to pharmacists, physician acceptance of pharmacist-developed care plans, staff support, and pharmacist documentation in medical charts. In addition, perceptual measures such as physician perceptions of pharmacist recommendations, and provider beliefs and control of PPCM can also provide useful insights.

Collaborative Working Relationship

Implementation of physician-pharmacist collaboration can be evaluated in several ways. Objective clinical and economic outcome data are desirable but not always available. Alternatively, perceptual measures such as the quality of the physician-pharmacist collaborative working relationship can serve as proxies **(Figure 3-1)**.

McDonough and Doucette (2001) developed a five-stage theoretical framework for forming physician-pharmacist collaborative relationships, where professionals develop mutual awareness and recognition at stage 0 and stage 1, begin exploration and trial at stage 2, expand professional relationship at stage 3, and eventually commit to the collaborative working relationship (CWR) at stage 4. The collaborative practice is influenced by individual, context, and exchange characteristics (Brock & Doucette, 2004; McDonough & Doucette, 2001), and three specific exchange characteristics – namely relationship initiation, trustworthiness, and role specification – have been identified as the strongest predictors of collaborative practice (Zillich et al., 2004). As such, these exchange characteristics have often been measured in studies as an index, the Physician-Pharmacist Collaboration Index (PPCI), to assess the CWR between physicians and pharmacists (Liu et al., 2010; Liu & Doucette, 2011; Snyder et al., 2010; Zillich et al., 2005; Zillich et al., 2006).

Objectives

This study examined the baseline barriers and facilitators of physician-pharmacist collaborative practices participating in the Collaboration Among Pharmacists and Physicians To Improve Outcomes Now (CAPTION) trial (R01 HL091841, B. Carter, PI), a 5-year cluster-randomized effectiveness study of a physician-pharmacist collaboration model to improve blood pressure control in primary care offices. Detailed descriptions of the full CAPTION trial have been provided elsewhere (Carter et al., 2010). The study was conducted in medical offices participating in the National Interdisciplinary Primary Care Practice Based Research Network (NIPC-PBRN) of faculty pharmacists practicing in primary care settings (Dickerson et al., 2007).

Within the broader CAPTION trial, the **objectives of this study** were to (1) describe the baseline collaboration pattern between physicians and pharmacists in primary care clinics participating in the trial; (2) compare and contrast physicians' and pharmacists' perceptions of factors facilitating or prohibiting physician-pharmacist collaboration; and (3) explore discriminating barriers and facilitators that distinguish successful collaborative working relationships from less successful ones.

Methods

Setting

A total of 32 medical clinics from 15 states in the United States participated in the CAPTION trial at baseline. The general demographics and practice site characteristics of these clinics have been described elsewhere (Dickerson et al., 2007). Briefly, a mean of 10 attending physicians, 23 resident physicians, and 1.9 clinical pharmacists worked per office. Most of the sites were located within family medicine residency programs (85.4%), and family medicine faculty practices (4.2%). Clinics were located mostly in urban communities (52.1%), followed by inner-city (18.8%) and suburban communities

(16.7%). Nearly half of the sites (47.9%) had provided clinical pharmacy services for over 10 years.

Design and Data Collection

Study data were collected as part of the CAPTION trial using a mailed survey design, with survey packets being sent to most sites between March and August 2010. Five sites that entered the trial late received survey packets between April and August 2011. Survey packets were mailed and personally addressed to a total of 938 physicians and 53 pharmacists across 32 primary care clinics. When either survey was automatically returned due to no forwarding address or site coordinators reported that providers had left the clinic, the number of physician providers who actually received a survey decreased to 895.

Each packet included two separate questionnaires: one questionnaire asked about a total of 12 facilitators and barriers of the collaborative practice and change implementation, while the other questionnaire included items of the Physician-Pharmacist Collaboration Index (**Appendix A**). Physicians and pharmacists were provided similar questionnaires with slight differences in wording to fit with the respondent's profession. Each respondent was asked to return completed questionnaires within 2 weeks in a sealed envelope to the respective site study coordinator, who then returned all envelopes collected at the site to researchers at the University of Iowa Clinical Coordinating Center (CCC) in Iowa City for data entry and analysis. No follow up with non-respondents was conducted by the site study coordinators. Instead, a CCC research team member emailed non-respondents up to two times and re-mailed the questionnaires when asked to do so. After all completed questionnaires were returned, one CCC research team member entered the data and another member checked the entries for accuracy.

Variables

Collaboration Pattern

Physicians were asked to estimate the percent of patients with chronic diseases that they refer to pharmacists at their clinic for medication management in an open-ended question, while pharmacists were asked to rate the likelihood that physicians would refer some aspects of chronic disease management to them on a 5-point response format ranging from very unlikely (1) to very likely (5). Similarly, physicians were asked to rate the likelihood that they would accept pharmacist recommendations for changes to the patients' medication regimen, whereas pharmacists were asked to rate the likelihood that physicians in their clinic would accept their recommendations, both on a 5-point response format ranging from very unlikely (1) to very likely (5).

Survey items regarding staff support and pharmacist documentation in medical charts were solicited only from pharmacists. Specifically, pharmacists were asked to rate the frequency that a clinic staff member assisted the pharmacist to schedule a room, put the appointment on the clinic schedule, put the patient in the room, take vital signs, and call the patient if no show, all on a 5-point response format ranging from almost never (1) to always (5). The same response format was used for pharmacist documentation in medical charts.

Physician-specific perceptual measures included their ratings of the quality of pharmacist recommendations, and their beliefs and understandings of PPCM. The quality of pharmacist recommendations was rated on a 7-point response format from very poor (1) to excellent (7). Physician knowledge of PPCM, referral procedures, potential to improve patient care, potential to increase workload, and their estimations that the benefits of the intervention would outweigh the burden were measured on a 7-point response format from very small (1) to very high (7).

Pharmacist-specific perceptual measures focused on the amount of control the pharmacists had over clinic policies and procedures. Specifically, respondents were asked to rate their control over hours of pharmacist coverage, types of pharmacist services, formulary, and development of collaborative practice, with possible responses ranging from none (1) to a great deal (7).

Collaborative Working Relationship

Collaborative working relationships were measured using the PPCI, a 14-item scale that has been validated for use with physicians and pharmacists respectively (Zillich et al., 2005; Zillich et al., 2006). For the domains of trustworthiness and role specification, the response format ranges from 1 (very strongly disagree) to 7 (very strongly agree); for the domain of relationship initiation, the response format ranges from 1 (not at all) to 5 (to a great extent). The Cronbach's alpha for each domain was 0.83/0.62 (relationship initiation), 0.92/0.98 (trustworthiness), and 0.85/0.90 (role specification) for physicians and pharmacists respectively.

Facilitators and Barriers of Collaboration

For the perceived barriers and facilitators, physicians and pharmacists were asked, "What things in your clinic make it difficult or easy for pharmacists and physicians to collaborate?" All of the 12 items in **Figure 3-1** were measured on a 7-point response with 1=a major hindrance, 4= neither a hindrance nor helpful, and 7=extremely helpful.

Demographic variables

Both physicians and pharmacists were asked to provide age, gender, race, Spanish speaking ability, as well as academic affiliation at the end of the PPCI questionnaire. Additionally, physicians were asked their years of residency training, years of practice, specialty group, and patient load. Pharmacists were asked their years of practice,

education, post-graduate training, certifications, as well as the number of days per week providing clinical services.

Data Analysis

Descriptive statistics including mean, median, minimum, and maximum were used to characterize the demographics and collaboration pattern as reported by the physicians and pharmacists respectively (Objective 1), as well as the facilitators, barriers, and dimensions of the PPCI reported by physicians and pharmacists respectively (Objective 2). Comparisons between physician and pharmacist responses were made using both *t*-tests and Mann-Whitney U tests, since the sample size for pharmacist responses was small. The barriers and facilitators that distinguish successful CWR from less successful ones (Objective 3) were examined using two approaches. First, pairwise Pearson correlation coefficients between barriers and facilitators, and domains of the collaborative working relationships were computed for physicians and pharmacists respectively. Next, multiple linear regressions were conducted for each of the three dimensions of the PPCI for physicians only. All of the 12 collaboration facilitators and barriers entered the models as independent variables. Variance inflation factors (VIF) were calculated. Values of VIF greater than 10 indicate serious multi-collinearity (O'Brien, 2007). All analyses were conducted using IBM SPSS, Version 21 (IBM Corp., Armonk, NY).

Results

After excluding the providers who had left their clinics, the response rates for the implementation questionnaire were 25.1% (225/895) for physicians and 77.4% (41/53) for pharmacists. For the PPCI questionnaire, the response rates were 35.9% (321/895) for physicians and 75.5% (40/53) for pharmacists. The demographics of physician and pharmacist respondents are shown in **Table 3-1**. Both groups had similar age (Mean = 39.3 years for physicians and 39.9 years for pharmacists), and there were higher

proportions of female pharmacists (62.2%) compared to female physicians (52.2%). Over half of the physician respondents were residents or fellows (57.1%), while most of the pharmacist respondents were full-time faculty (67.6%). Physician respondents had been in practice for an average of 7.6 years, and a majority specialized in family medicine (82.2%). Pharmacist respondents had been in practice for an average of 12.4 years, but only provided patient care for an average of 4.5 half-days a week (2.25 days per week). Nearly 95% of the pharmacists held a PharmD degree, and almost three quarters of respondents completed a post-graduate residency and/or a fellowship – 42.1% completed a pharmacy practice residency, 31.6% completed an ambulatory care specialty residency, and 18.4% completed a fellowship. In addition, over half of the pharmacists were Board Certified Pharmacotherapy Specialists (BCPS), while 18.4% of pharmacists were Certified Diabetes Educators (CDE).

Physician and pharmacist characterizations of their collaboration pattern are summarized in **Table 3-2** and **Table 3-3** respectively. As reported by physicians, only 5% (median) of their patients with chronic disease were typically referred to pharmacists for management. However, these physicians rated the quality of pharmacist recommendations very high [51.4% rated 7; Mean (SD) = 6.3 (0.9) from possible range of 1 (very poor) to 7 (excellent)], and most of the physicians (94.4%) would likely or very likely accept the medication changes recommended by the pharmacists [Median =5, Mean (SD) = 4.6 (0.6) from possible range of 1 (very unlikely) to 5 (very likely)]. Physicians also had positive beliefs that physician-pharmacist collaborative management (PPCM) would likely improve patient care without increasing their own workload. Conversely, when asked about their knowledge of the PPCM concept and referral procedures, physician responses were less confident and leaned toward neutral.

Similarly, pharmacists reported that physicians were likely to refer some aspects of chronic disease management to them [Median = 5, Mean (SD)=4.4(1.0) from a possible range of 1 (very unlikely) to 5 (very likely)], and physicians were likely (37.5%)

or very likely (62.5%) to accept their recommendations for medication changes [Median = 5, Mean (SD) = 4.6 (0.5) from possible range of 1 (very unlikely) to 5 (very likely)]. In terms of staff support, pharmacists were more likely to be assisted by non-pharmacist staff members with scheduling rooms and putting appointments on the clinic schedule, but they were more likely to room the patients, take vital signs, and follow up with patients missing appointments on their own. A majority of pharmacists (74.4%) always documented their services in the medical record [Median = 5, Mean (SD) = 4.5 (1.1) from possible range of 1 (almost never) to 5 (always)], and they had high autonomy over pharmacist coverage hours, types of services offered, and the development of collaborative practice.

Similarities and differences were both found between physician and pharmacist ratings of barriers and facilitators of physician-pharmacist collaborative management and the domains within the PPCI (**Table 3-4**). Pharmacist expertise was the highest rated facilitator, followed by physician expertise and communication technology, while insurance reimbursement level was the highest rated barrier reported by both physician and pharmacist respondents. Other barriers identified by physicians were patients' schedules and physician workload, while pharmacists identified pharmacist compensation system and pharmacist workload as additional barriers. Despite being rated as barriers by both groups, there were degrees of difference between physician and pharmacist ratings of insurance reimbursement levels, pharmacist compensation system, pharmacist workload, and physician workload. Pharmacists were more likely to rate insurance reimbursement levels, pharmacist compensation, and pharmacist workload as greater barriers than physicians, whereas physicians were more likely to rate physician workload as a greater barrier than pharmacists. In terms of domains within the PPCI, both physicians and pharmacists rated trustworthiness and relationship initiation highly, while role specification was moderately rated. Of note, physicians rated relationship initiation slightly higher than pharmacists (Mean =12.9 vs. 12.1, $p < 0.05$).

To explore the relationships between the PPCI and barriers and facilitators, bivariate correlations (**Table 3-5**) were employed for both physician and pharmacist responses. For physicians, communication technology and designated space for pharmacists were strongly and positively related with relationship initiation and role specification, and staff support was strongly and positively related with role specification. Most of the task design variables, including patients' schedules, pharmacist time, pharmacist workload, and physician workload, and referral policies, were positively associated with relationship initiation and role specification. Physician and pharmacist expertise were positively associated with all three domains of PPCI.

As for pharmacists, insurance reimbursement levels were positively related with role specification, and communication technology positively related with relationship initiation. Within task design variables, patient schedule and referral policies were positively associated with relationship initiation, and pharmacist time, pharmacist workload, and referral policies were all positively associated with role specification. Neither physician expertise nor pharmacist expertise were associated with any PPCI domain in pharmacist responses.

Multivariate regressions were used to further control for various barriers and facilitators as rated by physicians (**Table 3-6**), but not pharmacists due to the small sample size. In the first model of relationship initiation, 14.5% of variation was explained by the 12 facilitators and barriers. None of the predictors reached significance. In the second model of trustworthiness, 19.9% of variation was explained, and pharmacist expertise was the only significant predictor (B=1.366, s.e.=0.350, $p < 0.01$). In the last model of role specification, 21.9% of variation was explained, and staff support was the only significant predictor (B=0.895, s.e.=0.448, $p < 0.05$). The VIF values in all three models were less than 10 (range: 1.5-2.7), indicating no serious multi-collinearity problems.

Discussion

As part of the national CAPTION trial, this study examined baseline barriers and facilitators of physician-pharmacist collaboration in primary care medical offices from both physician and pharmacist perspectives. The results showed that (1) pharmacists were highly trusted by physicians in these clinic settings, (2) there were differences between physician and pharmacist perceptions of barriers and facilitators, and (3) pharmacist expertise was independently associated with trustworthiness and staff support was independently associated with role specification, after controlling for organizational- and task-related context. Such findings are significant for understanding the differences between what physicians and pharmacists look for in developing a collaborative working relationship.

Consistent with previous studies on interprofessional collaboration, we found in physician responses that pharmacist expertise was key to establishing trustworthiness with physicians (D. D'Amour et al., 2008; Gitlin, Lyons, & Kolodner, 1994; Johnson, 1992; Snyder et al., 2010; Warren, Houston, & Luquire, 1998). We also found that contrary to physician responses, pharmacist responses did not show an association between physician expertise and trustworthiness. This could be explained by the status difference between physicians and non-physicians, which is often reinforced by the differences in training, socialization, legal environment, and systems of accountability and liability (IOM, 2001; Lichtenstein, Alexander, McCarthy, & Wells, 2004). As such, physicians develop trust with pharmacists based on the pharmacists' unique expertise to contribute to the teamwork regardless of how the organizational context or task design is set up. Therefore, pharmacists should make demonstrating their expertise a priority to facilitate collaborations with physicians. One approach is to make in-service presentations to showcase what they have to offer and how they could help with patient care (Snella & Sachdev, 2003). A second approach is to make only high-quality recommendations to individual physicians regarding specific patient cases. Previous

studies have shown making high-quality recommendations helps gain physician trust and progress to higher stages of collaboration (McDonough & Doucette, 2001; Pottie et al., 2009; Snyder et al., 2010).

A parallel finding was that physician ratings of pharmacist's involvement in relationship initiation were significantly higher than the pharmacist ratings of physician's involvement in relationship initiation. This echoes a previous study that pharmacists are typically the main initiator in developing collaborative working relationships (Snyder et al., 2010). The training of physicians often emphasizes on practicing autonomously to develop a special physician-patient relationship, and qualitative studies in recent patient-centered medical home (PCMH) projects suggest that shifting from an independent practice to a team-based mental model is not easy for many physicians (P. A. Nutting et al., 2009; P. A. Nutting et al., 2010; P. A. Nutting et al., 2011). In the PCMH National Demonstration Project, having external facilitators was helpful in coaching through personal transformations of physicians (P. A. Nutting et al., 2010). An additional long-term solution is to introduce interprofessional education to physicians early in their training, so that they can get used to interdisciplinary approaches of care and carry them into practice as they enter the workforce. Recently a collaborative consisting of several health professional societies in the U.S. has released four core competencies for interprofessional collaborative practice: values/ethics for interprofessional practice, roles/responsibilities, interprofessional communication, as well as teams and teamwork (Interprofessional Education Collaborative Expert Panel, 2011). Future studies are needed to further develop and evaluate programs that can help health professional trainees reach the core competencies.

Another finding from physician responses was that role specification – dependence between physicians and pharmacists – was independently predicted by clinic staff support for scheduling pharmacists' patient meetings. One reason could be that good staff support frees up pharmacist time and allows pharmacists to see more patients and

have more interactions with physicians, thereby create stronger interdependence between physicians and pharmacists. Alternatively, strong dependence on pharmacists by champion physicians may have facilitated acquiring staff support for pharmacists' patient visits. Regardless of the direction, the positive association between clinic staff support and role specification suggests that it is important to consider workflow designs involving other clinic staff when incorporating physician-pharmacist collaborations (Snella & Sachdev, 2003). In this study, however, staff support was mostly limited to scheduling visits, and pharmacists typically had to room their own patients and take vital signs by themselves. While the current practice may have formed due to limited funds or limited availability of clinic staff, there may be room for pharmacists to delegate more work to clinic staff to improve the efficiency of the overall office practice, especially if the pharmacist takes more of a provider role seeing more patients at intervals in between physician visits (Snella & Sachdev, 2003).

Both physicians and pharmacists reported that insurance reimbursement level for pharmacist management was the greatest barrier for collaborative management. Such findings are consistent with numerous studies from pharmacist perspectives, and an insufficient reimbursement level has often been attributed to the lack of provider status to be able to directly charge for services (Beatty et al., 2012; Berdine & Skomo, 2012; Campbell & Saulie, 1998; Giberson, Yoder, & Lee, 2011; Lounsbery et al., 2009; Oladapo & Rascati, 2012). Our study adds to the literature that a number of office-based physicians also regard the insurance reimbursement levels for pharmacist management to be a barrier for collaboration. Despite being ranked as the strongest barrier by physicians, however, the ratings for insurance reimbursement level had a mean value close to neutral (3.4 out of 7), and it was not an independent predictor of collaborative working relationship in the regression analyses. Pharmacist responses, on the other hand, showed that insurance reimbursement level was a significant barrier (mean=2.6 out of 7), and it was positively associated with role specification. Such discrepancy shows that the limited

insurance reimbursement is a greater concern for pharmacists than for physicians, and this limitation may have restricted pharmacists' ability to see patients only on an average of 4.5 half-days or 2.25 days a week, rather than full-time. As enhancing patient accessibility to primary care services – one of the core principles of PCMH – receives more attention, there is a need to compensate for pharmacist services to achieve the full benefits of physician-pharmacist collaborations.

Based on pharmacist responses, relationship initiation was most strongly associated with referral policies, followed by communication technology and patients' schedules; role specification was positively associated with three of the five task design items. This finding is noteworthy as it shows that despite pharmacist co-location with the physicians in the clinics, structural guidance is still needed to establish and support the roles for clinic pharmacists, and facilitate physician-pharmacist collaborations. Established referral policies or procedures may help maintain a steady number of patients for pharmacists to manage; communication technology such as electronic medical records (EMRs) may facilitate the communication of care plans between physicians and pharmacists; and scheduling of patient visits that are not too full would allow for time for physician-pharmacist communications.

There are a few limitations in this study. First, the survey was limited to the practice sites participating in the CAPTION trial. Most of these sites had incorporated clinical pharmacists for over a decade, and the study findings may not be generalized to all family practices. However, even within these well-established practice sites, barriers such as insurance reimbursement levels and pharmacist compensation systems were identified and could be a common barrier to physician-pharmacist collaboration in other practice sites. Second, the sample size for both physicians and pharmacists limited our ability to statistically control for clustering effects within each of the 32 clinics. In addition, many sites only had one pharmacist, limiting our ability to conduct regression analysis and control for multiple facilitators and barriers at once for the pharmacist

responses. We plan to use mixed methods during the end-of-study evaluations to account for the clinic-level influences and provide more in-depth descriptions of the facilitators and barriers to collaboration. Third, most physician respondents were still in residency training, while most pharmacist respondents had completed post-graduate training and become faculty. Although we believe the current sample likely is representative of the numbers and credentials of practitioners in family medicine residency programs, the results may not be generalized to other settings. Finally, we acknowledge that using the response format that ranged from major hindrance (1) to extremely helpful (7) does not allow us to differentiate whether a higher or lower pharmacist workload was associated with better collaborative working relationship and so forth. Yet within this limitation, we were able to identify which facilitators and barriers are of more importance to physicians and pharmacists.

Conclusion

Our survey of primary care clinics participating in the CAPTION trial showed that pharmacist expertise and clinic staff support were the most important facilitators for physicians to develop collaborative working relationships with pharmacists, while organizational context and task design factors were more important for pharmacists. We also identified insurance reimbursement levels for pharmacist management to be the greatest barrier to collaborative management based on both physician and pharmacist responses. We suggest that future research could further link these facilitators and barriers with clinical outcomes to identify mechanisms to promote collaborative management on chronic diseases. In addition, more qualitative and mixed methods studies are warranted to understand how these contextual factors play a role in implementation of pharmacist interventions in primary care clinics to improve patient outcomes on larger scales.

Table 3-1. Demographics

	Physicians (N=180-213)[a]	Pharmacists (N=37-38)[a]
	Mean (SD) or %	Mean (SD) or %
Age (year)	39.3 (11.8)	39.9 (9.4)
Female	52.2%	62.2%
Race		
Asian	8.9%	5.3%
Black	3.3%	2.6%
White	77.0%	81.6%
Hispanic	6.3%	10.5%
Speaks Spanish	21.3%	21.6%
Academic Affiliation		
Resident/Fellow	57.1%	13.5%
Full-time Faculty	37.6%	67.6%
Part-time/Adjunct Faculty	3.4%	18.9%
Not Academically Affiliated	2.0%	0%
Specialty		
Family Medicine	82.2%	
Internal Medicine	13.1%	
Geriatrics	2.8%	
Other	2.8%	
PharmD (Doctor of Pharmacy)		94.7%
Residency or Fellowship		73.7%
Pharmacy Practice Residency		42.1%
Ambulatory Care Specialty Residency		31.6%
Fellowship		18.4%
Certification		
BCPS (Board Certified Pharmacotherapy Specialist)		52.6%
BCPP (Board Certified Psychiatric Pharmacists)		2.6%
CDE (Certified Diabetes Educator)		18.4%
Years of Residency Training	2.3 (1.1)	
Years of Practice (excluding residency)	7.6 (11.2)	12.4 (9.9)
Number of Patients Seen/Week		
≤ 75	84.0%	
76-100	13.6%	
101-125	2.4%	
Number of Half-Days Providing Patient Care Per Week		4.5 (2.6)

[a] Due to missing data

Table 3-2. Physician Perspectives of Physician-Pharmacist Collaboration Patterns

Questionnaire Items	N	Median (Range)	Mean (SD)
For what percent of your patients with chronic disease do you refer the patients to the pharmacists at your clinic for medication management? (%)	206	5 (0-100)	11.0 (15.8)
Overall, how would you rate the quality of recommendations made by pharmacists in your clinic for patients with chronic disease when you refer patients to them? (1=very poor, 7=excellent)	208	7 (3-7)	6.3 (0.9)
How would you rate the likelihood that you will accept pharmacists' recommendations for changes to the medication regimen of patients with chronic disease when you refer patients to them? (1=very unlikely, 5=very likely)	215	5 (2-5)	4.6 (0.6)
How would you rate your understanding of and beliefs about using Physician-Pharmacist Collaborative Management (PPCM) to manage chronic disease states? (1=very small, 7=very high)			
Your knowledge of the PPCM concept	215	4 (1-7)	4.1 (1.7)
Your knowledge of the procedures for referring a patient to a pharmacist for medication management in your clinic	210	5 (1-7)	4.5 (1.9)
The potential for PPCM to improve care for your patients	216	6 (1-7)	5.6 (1.4)
The potential for PPCM to increase your workload	215	3 (1-7)	3.3 (1.6)
The likelihood that the improvement in quality of care will be greater than any increase in workload	216	6 (1-7)	5.4 (1.5)

Table 3-3. Pharmacist Perspectives of Physician-Pharmacist Collaboration Patterns

Questionnaire Items	N	Median (Range)	Mean (SD)
How would you rate the likelihood of the physicians in your clinic referring some aspects of chronic disease management for some conditions to you? (1=very unlikely, 5=very likely)	40	5 (1-5)	4.4 (1.0)
Overall, how would you rate the likelihood of the physicians in your clinic accepting changes in the medication regimen you suggest for their patients with chronic diseases? (1=very unlikely, 5=very likely)	40	5 (4-5)	4.6 (0.5)
When scheduling patient-pharmacist meetings, how frequently does a clinic staff member other than a pharmacist? (1=almost never, 5=always)			
Schedule a room	37	4 (1-5)	3.3 (1.8)
Put the appointment on the clinic schedule	37	5 (1-5)	4.1 (1.6)
Put the patient in the room	37	2 (1-5)	2.5 (1.7)
Take the patient's vital signs	37	2 (1-5)	2.6 (1.8)
Call the patient if the patient misses an appointment	37	3 (1-5)	2.8 (1.6)
How often do pharmacists record or document their medication management services in the medical record? (1=almost never, 5=always)	39	5 (1-5)	4.5 (1.1)
How much say do pharmacists have over clinic policies and procedures regarding clinical pharmacy services? (1=none, 7=a great deal)			
Pharmacist coverage of clinic hours	38	7 (3-7)	6.5 (1.0)
Types of pharmacist services offered	38	7 (3-7)	6.2 (1.2)
Formulary	30	4.5 (1-7)	4.3 (2.3)
Developing collaborative practice	38	7 (3-7)	6.1 (1.2)

Table 3-4. Physician and Pharmacist Perspectives of Barriers and Facilitators of Physician-Pharmacist Collaborative Management (PPCM), and Physician-Pharmacist Collaboration Index (PPCI) Ratings

Items [Possible Range]	Physicians			Pharmacists			Mann-Whitney U test	*t*-test
	N	Median (Range)	Mean (SD)	N	Median (Range)	Mean (SD)	*p*-value	*p*-value
A. Barriers and Facilitators [a]								
Organizational Context								
Insurance reimbursement levels or mechanism for pharmacists to charge for medication management [1-7]	191	4 (1-7)	3.4 (1.4)	39	2 (1-7)	2.6 (1.5)	0.002	0.007
Pharmacists compensation system in the clinic [1-7]	181	4 (1-7)	3.9 (1.4)	39	4 (1-7)	3.2 (1.6)	0.011	0.019
Clinic staff support for scheduling pharmacists' patient meetings [1-7]	199	4 (1-7)	4.5 (1.5)	38	5 (1-7)	5.0 (1.9)	0.062	0.177
Communication technology [1-7]	206	5 (1-7)	5.2 (1.5)	40	5 (1-7)	5.0 (1.4)	0.463	0.575
Designated space available for pharmacists to meet with patients [1-7]	205	4 (1-7)	4.3 (1.6)	40	5.5 (1-7)	4.9 (2.1)	0.059	0.091
Task Design								
Patients' schedules [1-7]	207	4 (1-7)	3.8 (1.5)	40	4 (1-7)	4.0 (1.4)	0.274	0.278
Pharmacist's time available for meeting with patients [1-7]	202	4 (1-7)	4.4 (1.6)	40	4 (1-7)	4.2 (1.9)	0.540	0.581
Pharmacist workload [1-7]	206	4 (1-7)	4.2 (1.5)	40	3 (1-7)	3.5 (1.6)	0.004	0.016
Physician workload [1-7]	207	4 (1-7)	3.9 (1.7)	40	4 (2-7)	4.4 (1.5)	0.060	0.040
Policies or procedures for referring patients to pharmacists [1-7]	205	5 (1-7)	4.7 (1.7)	39	5 (1-7)	4.7 (1.9)	0.879	0.930
Team Composition								
Physician's level of expertise [1-7]	209	5 (2-7)	5.4 (1.3)	40	6 (3-7)	5.7 (1.1)	0.296	0.177
Level of pharmacists' expertise [1-7]	211	7 (1-7)	6.2 (1.3)	40	6 (4-7)	6.2 (0.8)	0.078	0.742
B. PPCI Domains	198	79 (27-92)	77.3 (10.0)	38	79 (26-92)	75.5 (13.4)	0.673	0.437
Role Specification [b] [1-35]	202	25 (9-35)	25.2 (5.6)	38	26 (5-35)	26.1 (6.6)	0.274	0.455
Trustworthiness [b] [1-42]	202	41 (9-42)	39.0 (4.2)	38	41 (6-42)	37.4 (7.8)	0.476	0.242
Relationship Initiation [c] [1-15]	202	14 (4-15)	12.9 (2.4)	38	12 (7-15)	12.1 (2.0)	0.007	0.023

[a] Response format for each item: 1= a major hindrance, 4= neither a hindrance nor helpful, 7= extremely helpful; [b] Response format for each item: 1= very strongly disagree, 4= neutral, 7= very strongly agree; [c] Response format for each item: 1= not at all, 5= to a great extent.

Table 3-5. Pearson Correlations between Dimensions of the Physician-Pharmacist Collaboration Index and Barriers and Facilitators by Provider Type

	Physicians						Pharmacists					
	Relationship Initiation		Trustworthiness		Role Specification		Relationship Initiation		Trustworthiness		Role Specification	
	N	r	N	r	N	r	N	r	N	R	N	r
Organizational Context												
Insurance reimbursement levels or mechanism for pharmacists to charge for medication management	175	0.128	175	-0.054	176	0.026	37	0.233	37	0.140	37	0.388*
Pharmacists compensation system in the clinic	166	0.028	166	-0.148	167	-0.024	37	-0.089	37	0.049	37	0.081
Clinic staff support for scheduling pharmacists' patient meetings	182	0.114	182	0.079	183	0.266**	36	-0.014	36	0.061	36	0.158
Communication technology	188	0.268**	188	0.172*	189	0.245**	38	0.392*	38	-0.148	38	0.090
Designated space available for pharmacists to meet with patients	187	0.217**	186	0.098	188	0.229**	38	0.130	38	0.105	38	0.247
Task Design												
Patients' schedules	188	0.190**	188	0.009	189	0.257**	38	0.350*	38	0.075	38	0.189
Pharmacist's time available for meeting with patients	185	0.157*	184	0.046	186	0.196**	38	0.033	38	0.052	38	0.348*
Pharmacist workload	187	0.160*	187	0.018	188	0.183*	38	0.103	38	0.221	38	0.468**
Physician workload	187	0.153*	187	-0.007	188	0.190**	38	0.248	38	-0.197	38	0.069
Policies or procedures for referring patients to pharmacists	187	0.128	187	0.106	188	0.251**	37	0.465**	37	0.017	37	0.443**
Team Composition												
Physician's level of expertise	190	0.196**	190	0.190**	191	0.160*	38	0.268	38	-0.089	38	0.029
Level of pharmacists' expertise	192	0.318**	192	0.415**	193	0.270**	38	0.110	38	0.027	38	-0.091

* $p < 0.05$, ** $p < 0.01$

Table 3-6. Linear Regressions of Dimensions of the Physician-Pharmacist Collaboration Index Rated by Physicians

Unstandardized Coefficients (Std. Error)	Relationship Initiation	Trustworthiness	Role Specification
Organizational Context			
Insurance reimbursement levels or mechanism for pharmacists to charge for medication management	0.174 (0.187)	-0.099 (0.338)	-0.535 (0.430)
Pharmacists compensation system in the clinic	-0.171 (0.188)	-0.608 (0.338)	-0.742 (0.430)
Clinic staff support for scheduling pharmacists' patient meetings	-0.129 (0.195)	0.379 (0.352)	0.895 (0.448)*
Communication technology	0.196 (0.149)	0.300 (0.273)	0.244 (0.343)
Designated space available for pharmacists to meet with patients	0.095 (0.185)	0.164 (0.327)	0.095 (0.415)
Task Design			
Patients' schedules	0.143 (0.166)	-0.114 (0.307)	0.701 (0.372)
Pharmacist's time available for meeting with patients	0.106 (0.191)	-0.110 (0.345)	0.133 (0.439)
Pharmacist workload	0.064 (0.199)	0.147 (0.363)	0.139 (0.455)
Physician workload	-0.069 (0.179)	-0.399 (0.316)	-0.133 (0.402)
Policies or procedures for referring patients to pharmacists	-0.073 (0.146)	-0.019 (0.264)	0.543 (0.335)
Team Composition			
Physician's level of expertise	-0.042 (0.180)	-0.133 (0.328)	-0.266 (0.417)
Level of pharmacists' expertise	0.504 (0.194)	1.366 (0.350)**	0.714 (0.445)
Constant	8.618 (1.167)**	31.888 (2.098)**	15.597 (2.671)**
Model F Statistic	1.946	2.849	3.246
Model Significance	0.034	0.002	<0.001
N	151	151	152
R^2	0.145	0.199	0.219
Adjusted R^2	0.070	0.129	0.151

* $p < 0.05$, ** $p < 0.01$

CHAPTER FOUR:
[STUDY TWO]
CLINIC EXPERIENCE OF THE PHYSICIAN-PHARMACIST COLLABORATION MODEL IN THE CAPTION TRIAL

Introduction

Effective and efficient management of chronic diseases often requires the use of team-based care among different health care providers (Wagner et al., 1996). One approach is through physician and pharmacist collaboration, where pharmacists manage care for patients with specific chronic diseases or specific medications, develop care plans, and then collaborate with physicians to implement the plans. This type of collaborative model has been evaluated for hypertension, diabetes, and hyperlipidemia with generally favorable results (Carter et al., 2009; Chisholm-Burns et al., 2010), and has recently been recommended by the Community Preventive Services Task Force (2012) as a team-based care approach for improving blood pressure (BP) control.

Although relatively strong clinical evidence supports the efficacy of the physician-pharmacist collaborative model for BP control, its implementation in real world settings is not straightforward and involves multiple parties. Previous studies have identified barriers to implementation of enhanced pharmacist services, such as difficulty in billing procedures, lack of pharmacist time, and physician beliefs that collaboration is not needed (Alkhateeb, Unni, Latif, Shawaqfeh, & Al-Rousan, 2009; Beatty et al., 2012; Bradley et al., 2008; MacIntosh et al., 2009; S. H. McGrath et al., 2010; Oladapo & Rascati, 2012). However, earlier studies have been limited in three ways: First, these studies typically relied on only one type of informant, such as pharmacists or physicians alone, even though successful implementation usually requires the uptake by multiple professions, including physicians, pharmacists, nurses, administrators, and other clinic staff. Study coordinators' views can also be informative in intervention studies, since

they work closely with providers in clinics participating in studies and are responsible for many day-to-day data collection procedures. Second, clinic size, workflow, and patient populations can vary greatly from clinic to clinic and affect how local providers practice. Many survey studies have aggregated provider responses without considering such variations. Accounting for clinic-level influences is important when evaluating implementation of practice models. Finally, to our knowledge no studies have examined objective clinical outcomes in conjunction with provider-reported facilitators and barriers for implementation of enhanced pharmacist services. The absence of such studies limits our understanding of any impact these facilitators and barriers might have on patient outcomes.

This study describes the experiences of clinic providers and staff participating in the Collaboration Among Pharmacists and Physicians To Improve Outcomes Now (CAPTION) study (NIH/NHLBI: R01 HL01841, Barry L. Carter, PI), a cluster-randomized effectiveness trial of BP management in 32 primary care clinics in 13 states in the United States (Carter et al., 2010). Clinics were first stratified by pharmacy structure scores (low or high) and percentage of minority patients (<44% or ≥ 44%), and then randomized into a 9-month BP intervention group, a 24-month BP intervention group, or usual care BP group. The pharmacy structure scores were calculated using a validated instrument measuring the structure and process for pharmaceutical care delivery (Billups et al., 2000). Briefly, this instrument included 32 questions asking the frequencies of patient record screening, assessments, treatment plan implementations, counseling, referrals, and documentation activities performed by the pharmacists. Each item was rated using a response format where 0 = never, 1 = less than 25% of the time, 2 = 25-50% of the time, 3 = 51-75% of the time, 4 = 75-95% of the time, and 5 = always. The BP intervention groups (9-month and 24-month) had a clinical pharmacist review a patient's medical records, interview the patient, create a care plan, and implement the plan if approved by the physician. Clinics randomized to the usual care BP group also

enrolled an unrelated group of subjects with a diagnosis of asthma, who received a pharmacist intervention designed to simultaneously improve control of asthma and minimize pharmacist focus on patients with uncontrolled blood pressures.

Objectives

The specific objectives of this study were to (1) describe the experience of physicians, pharmacists, clinic administrators, and study coordinators participating in the BP and asthma intervention groups in the CAPTION trial, and (2) explore determinants of effective physician-pharmacist collaboration for BP control and asthma control at 9 months into the pharmacist intervention.

Theoretical Framework and Literature Review

This study uses the input-process-outcome framework from the social psychology literature (J. E. McGrath, 1964), where inputs refer to "antecedent factors that enable and constrain members' interactions", processes refer to "members' interactions directed toward task accomplishment", and outcomes refer to "results and by-products of team activity that are valued by one or more constituencies". This framework has been commonly used to study team effectiveness in businesses and health care organizations (Lemieux-Charles & McGuire, 2006; Mathieu et al., 2008). A literature review on the domains examined in this study is provided in the following.

Inputs

A number of inputs can serve as facilitators or barriers to physician-pharmacist collaboration. Both physician and pharmacist workloads can limit interactions between the two providers, potentially decreasing the intervention's impact on outcomes. For physicians, this typically occurs when they are developing new working relationships with a pharmacist and adjusting their routines to incorporate the new team member (Kozminski et al., 2011; Pottie et al., 2008). Pharmacist workload issues may result from

multiple responsibilities from different roles in patient care, teaching, and research, sometimes requiring the pharmacists to travel between different locations. Workload perceptions can vary among pharmacists due to differences in time management styles and different stages in learning their roles and exploring the breadth and depth of those roles (Kozminski et al., 2011; Pottie, Haydt et al., 2008).

The design of clinic workflow and utilization of space can also impact how well providers in the clinic interact with one another. Driven by fee-for-service reimbursements, maintaining patient flow and efficiency is usually a priority for clinic administrators (P. A. Nutting et al., 2012). When functioning as the newest addition to clinic staff, pharmacists typically find ways to incorporate their roles into established clinic workflow and save time for physicians (Kozminski et al., 2011; Pottie et al., 2008). Limited space in the clinic, however, can decrease pharmacist efficiency and limit communications with physicians especially when separated on different clinic floors (Legault et al., 2012; Pottie et al., 2008).

Some physicians believe that pharmacists lack the expertise needed to review and manage medication therapies, and that there is little need for enhanced pharmacist services (Bradley et al., 2008; S. H. McGrath et al., 2010). Nevertheless, physicians with more experience working with pharmacists have been satisfied with pharmacists' level of knowledge and have supported enhanced pharmacist services (Adamcik et al., 1986; Bradley et al., 2008; Padiyara & Rabi, 2006). A survey of office-based physicians showed that the respondents had moderately strong beliefs that physician-pharmacist collaboration could improve medication adherence, prevent drug therapy problems, improve physician prescribing, and increase use of cost-effective medications (Kucukarslan et al., 2011). In particular, the belief that collaboration could improve medication adherence was the strongest predictor of physician attitude toward community pharmacist's role in helping patients manage their medications (Kucukarslan et al., 2011). Other qualitative studies have also identified improved disease state control, improved

quality of life, reduced morbidity and mortality, and increased scope of practice as physician-held beliefs regarding the outcomes of collaboration (Dey et al., 2011; Pottie et al., 2008).

Another factor influencing physician-pharmacist collaboration is the presence of a formal practice agreement for pharmacist initiation of drug therapy adjustments (Hammond et al., 2003; Punekar et al., 2003; Sachdev & Kliethermes, 2012). Formal practice agreements may include the names of the organization, all referring physicians, all participating pharmacists, the scope of collaborative drug therapy management (CDTM) practice, and details about referral process, scheduling, documentation, and frequency of meetings (Sachdev & Kliethermes, 2012). Roughly half of the clinics participating in the CAPTION trial reported having collaborative practice agreements in 2006 (Dickerson et al., 2007).

Although provider and staff support of enhanced pharmacist roles in the clinic can facilitate the incorporation of pharmacists, survey studies have demonstrated the potential for "turf wars" between physicians, nurses, and pharmacists, especially when expanded pharmacist roles were perceived to be overlapping with the role of another provider (Adamcik et al., 1986; Freeman et al., 2012; Punekar et al., 2003; Reebye et al., 2002). Nevertheless, qualitative studies of physician-pharmacist collaborative interventions have reported positive comments from both physicians and nurses regarding the incorporation of pharmacists (Campbell & Saulie, 1998; Kozminski et al., 2011; Pottie et al., 2008), potentially due to freeing up their time regarding medication issues.

Finally, patient factors can influence physician-pharmacist collaboration. The extra time and extra visits that arise from the collaborative intervention can become inconvenient for patients, causing them to miss follow-up appointments (Garcia et al., 2009). In addition, some patients question the higher level role of pharmacists and fear receiving contradictory advice from the pharmacist against their doctors' orders (Garcia et al., 2009). However, the positive impact from physician-pharmacist collaboration has

been observed by some patients and judged to be worth the tradeoff (Campbell & Saulie, 1998; Kozminski et al., 2011; Lauffenburger et al., 2012).

Processes

The predominant interactions between physicians and pharmacists in the intervention arms in the CAPTION trial were pharmacist recommendations for changes in therapeutic regimen and physician acceptance or rejection of those recommendations. Therefore, an examination of the frequency of physician acceptance of pharmacist recommendations provided a snapshot of physician uptake. Previous studies have reported physician acceptance of pharmacist recommendation between 85 to 96% based on medication reviews in primary care clinics (Carter et al., 2008; Carter et al., 2009; Krska et al., 2001; Moczygemba et al., 2011), which is significantly higher than the 49 to 54% of acceptance rates reported in studies involving community pharmacists or home visit pharmacists not co-located with the physicians (Chrischilles et al., 2004; Sorensen et al., 2004). In the later studies, the most common reasons physicians reject pharmacist recommendations have been pharmacist unfamiliarity with patients – often due to lack of access to patients' medical records – and pharmacist recommendations that were too theoretical (Bryant et al., 2010; Lauffenburger et al., 2012). These concerns are rarely seen in studies involving clinic pharmacists, as clinic pharmacists typically have access to patient clinic records and are able to discuss patient cases with the physicians more often.

When given a choice regarding communication methods with pharmacists, physicians have typically preferred face-to-face communications in the office rather than emails or faxes (Bryant et al., 2010; Hughes & McCann, 2003; S. H. McGrath et al., 2010). Being physically present in the clinic enables pharmacists to better integrate themselves into the primary care team and to project personal skills and levels of knowledge that are distinct from the typical shopkeeper image of community pharmacists (Bryant et al., 2010; Hughes & McCann, 2003; Kozminski et al., 2011; Lauffenburger et

al., 2012). In addition to increased interaction frequency and better working relationships, the appearance of physicians working with pharmacists in the clinic could also result in increased patient trust (Kozminski et al., 2011).

Subjective Outcomes

This study examined subjective measures of study outcomes reported by providers and administrators. Provider views of patient, provider, and clinic outcomes can provide insight into how well an intervention was carried out and how it was perceived. Specific outcomes collected in this study include provider perceptions and opinions regarding improved disease state control resulting from the collaborative intervention, patient concerns about collaboration, and the effect of the intervention on physicians' and pharmacists' relationships with patients.

Previous studies have reported that some patients were hesitant to have pharmacists rather than physicians making medication therapy recommendations (W. R. Doucette et al., 2007; Witry et al., 2011), possibly because they had developed trust with their physicians and were not familiar with enhanced pharmacist roles. Physician-pharmacist collaboration in which pharmacists spend more time with patients to manage medication therapy has the potential to foster patient-pharmacist relationships without disrupting patient-physician relationships (Lauffenburger et al., 2012).

A desired physician outcome from physician-pharmacist collaboration is to have either no increase or even a reduction in physician workload, so that physicians can focus their attention on patients with complex problems (Wagner et al., 1996; Wagner, 1998). Physicians appreciate the time pharmacists spend teaching patients about medications, which on average is longer than the time physicians spend on medication teaching (Kulchaitanaroaj et al., 2012; Lauffenburger et al., 2012). However, physician workload is rarely directly measured in such studies. In addition, subjective responses from

physicians can be informative in understanding the impact of collaboration on both their practices and their patients.

Two other anticipated provider outcomes from physician-pharmacist collaboration are increased physician referrals to pharmacists and increased pharmacist influence in the clinic. Referrals and exchanges of information with pharmacists create physician expectations regarding pharmacist interventions, and when the quality of pharmacist service exceeds physician expectation, it is more likely that their professional relationships will be expanded and that pharmacists will have more influence over the provision of services (McDonough & Doucette, 2001). Therefore, increased physician referrals to pharmacists and increased pharmacist influence over service provisions can be regarded as indicators of physician-pharmacist collaborative working relationships.

Physician-pharmacist collaboration on clinic operations can influence clinic administrator opinions about the sustainability of such activities over the long term. Since practice change is difficult, interventions with minimal impact on clinic workflow are more likely to be welcome by administrators. Nevertheless, evidence from the Chronic Care Model and related practice models such as Patient-Centered Medical Home Models suggest that substantial practice redesigns are needed in order for primary care practices to meet the demands of patients with chronic diseases (P. A. Nutting et al., 2010; Wagner et al., 1996; Wagner, 1998). While the magnitude or direction of an intervention's impact on clinic workflow does not directly point toward its success or failure, these measures can provide insights into how local practices implement such an intervention.

In addition, billing for pharmacist services is another indicator of service institutionalization, as it suggests that a business model is in place to help sustain the service. The lack of recognition of provider status by Medicare Part B and the complexity of billing methods is often regarded as a major barrier to implementation of pharmacist services (Beatty et al., 2012; Campbell & Saulie, 1998; Lounsbery et al., 2009; Oladapo & Rascati, 2012; Raisch, 1993; Stubbings et al., 2011). Clinic pharmacists, however, do

have additional billing mechanisms such as facility fee under ambulatory payment classification (APC) or "incident to" physician services, when compared to community pharmacists. A recent survey of outpatient pharmacists showed that roughly 61-65% of pharmacists working at physician offices or health system outpatient facilities bill patients for their services (Beatty et al., 2012).

Finally, an increase in pharmacist-generated clinic revenue can be a direct measure of an intervention's impact on clinic operations in cases where clinic workflow or billing practices are changed.

Methods

Design

Because of the diversity of clinics participating in the CAPTION trial (Dickerson et al., 2007), a multiple-case study design was selected to provide enriched description at the clinic level, as well as comparisons between clinics (Yin, 2009). The major data sources for the study were BP measurements (for patients who received the BP pharmacist intervention) and asthma control test questionnaires (for patients who received the asthma pharmacist intervention), end-of-study individual phone interviews, and patient demographics at baseline. These data were supplemented by information available on the World Wide Web regarding demographic and structural features of each clinic. Patient baseline demographics have been previously reported by treatment arms by Carter et al (2013).

Data Collection

The primary study outcome for patients enrolled in the BP intervention arms was the BP measurements taken by trained study coordinators at 9 months after enrollment (Carter et al., 2010). For patients enrolled in the asthma intervention arm, a five-item self-administered questionnaire – the Asthma Control Test (ACT) – was given to patients at

baseline and 9 months and served as the primary study outcome for this analysis (Nathan et al., 2004).

End-of-study individual phone interviews were conducted with up to 3 physicians, the primary clinical pharmacist, a clinic administrator, and the study coordinator at each of the 30 sites (20 BP intervention sites and 10 asthma intervention sites) by two investigators (G.A. and C.P.) between April 2012 and February 2013. Two of the 32 original CAPTION sites were ineligible for the end-of-study interviews: one site terminated from the trial early and another site never implemented the randomized intervention. To recruit physician participants from the remaining 30 sites, a randomized order of all physicians at each site was generated by the data coordinating center, and IRB-approved interview invitations were mailed to groups of 5 physicians at once until 3 physicians at each clinic completed the interview. Interview invitations were also mailed to the primary clinical pharmacist, a clinic administrator, and the study coordinator at each clinic. In other words, the target numbers for completed interviews were 90 for physicians, 30 for pharmacists, 30 for clinic administrators, and 30 for study coordinators. Follow-up emails were sent to responders to schedule the interviews, and a reminder email was sent to non-responders roughly one month after the initial invitation was mailed.

Structured interview guides were created to facilitate the interviews. The interviewers documented the responses on paper and entered responses into a Microsoft Access database. Each telephone interview lasted 20-30 minutes. The interview guides were tailored to each type of position – physician, pharmacist, administrator, and study coordinator (**Appendix A**). A mapping of interview questions to corresponding domains is provided in **Appendix B** (**Table B-1**). In addition to the inputs, processes, and outcomes, respondents were also asked about their opinions on how to integrate pharmacists into usual care, and whether pharmacists should be granted provider status by Medicare. To shorten the interviews, most of the questions were designed to be close-

ended with yes/no as the response format, yet open comments were allowed. For questions regarding acceptance of recommendations, answers were recorded in one of the four categories: 0-25%, 26-50%, 51-75%, and 76-100%.

Data Analysis

To ensure triangulation from different informants at the same site was possible, each site had to have provided at least one physician and one pharmacist interview to be included in this multiple-case study.

Objective 1

Within-case analysis was used to describe clinic personnel experience of physician-pharmacist collaboration at the clinic level (Yin, 2009). First, interview data were extracted into a table that grouped the same concepts from the four informants (physicians, pharmacists, administrators, and study coordinators) for each site according to **Table B-1**. Next, a list of themes based on the theoretical framework was developed. Additional themes grounded from the interviews also were identified. Triangulation between different informants was conducted whenever possible to strengthen construct validity of the results (Yin, 2009). For each theme, the sites were categorized as having positive opinions, negative opinions, mixed opinions, or no evidence. Finally, a summary that highlighted the unique findings was written for each case.

Objective 2

Cross-case analyses were conducted to explore determinants of successful physician-pharmacist collaboration outcomes. These analyses were not carried out until all within-case analyses had been completed to avoid bias in coding judgments. First, clinics were grouped according to outcome measurements. For clinics in the BP intervention arms, the percentages of patients with controlled BP at 9 months were used to classify clinics with higher BP control and those with lower BP control. Patients

meeting BP goals (<140/90 mmHg for patients with uncomplicated hypertension and <130/80 mmHg for patients with diabetes or chronic kidney disease) were considered to have controlled BP. Eligible patients with missing BP data at 9 months were treated as having uncontrolled BP. Clinics whose percentages of patients with controlled 9-month BPs fell into the top quartile and the bottom quartile were compared to explore differences in clinic experience based on prior within-case analyses. The mean BP at baseline, mean change in BP from baseline to 9 months, and the percentage of patients with diabetes or chronic kidney disease for each clinic were also calculated for these clinics.

For clinics in the asthma intervention arms, the change in percentage of patients with controlled asthma from baseline to 9 months was used to classify clinics with higher asthma control and lower asthma control. Patients with ACT scores ≤ 19 were considered to have controlled asthma (Nathan et al., 2004). Eligible patients with missing ACT data at 9 months were also treated as having uncontrolled asthma. Because the overall asthma study enrolled both patients with controlled asthma and patients with uncontrolled asthma at baseline, the change from baseline to 9 months was used instead of the 9-month data alone. In addition, clinics with > 50% of controlled asthma patients at baseline were eliminated from this analysis. The rest of the clinics were compared to explore differences in clinic experience based on prior within-case analyses.

Meta-matrices and worksheets were constructed to facilitate comparisons across concepts and clinic sites (Miles & Huberman, 1994; Stake, 2006). The similarities and differences across clinic sites and impact designations were highlighted, and explanations were sought from interview data as part of explanation building (Yin, 2009). All analyses were conducted by one investigator (E.C.).

In order to improve trustworthiness of this study, peer debriefing was used to establish credibility, and auditing of the analysis processes and outcomes were used to establish dependability and confirmability (Lincoln & Guba, 1985). Peer debriefing was

conducted between the investigator who conducted the analysis (E.C.) and a debriefer (B.U.) who was a graduate student knowledgeable about the subject but not involved with this study during data collection or analysis. The debriefer was asked to provide counterarguments or alternative explanations for the findings in the study, and the debriefer's viewpoints were taken into considerations for incorporation. Auditing of the analysis process was conducted by one of the phone interviewers (G.A.), and this process audit involved sampling 10% of the clinics and reviewing how raw interview data from these clinics were extracted into worksheets and tables for accuracy. Auditing of the analysis outcomes was conducted by the other phone interviewer (C.P.), who reviewed all quotes extracted into the worksheets and the final results to ensure that there was data to support the final results and no pertinent ideas were left out. All quantitative data analysis was conducted in IBM SPSS, Version 21 (IBM Corp., Armonk, NY).

Results

A total of 63 physicians (70.0% of target), 26 pharmacists (86.7% of target), 13 administrators (43.3% of target), and 23 study coordinators (76.7% of target) from 29 clinics participated in the end-of-study interviews. After excluding interviews without usable data and interviews from sites without at least a physician interview and a pharmacist interview, a total of 56 physician interviews, 24 pharmacist interviews, 10 administrator interviews, and 19 study coordinator interviews from 18 BP intervention sites and 6 asthma intervention sites remained for analysis (**Table 4-1**).

Objective 1: Experience of Clinic Personnel

Because there were no striking differences between the results from the BP intervention sites and those from the asthma intervention sites, all within-case findings are combined in the **Table 4-2**, and highlights of the findings are provided here:

Context and Inputs

Both the demographics data collected for enrolled patients (data not shown) and interviews with clinic personnel indicated that many of the 24 sites serve an indigent and/or lower education population. Many of these sites reported that patient no-shows impacted the pharmacist(s)' ability to manage disease states. Some study coordinators and pharmacists specifically pointed out that patient transportation to multiple study visits and non-adherence with medications were problems at their sites.

While most of the pharmacists indicated that they spend their majority of time in their clinics, their other responsibilities took time away from them to see patients for the study. These responsibilities typically included teaching responsibilities for medical residencies or for colleges of pharmacy, and other administrative responsibilities.

Clinic workflow typically was conducive to collaboration in these clinics, though some clinics did have problems with scheduling or space. Opinions on physician beliefs were mixed within several clinics. Physicians and pharmacists both responded that physicians thought that collaboration was needed, and that clinical pharmacists have the expertise to manage disease states. Nevertheless, physicians reported barriers to collaboration in open comments as:

"tradition of little or no teamwork between physicians and pharmacists" (physician, clinic X)

"clinical inertia - changing current practice patterns" (physician 1, clinic J)

"physicians feeling threatened at managing chronic diseases by pharmacists' abilities" (physician 2, clinic J)

Most of the clinic sites had collaborative practice agreements in place prior to the study, and being part of the study did not change the agreements at most sites. In few instances, interviewed physicians were either not aware or not sure about the agreements in place, or were not aware of the full spectrum of disease states managed by pharmacists

at their clinics. These responses mostly came from resident physicians, and it was noted by a pharmacist that it was important to:

> "Remember to deal with internal change occurring at a site such as new providers coming in who may have not worked with pharmacists before." (pharmacist, clinic C)

As such, one of the major facilitators noted by pharmacists was giving presentations or having meetings with providers and/or staff. Some pharmacists pointed out that giving follow-up presentations also was important. In addition, support from clinic leadership – specifically support from the medical director – was noted by many pharmacists as an important facilitator to successful collaboration.

Processes

Physicians demonstrated a very high acceptance of pharmacist recommendations, and many physicians favored verbal or face-to-face communications in the clinic. Occasionally, therapy recommendations on the electronic medical records (EMR) were not promptly approved by physicians, leading to delays in patients getting their medications. Also, since clinic staff was minimally involved with the study at some of the sites, poor communications or confusion sometimes developed with the front desk or nursing staff.

Subjective Outcomes

The impact of collaboration on patient disease state control and patient-physician relationships was rated favorably by the interview respondents, but patient inconvenience with the extra patient visits also was noted. There was no increase in physician workload at most sites, other than added time to approve pharmacist recommendations for medication changes. Pharmacists might have benefited from the study, since referrals to pharmacists increased and their ability to influence decisions increased at some of the CAPTION sites.

As most of the questions regarding clinic outcomes were directed to the administrators, the high no-response rate of administrator interviews limited the understanding on this area. Based on the few respondents, the trial had very limited impact on clinic workflow, billing practices, and revenue.

Future Prospects

Questions regarding future prospects were mostly open-ended, and several themes emerged based on these responses. First, building rapport and having trusting relationships between pharmacists and physicians were deemed to be important for collaboration. For example, it was important to "prove your abilities to providers" (pharmacist, clinic C). In addition, the pharmacist should be "willing to be part of the team instead of working on their own for patient care" (pharmacist, clinic J). Some sites mentioned that "having relationships already formed between pharmacists and physicians" (pharmacist, clinic Q) was a facilitator for successful collaboration.

Second, pharmacist visibility at the clinic was important for collaboration. Many sites envisioned having full-time pharmacists on site to help with medication reconciliation, disease state management, and "be available for physicians to ask questions" (physician, clinic K). A few physicians mentioned that seeing pharmacists "shouldn't be a separate interaction for the patient" (physician, clinic D) , as some patients may not go to separate pharmacist appointments if not held on the same day at the same place in conjunction with the physician visits.

Third, reimbursement for incorporating on-site pharmacists was mentioned by the majority of respondents. As one administrator mentioned:

> "Clinic patients have a very high level of acuity, and polypharmacy is common. This requires a substantial amount of pharmacist time for management. However, the clinic can only bill the lowest possible charge, roughly equivalent to a nurse medication injection. The model is only viable financially if care is truly interdisciplinary, such that the pharmacist and MD both see the patient on the same date, and the visit is billed as a physician visit." (Administrator, clinic V)

Finally, all physicians were asked whether pharmacists should be recognized as health care providers by Medicare to be able to bill their clinical services, and all except for three responded "yes". A few specified that billing for pharmacist clinical services should be limited only to "clinical practice, not in big box retail pharmacy" (physician, clinic A). Some physicians were concerned that they might "lose reimbursement from pharmacist's billing for certain clinic expertise" (physician, clinic T); as such, some advocated for "more outcomes-based reimbursement models" (physician, clinic J), or "creating a case management program for a team-based approach to be funded so as to pay for each member of the team" (physician, clinic Q), so that their efforts on teamwork would be recognized.

Objective 2: Exploring Determinants of Effective Physician-Pharmacist Collaboration for Disease State Control

BP Intervention Sites

Across all 20 CAPTION clinics that were in the BP intervention group, the median of the percentage of patients with 9-month BP control at the clinic level was 45%. Six sites with percentages equal to or above the top quartile (54%) and four sites with percentages below the bottom quartile (35%) had interview data from at least one physician and one pharmacist, and these 10 sites were used for the cross-case analysis (**Table 4-3**). Among the two sites that did not have sufficient interview data to enter into the within-case analysis, one had BP control percentage above the median (54%) and one had BP control percentage below the median. The mean BP at baseline ranged from 146-151/80-89 mmHg for clinics with higher BP control and 143-157/83-92 mmHg for clinics with lower BP control. The mean change in BP from baseline to 9 months ranged from -19 to -25 mmHg for systolic BP and -7 to -11 mmHg for diastolic BP for clinics with

higher BP control; the mean change in BP ranged from -8 to -20 mmHg for systolic BP and -5 to -9 mmHg for diastolic BP for clinics with lower BP control.

Context and Clinic Stratification Criteria

The sites with higher 9-month BP control typically had a lower pharmacy structure score at baseline than the sites with lower 9-month BP control. These sites with higher BP control also tended to serve populations with lower percentages of minority group, though some had populations with low income and low education.

Inputs

Compared to clinics with lower 9-month BP control, clinics with higher 9-month BP control tended to: (1) have less affirmative evidence that greater physician workload led to more collaboration with the pharmacist, hinting that these might be less busy clinics; (2) have fewer challenges with scheduling; (3) have higher likelihood that clinic staff played little role in the study; and (4) report that pharmacist presentation to providers and/or staff facilitated the study.

Open comments regarding scheduling provided additional insights. Within the clinics with higher BP control, respondents mentioned:

"Pharmacist was not available in the mornings, when many patients wanted to come. However, they always worked around the schedule limitations so that patients could be seen." (study coordinator, clinic H)

"The study coordinator… made appointments that worked around the patient's schedule. The pharmacist always made time to see study patients." (study coordinator, clinic O)

In contrast, respondents within the clinics with lower BP control mentioned:

"Biggest problem is no-shows. The pharmacist went the extra mile to get patients in." (study coordinator, clinic L)

"Appointment availability is not as frequent as physicians would like given patient load." (physician, clinic M)

"[Pharmacists are] short staffed" (pharmacist, clinic M)

Processes

Clinics with higher versus lower 9-month BP control did not differ in physician acceptance of pharmacist recommendations and communication. While poor communication with staff seemed to occur more frequently in clinics with higher BP control, these were also the sites where clinic staff was minimally involved with the study.

Subjective Outcomes

Little variation in patient-level outcomes was reported by respondents. However, clinics with higher 9-month BP control tended to report stronger pharmacist influence regarding decisions of pharmacist services after the study, compared to clinics with lower 9-month BP control. Relevant comments include the following:

"Working with Director of Clinic to implement more pharmacy services and teaching opportunities" (pharmacist, clinic D)

"more pharmacist services being performed" (pharmacist, clinic F)

"more direct patient care by the pharmacist" (pharmacist, clinic H)

In addition, fewer administrators responded in clinics with lower 9-month BP control, when compared to clinics with higher BP control, limiting the understanding of clinic-level outcomes.

Future Prospects

Little difference was found between the clinics with higher and lower 9-month BP control regarding future prospects of physician-pharmacist collaboration, which included items concerning relationships, visibility, reimbursement, and collaboration mechanisms.

Asthma Intervention Sites

Among all 10 sites in the asthma intervention group, the percentage of patients with controlled asthma ranged from 13.3%-66.7% at baseline, and ranged from 25-87.5%

at nine months. After eliminating the sites that did not provide at least one physician interview and one pharmacist interview, as well as the sites with greater than 50% of patients with controlled asthma at baseline, the remaining four sites were retained for cross-case analysis (**Table 4-4**).

Context and Clinic Stratification Criteria

Similar to the pattern found across the BP intervention sites, clinics with less improvement in asthma control tended to serve high minority, low income and less well-educated populations. The clinic with the lowest pharmacy structure score at baseline had the greatest improvement in asthma control. In addition, there were differences in specialty area, as clinic W was an internal medicine residency site, whereas the other sites were family medicine residency sites.

Inputs

Some contrasts were found between the site with the lowest improvement in asthma control (clinic W) and the site with the highest improvement (clinic V). First, both physician and pharmacist workload impacted collaboration at clinic W, and respondents from this site indicated their busyness:

"very busy clinic leads to lots of patient appointments at one time" (pharmacist, clinic W)

"Pharmacist is often booked and unable to see any more patients during the day" (physician, clinic W)

In contrast, pharmacist workload and availability did not seem to impact collaboration and pharmacist visits at clinic V:

"The pharmacist's schedule varied each month due to hospital rotations. But the pharmacist worked hard to make time for study patients, even before 8:00 am or after 5:00 pm. So this was really a minor problem." (study coordinator, clinic V)

Second, the study triggered development of the collaborative practice agreement at clinic V, whereas clinic W had already had them in place prior to the study. Third, as

was found at BP intervention sites, the sites with better improvement in asthma control were more likely to have little staff involvement with pharmacist practice with study subjects. Finally, clinic leadership and pharmacist presentation to providers and/or staff were again reported in the site with the highest improvement in asthma control, but not in the site with the lowest improvement.

Processes, Subjective Outcomes, and Future Prospects

No distinct patterns occurred between clinics with better and lower improvement in asthma control in terms of processes, subjective outcomes, and future prospects. Of note, administrator interview data regarding clinic outcomes were missing from clinics with less improvement in asthma control.

Discussion

This study provided insights regarding how team-based care can be implemented and tested in a national practice-based research network (PBRN). At baseline, the extent of pharmacy services varied across individual clinics as seen in pharmacy structure scores and frequency of referrals to pharmacists. Our study found that an indirect effect of participating in the CAPTION trial was that some of the clinics with lower pharmacy structure scores had the opportunity to expand their pharmacy services to improve patient care. This adds to the literature that PBRN participation can facilitate innovation uptake and provide benefits to the practice beyond the objectives of individual PBRN studies (Carpenter et al., 2012; Yawn et al., 2010). The CAPTION study protocol included recommended pharmacist activities and follow-up frequencies for BP and asthma management. We speculate that these recommendations, as well as the workflow procedures and collaborative working relationships developed at individual sites may have served as resources to support development of similar chronic disease management programs by their clinic pharmacists, such as diabetes and hyperlipidemia. Future follow-up surveys examining the elements and extent of the intervention that were retained and

continued at individual PBRN sites after the end of the trial would be helpful in understanding the diffusion effects of the interventions.

Most of the physicians, pharmacists, administrators, and study coordinators were receptive to the physician-pharmacist collaborative management intervention in both BP and asthma groups, and there was high acceptance of pharmacist recommendations by physicians. Such findings are not surprising as the majority of these clinics have been providing clinical pharmacy services for over five years and collaborative working relationships between physicians and pharmacists have been well-developed (Dickerson et al., 2007). The high acceptance rates of pharmacist recommendations also were consistent with acceptance rates over 85% found in previous studies evaluating pharmacist interventions in primary care (Moczygemba et al., 2011; Von Muenster et al., 2008).

Since CAPTION sites have established pharmacist services for years, physicians recognized the benefits of collaboration and the expertise of clinic pharmacists. Nevertheless, the inertia to change and feelings of being threatened by pharmacist abilities were reported as barriers to collaboration. These findings parallel qualitative results from patient-centered medical home (PCMH) demonstration projects that found that adopting team-based approaches required changes in mental models, and such changes are particularly difficult for physicians who are less used to delegating clinical tasks to other qualified team members (P. A. Nutting et al., 2010; P. A. Nutting et al., 2011). One long-term solution is to promote interprofessional education early in each profession's training program, so that professional students can get used to working in interprofessional teams at an early stage. Core competencies of interprofessional education have recently been developed by professional societies in both the U.S. (Interprofessional Education Collaborative Expert Panel, 2011) and Canada (Canadian Interprofessional Health Collaborative, 2010), and teamwork was one of the main domains in both reports. While some sample learning activities have been proposed, more

research on the effectiveness of interprofessional learning activities are needed to enhance the quality of interprofessional education.

In this study, having on-site pharmacists collaborate with physicians and provide disease state management was helpful in improving patient care. In some ways, patient access to care – one of the Joint Principles of PCMH (American Academy of Family Physicians (AAFP) et al., 2007) – has been enhanced by allowing patients to have follow-up visits with pharmacists. However, these pharmacists often have other responsibilities that limit their availability to see patients, and scheduling for patient visits can become difficult, especially in clinics working with a population having low socioeconomic status. Several respondents envisioned having full-time pharmacists on site, but obtaining sufficient reimbursement to support collaborative work can be challenging. Almost all of the physician respondents agreed that clinic pharmacists should be recognized as health care providers by Medicare, which would allow pharmacists to bill for their services; this change would constitute an important solution for the challenges surrounding reimbursement. In addition, outcomes-based or pay-for-performance reimbursement methods that incentivize improved quality while acknowledging the team's effort have also been raised by some of the respondents. Although the appropriate form of primary care payment is beyond the scope of this study, our findings echo previous studies that found substantial limitations to the current reimbursement mechanism (R. A. Berenson & Rich, 2010; Rosenthal, 2008). Updated payment models could clearly help sustain physician-pharmacist collaborative management directed at improving the quality of primary care.

Clinics that had lower BP control rates tended to have high proportions of minority and indigent patients, as well as high pharmacy structure scores. It is well-established that racial minorities and indigent patients tend to have lower BP control rates (Axon, Gebregziabher, Echols, Msph, & Egede, 2011; CDC, 2013; Umscheid et al., 2010), but the causes of the disparity are not fully understood. Sociodemographic factors,

access to care, health beliefs, medication adherence, care experience, and trust in provider are all possible reasons contributing to the disparity (Axon et al., 2011; CDC, 2013; Cuffee et al., 2013; Kressin, Orner, Manze, Glickman, & Berlowitz, 2010; Umscheid et al., 2010). We had proposed that physician-pharmacist collaborative management could help overcome some barriers leading to disparity, but this was not supported at the clinic level at nine months into the study. There are two possible explanations to this finding. First, clinics with more minority and indigent patients might require more assistance to overcome their barriers and achieve blood pressure control, and require more than nine months to gain control despite a high level of pharmacy services, compared to clinics with fewer minority and low income patients. Patients with higher BP at baseline (such as those from Clinic L) would especially need more time to reach their treatment goals. Second, it is possible that the pharmacists at clinics with high pharmacy structure scores had more patients and disease states to manage, whereas the pharmacists at clinics with low pharmacy structure scores might have more closely focused on patients with hypertension and had more flexibility with scheduling patient visits. Finally, the clinics with higher proportions of minority and indigent populations may have been obligated to provide diversified pharmacy services due to patient needs and were less likely to only focus on patients with hypertension. These explanations, individually or combined, could have resulted in a mismatch between the needs of the minority and indigent population, and the pharmacists' availability and resources. A parallel pattern was found in the cross-case comparison for the asthma intervention group, and such replication strengthens the robustness of this finding (Yin, 2009). Unfortunately, we do not have evidence to support or refute either possibility.

The findings of this study have several implications. First, even when there are no disparities in treatment, pharmacists need to be mindful of the barriers minority and indigent patients might have and tailor their approaches to meet the patients' needs in order to overcome disparity in disease state control. Second, increased manpower and

resources might be needed in clinics with high proportions of minority and indigent patients in order to achieve the same levels of disease state control reached in clinics with lower proportions of minority and indigent patients. Finally, future research should quantify both minority patient needs and pharmacist workload, so that the mismatch between the two can be better understood.

Other findings from the cross-case analysis showed that clinics with lower BP control and lower improvement in asthma control were more likely to have clinic staff involvement with pharmacist patient visits but less likely to have reported that presentation to providers and staff facilitated the study. These clinics might be busier than their counterpart clinics and already have staff helping with rooming or scheduling patients for the pharmacists. However, more coordination and communication is needed when more clinic personnel are involved; hence, it may have been useful for these clinics to provide regular updates to providers and staff, so that the group's process to improve patient disease state control may be more consistent.

This study has a few limitations. First, there might have been non-response bias, where the clinic personnel that did not participate in the interviews may have had different experiences than the ones that participated. Also, the clinics that were dropped from data analysis because of not providing at least one physician interview and one pharmacist interview may have also been different than the clinics that entered data analysis. Such bias is less likely in the BP intervention group, since one of the two clinics dropped was classified as having higher BP control while the other was classified as having lower BP control. Non-response bias is a greater concern in the analysis of asthma intervention clinics, where the four clinics dropped due to missing interview data had no change or an improvement in asthma control of less than 13% from baseline to 9 months. Two of these sites also had high patient drop-out rates at 9 months (31% and 43%). Second, there might have been recall bias as some of the questions asked about conditions prior to the beginning of the CAPTION trial. The respondents might have had

difficulty recalling conditions in the past, and the responses on those questions might be less accurate. Third, as each site was only expected to recruit up to 24 BP patients (and site I and site J were only asked to recruit up to 12 patients), the clinic-level BP control and asthma control rates are more likely to be affected by one patient's outcome in clinics with smaller number of enrolled patients. Future studies with larger number of patients per clinic will be helpful to further explore clinic-level influences on patient outcomes. Finally, this study was conducted in clinics that have already been providing pharmacy services for years. Therefore, the findings in the study may not be directly generalized to clinics just starting to establish pharmacy services.

Conclusion

The experiences of clinic personnel regarding physician-pharmacist collaborative management of blood pressure and asthma were positive overall, though each clinic had its own unique barriers. Clinics with poorer outcomes were more likely to have higher proportions of indigent and minority populations and busier pharmacist workload, indicating the importance of developing additional approaches to working with these populations and conducting future research to better quantify pharmacist workload and measure success.

Table 4-1. Characteristics of CAPTION Clinics Retained for Case Study Analysis

Clinic ID	Region	Pharmacy Service Structure Score	Minority Group Percentage	Number of Usable Interviews			
				Physician	Pharmacist	Admin	SC
BP Intervention Sites (18 Sites)							
A	South	High	High	3	1	1	1
B	Midwest	High	High	3	1	0	1
C	South	High	High	3	1	0	1
D	South	Low	High	2	1	0	0
E	West	High	Low	2	1	0	0
F	Midwest	High	Low	2	1	1	1
G	Midwest	Low	Low	2	1	1	1
H	Midwest	Low	Low	3	1	1	1
I	Midwest	High	High	3	1	0	1
J	West	High	Low	2	1	0	0
K	Northeast	High	High	3	1	0	1
L	Midwest	High	High	1	1	1	1
M	South	High	High	2	1	0	1
N	South	High	High	2	1	0	1
O	Northeast	Low	High	3	1	0	1
P	Northeast	High	Low	1	1	1	0
Q	West	Low	Low	3	1	1	1
R	South	Low	Low	2	1	0	1
			Total	42	18	7	14
Asthma Intervention Sites (6 Sites)							
S	Northeast	High	High	2	1	0	1
T	West	High	High	3	1	0	0
U	South	High	Low	2	1	1	1
V	South	Low	Low	2	1	1	1
W	Northeast	High	High	2	1	0	1
X	Midwest	High	Low	3	1	1	1
			Total	14	6	3	5

Note: Admin – Administrator; SC – Study Coordinator.

Table 4-2. Within-case Analysis of Blood Pressure Intervention Sites (N=18) and Asthma Intervention Sites (N=6)

Category	Theme	Number of sites with positive opinions	Number of sites with negative opinions	Number of sites with mixed opinions	Number of sites with no evidence
Context					
Patient population	• Clinic serves an indigent population and/or a population with low education. #	15	2	0	7
Input					
Physician workload	• More physician workload led to more collaboration.	7	5	12	0
Pharmacist workload	• Pharmacist workload impacted collaboration.	9	4	11	0
	• Pharmacist spends majority of time in clinic.	18	6	0	0
	• Pharmacist teaching/other non-patient care responsibilities impacted ability to collaborate. #	11	0	1	12
Clinic workflow	• Clinic workflow was conducive to collaboration.	12	1	11	0
	• Pharmacist scheduled patient visits.	11	13	0	0
	• Study coordinator scheduled patient visits.	9	15	0	0
	• Office staff scheduled patient visits.	8	16	0	0
	• Scheduling was challenging.	6	2	9	7
Clinic space	• There were not enough exam rooms.	4	13	2	5
Physician beliefs	• There were positive physician beliefs about pharmacist work.	4	1	19	0
Formal agreement	• This site has at least one collaborative practice agreement in place prior to CAPTION.	14	10	0	0
	• CAPTION triggered development of collaborative practice agreement.	1	15	3	5
	• Physicians were not aware of the collaborative practice agreement(s) in place at the clinic. #	1	10	5	8
	• Physicians noted fewer disease states for pharmacist management than the list pharmacist provided.#	7	11	1	5
Office staff support	• Clinic staff played little role in CAPTION. #	7	8	8	1
	• Nurses/MA's helped room patients. #	6	2	0	16
Patient factors	• No-shows impacted pharmacist ability to control chronic disease.	12	3	9	0

Table 4-2. Continued

Category	Theme	Number of sites with positive opinions	Number of sites with negative opinions	Number of sites with mixed opinions	Number of sites with no evidence
	• Transportation was a barrier for some patients. #	5	0	0	19
	• Patient non-adherence was a concern. #	8	0	0	16
Other facilitators	• Clinic leadership supported collaboration. #	12	0	1	11
	• Pharmacist presenting CAPTION to providers and/or staff facilitated the study. #	11	0	0	13
Process					
Physician acceptance	• Physicians receptive to pharmacist recommendations prior to CAPTION.	19	0	5	0
	• 76-100% of the time physicians accept pharmacist recommendations.	19	0	5	0
Communication	• One or more physicians favored verbal or face-to-face communication.	19	4	1	0
	• Pharmacist favored verbal or face-to-face communication.	15	9	0	0
	• Physician forgets to read and/or approve pharmacist changes in EMR. #	4	0	0	20
	• There was poor communication with clinic staff. #	8	1	1	14
Subjective Outcome					
Patient outcome	• Collaboration was successful for improving disease state control.	22	0	2	0
	• Patients perceived collaboration positively.	13	0	11	0
	• Collaboration negatively impacted patient-physician relationships.	0	22	2	0
Provider outcome	• Physician workload increased after collaboration.	0	18	6	0
	• Physician referred patients to pharmacists in the past.	10	3	11	0
	• Referrals have increased since CAPTION.	9	4	11	0
	• Pharmacist ability to influence decisions of pharmacist services has changed since CAPTION.	8	16	0	0

Table 4-2. Continued

Category	Theme	Number of sites with positive opinions	Number of sites with negative opinions	Number of sites with mixed opinions	Number of sites with no evidence
Clinic outcome	• Intervention had no impact on workflow.	9	2	1	12
	• Clinic billed for pharmacist services prior to CAPTION.	7	2	1	14
	• Clinic billing practices has changed since CAPTION.	1	8	1	14
	• Clinic currently bills for pharmacist services.	8	2	0	14
	• Clinic charged co-pays for pharmacist visits. #	2	0	0	22
	• CAPTION had positive effects on revenue.	2	8	0	14
Future prospects					
	• Pharmacist building rapport with physicians is important for collaboration. #	16	0	0	8
	• Pharmacist should be on site/visible to be integrated in workflow. #	23	0	0	1
	• Reimbursement needs to be in place for integrating pharmacists. #	21	0	0	3
	• Pharmacists should be recognized as Medicare providers.	23	0	1	0
	• Clinic pharmacists should be recognized as Medicare providers, not retail pharmacists. #	4	0	0	20
	• Pharmacists should see patients on same day of physician visit at the clinic. #	12	0	0	12
	• Pharmacists should see patients at intervals between physician visits. #	6	0	0	18

[#] Themes derived from open-ended comments.

Table 4-3. Cross-case Analysis of Blood Pressure Intervention Sites (N=10)

		Higher BP Control						Lower BP Control			
	Clinic ID	**D**	**Q**	**F**	**H**	**G**	**O**	**M**	**L**	**I**	**B**
Objective outcome											
	• % of patients with controlled BP at 9 mo	71%	63%	60%	58%	54%	54%	29%	26%	25%	22%
	N of controlled patients at 9 mo	17	15	6	14	13	13	7	5	3	2
	N of missing data at 9 mo	3	1	0	3	2	5	6	3	1	0
	N of enrolled patients	24	24	10	24	24	24	24	19	12	9
	Mean systolic BP at baseline (mmHg)	149	146	150	147	151	150	143	157	148	155
	Mean diastolic BP at baseline (mmHg)	82	84	81	83	80	89	83	90	84	92
	Mean change in systolic BP from baseline to 9 mo (mmHg)	-19	-20	-25	-21	-19	-20	-12	-20	-12	-8
	Mean change in diastolic BP from baseline to 9 mo (mmHg)	-10	-10	-11	-10	-7	-11	-5	-9	-7	-6
	% of enrolled patients diagnosed with diabetes or CKD	50%	67%	60%	71%	38%	42%	63%	58%	33%	56%
Clinic stratification											
	• Pharmacy structure score	L	L	H	L	L	L	H	H	H	H
	• Minority group %	H	L	L	L	L	H	H	H	H	H
Context											
Patient population	• Clinic serves an indigent and/or minority population.	+	0	+	+	0	+	+	+	+	+
Input											
Physician workload	• More physician workload led to more collaboration.	+/-	-	+/-	+/-	+/-	+	+	-	+	+
Pharmacist workload	• Pharmacist workload impacted collaboration.	+	+	+/-	+	+/-	+/-	+	+/-	+	+
	• Pharmacist spends majority of time in clinic.	+	-	+	+	+	+	+	+	+	-
	• Pharmacist teaching/other non-patient care responsibilities impacted ability to collaborate.	+	+	0	+	+	+	+	+	0	+
Clinic workflow	• Clinic workflow was conducive to collaboration.	+	+/-	+/-	+	+	+/-	+	+	+	+/-
	• Pharmacist scheduled patient visits.	-	+	+	-	+	-	-	-	+	-
	• Study coordinator scheduled patient visits.	+	-	-	+	-	+	-	-	-	+
	• Office staff scheduled patient visits.	-	-	+	-	-	-	+	+	-	-
	• Scheduling was challenging.	0	+/-	0	+/-	+/-	-	0	+/-	+	+
Clinic space	• There were not enough exam rooms.	0	-	-	+/-	-	+	0	-	-	+/-
Physician beliefs	• There were positive physician beliefs about pharmacist work.	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+

Table 4-3. Continued

		Higher BP Control						Lower BP Control			
	Clinic ID	**D**	**Q**	**F**	**H**	**G**	**O**	**M**	**L**	**I**	**B**
Formal agreement	• This site has at least one collaborative practice agreement in place prior to CAPTION (based on pharmacist response).	+	+	+	-	+	-	+	-	+	-
	• CAPTION triggered development of collaborative practice agreement.	-	-	-	-	-	+/-	-	0	-	+/-
Office staff support	• Clinic staff played little role in CAPTION.	+	+	+/-	+/-	+/-	0	+	-	+/-	+/-
	• Nurses/MA's helped room patients.	0	-	0	0	0	0	0	0	+	+
Patient factors	• No-shows impacted pharmacist ability to control chronic disease.	+	+/-	-	+/-	+/-	+/-	+	+	-	-
	• Transportation was a barrier for some patients.	0	0	+	0	0	+	0	0	+	0
	• Patient non-adherence was a concern.	0	+	0	0	0	0	0	+	+	0
Other facilitators	• Clinic leadership supported collaboration.	0	+	0	0	+	+	0	+	+/-	0
	• Pharmacist presenting CAPTION to providers and/or staff facilitated the study.	0	0	+	+	0	+	0	0	0	0
Process											
Physician acceptance	• Physicians receptive to pharmacist recommendations prior to CAPTION.	+	+	+	+	+	+/-	+	+	+/-	+
	• 76-100% of the time physicians accept pharmacist recommendations.	+	+/-	+/-	+	+	+	+	+	+	+
Communication	• One or more physicians favored verbal or face-to-face communication.	+	+	+	+	+	+	+	+/-	+	+
	• Pharmacist favored verbal or face-to-face communication.	-	-	+	+	+	+	-	+	-	+
	• Physician forgets to read and/or approve pharmacist changes in EMR.	0	0	0	+	0	0	0	0	0	0
	• There was poor communication with clinic staff.	+	0	+	0	0	0	0	-	0	0
Subjective Outcome											
Patient outcome	• Collaboration was successful for improving disease state control.	+	+	+	+	+	+	+	+/-	+	+
	• Patients perceived collaboration positively.	+	+	+	+/-	+/-	+/-	+	+/-	+	+

Table 4-3. Continued

		Higher BP Control						Lower BP Control			
	Clinic ID	**D**	**Q**	**F**	**H**	**G**	**O**	**M**	**L**	**I**	**B**
	• Collaboration negatively impacted patient-physician relationships.	-	-	-	-	-	-	-	-	-	-
Provider outcome	• Physician workload increased after collaboration.	-	-	+/-	+/-	-	-	-	-	-	+/-
	• Physician referred patients to pharmacists in the past.	+	+/-	+/-	-	+	-	+/-	+/-	+	+
	• Referrals have increased since CAPTION.	+	+/-	+	+/-	+/-	+	+/-	+	-	+
	• Pharmacist ability to influence decisions of pharmacist services has changed since CAPTION.	+	-	+	+	-	-	-	-	-	-
Clinic outcome	• Intervention had no impact on workflow.	0	+	+	+	+	0	0	+	0	0
	• Clinic billed for pharmacist services prior to CAPTION	0	+	+	+/-	+	0	0	-	0	0
	• Clinic billing practices has changed since CAPTION.	0	-	-	+/-	-	0	0	-	0	0
	• Clinic currently bills for pharmacist services.	0	+	+	+/-	+	0	0	-	0	0
	• Clinic charged co-pays for pharmacist visits.	0	0	0	0	0	0	0	0	0	0
	• CAPTION had positive effects on revenue.	0	-	-	-	+	0	0	-	0	0
Future prospects											
	• Pharmacist building rapport with physicians is important for collaboration.	0	+	0	+	0	+	+	+	+	0
	• Pharmacist should be on site/visible to be integrated in workflow.	+	+	+	+	+	+	+	0	+	+
	• Reimbursement needs to be in place for integrating pharmacists.	+	+	+	+	+	+	0	+	+	+
	• Pharmacists should be recognized as Medicare providers.	+	+	+	+	+	+	+	+	+/-	+
	• Clinic pharmacists should be recognized as Medicare providers, not retail pharmacists.	0	+	0	0	0	0	0	0	0	0
	• Pharmacists should see patients on same day of physician visit at the clinic.	0	+	0	0	+	0	+	+	0	0
	• Pharmacists should see patients at intervals between physician visits.	0	+	0	+	0	0	+	0	+	+

Note: L: low, H: high, +: sites with supporting evidence, -: sites with conflicting evidence, +/-: sites with mixed opinions, 0: sites with no evidence, CKD: chronic kidney disease.

Table 4-4. Cross-case Analysis of Asthma Intervention Sites (N=4)

	Clinic ID	V	X	S	W
Objective outcome					
	• Change in % of patients with controlled asthma from baseline to 9 months	43.8%	36.4%	25.0%	6.7%
	• % of patients with controlled asthma at baseline	25.0%	27.3%	18.8%	13.3%
	• % of patients with controlled asthma at 9 months	68.8%	63.6%	43.8%	20.0%
	N of controlled patients at 9 months	11	7	7	3
	N of missing data at 9 months	1	3	3	4
	N of enrolled patients	16	11	16	15
Clinic stratification					
	• Pharmacy structure score	L	H	H	H
	• Minority group %	L	L	H	H
Context					
Patient population	• Clinic serves an indigent and/or minority population.	0	0	+	+
Input					
Physician workload	• More physician workload led to more collaboration.	+/-	+/-	+/-	+
Pharmacist workload	• Pharmacist workload impacted collaboration.	-	+/-	+/-	+
	• Pharmacist spends majority of time in clinic.	+	+	-	+
	• Pharmacist teaching/other non-patient care responsibilities impacted ability to collaborate.	+	0	0	0
Clinic workflow	• Clinic workflow was conducive to collaboration.	+/-	+/-	+/-	+/-
	• Pharmacist scheduled patient visits.	+	-	+	+
	• Study coordinator scheduled patient visits.	-	+	+	-
	• Office staff scheduled patient visits.	-	-	-	-
	• Scheduling was challenging.	+/-	+/-	+/-	+
Clinic space	• There were not enough exam rooms.	-	-	+	0
Physician beliefs	• There were positive physician beliefs about pharmacist work.	+/-	+/-	+/-	+/-
Formal agreement	• This site has at least one collaborative practice agreement in place prior to CAPTION (based on pharmacist response).	-	+	-	+
	• CAPTION triggered development of collaborative practice agreement.	+	0	0	+/-
	• Physicians were not aware of the collaborative practice agreement(s) in place at the clinic.	-	+/-	0	-
	• Physicians noted fewer disease states for pharmacist management than the list pharmacist provided.	-	+/-	0	-

Table 4-4. Continued

	Clinic ID	V	X	S	W
Office staff support	• Clinic staff played little role in CAPTION.	+/-	+	-	+/-
	• Nurses/MA's helped room patients.	0	-	0	+
Patient factors	• No-shows impacted pharmacist ability to control chronic disease.	+	+/-	+	+
	• Transportation was a barrier for some patients.	0	+	0	0
	• Patient non-adherence was a concern.	+	+	+	0
Other facilitators	• Clinic leadership supported collaboration.	+	+	0	0
	• Pharmacist presenting CAPTION to providers and/or staff facilitated the study.	+	+	+	0
Process					
Physician acceptance	• Physicians receptive to pharmacist recommendations prior to CAPTION.	+	+	+/-	+
	• 76-100% of the time physicians accept pharmacist recommendations.	+	+	+/-	+
Communication	• One or more physicians favored verbal or face-to-face communication.	+	+	+	+
	• Pharmacist favored verbal or face-to-face communication.	+	-	+	+
	• Physician forgets to read and/or approve pharmacist changes in EMR.	0	0	+	0
	• There was poor communication with clinic staff.	0	+	+/-	+
Subjective Outcome					
Patient outcome	• Collaboration was successful for improving disease state control.	+	+	+	+
	• Patients perceived collaboration positively.	+/-	+	+	+/-
	• Collaboration negatively impacted patient-physician relationships.	-	-	+/-	-
Provider outcome	• Physician workload increased after collaboration.	-	+/-	-	+/-
	• Physician referred patients to pharmacists in the past.	+/-	+/-	+/-	+/-
	• Referrals have increased since CAPTION.	+	+/-	+/-	+/-
	• Pharmacist ability to influence decisions of pharmacist services has changed since CAPTION.	+	+	-	+
Clinic outcome	• Intervention had no impact on workflow.	+	+	-	0
	• Clinic billed for pharmacist services prior to CAPTION	+	+	0	0
	• Clinic billing practices has changed since CAPTION.	-	-	0	0
	• Clinic currently bills for pharmacist services.	+	+	0	0
	• Clinic charged co-pays for pharmacist visits.	0	0	0	0
	• CAPTION had positive effects on revenue.	-	-	0	0
Future prospects					
	• Pharmacist building rapport with physicians is important for collaboration.	0	+	+	+
	• Pharmacist should be on site/visible to be integrated in workflow.	+	+	+	+

Table 4-4. Continued

Clinic ID	V	X	S	W
• Reimbursement needs to be in place for integrating pharmacists.	+	+	+	0
• Pharmacists should be recognized as Medicare providers.	+	+	+	+
• Clinic pharmacists should be recognized as Medicare providers, not retail pharmacists.	0	0	+	0
• Pharmacists should see patients on same day of physician visit at the clinic.	+	+	+	0
• Pharmacists should see patients at intervals between physician visits.	0	0	0	0

Note: L: low, H: high, +: sites with supporting evidence, -: sites with conflicting evidence, +/-: sites with mixed opinions, 0: sites with no evidence.

CHAPTER FIVE:
[STUDY THREE]
ORGANIZATIONAL DETERMINANTS OF EFFECTIVE PRIMARY CARE TEAMS INCORPORATING PHARMACISTS IN OUTPATIENT SETTINGS: A MULTIPLE-CASE STUDY

Introduction

In the modern society, chronic diseases such as heart disease, stroke, and diabetes have become the leading causes of death both in the United States and worldwide (CDC, 2012; World Health Organization, 2012). With early recognition and proper management, however, many of the complications from chronic diseases could be prevented or delayed. Taking such a proactive approach in managing a population often requires the use of team-based approaches and delegation of certain clinical and nonclinical tasks to non-physician team members (Wagner et al., 1996). Previous studies including rigorous randomized controlled trials have examined the effect of primary care teams compared to non-team approaches and have provided evidence that team care often is associated with better patient outcomes (Lemieux-Charles & McGuire, 2006). In addition, both the Institute of Medicine (IOM) and Joint Commission have recommended the use of team-based approaches and coordination between care processes (IOM, 2001; Joint Commission on Accreditation of Healthcare Organizations, 2003). As a result, primary care teams involving interprofessional clinicians are becoming more prevalent in recent health care reform efforts such as patient-centered medical homes, and more attention is being placed on proactively managing chronic illnesses (R. A. Berenson et al., 2008; Bodenheimer, Wagner, & Grumbach, 2002; P. A. Nutting et al., 2009; Wagner et al., 1996).

As management of most chronic diseases involves medication therapies, an evolving role in primary care teams is pharmacists performing clinical responsibilities

instead of traditional dispensing duties, and being responsible for drug therapy outcomes (Hepler & Strand, 1990). Such responsibilities may include taking medication histories, identifying drug therapy problems (DTPs) through patient assessment and chart reviews, resolving DTPs through making recommendations to physicians, referrals to other professions, or patient education, and prevention of potential DTPs through regular follow-ups (Hepler & Strand, 1990).

In addition, some pharmacists have developed collaborative drug therapy management (CDTM) agreements with physicians where pharmacists provide patient assessment and therapy adjustments for patients with specific chronic diseases (Hammond et al., 2003; Sachdev & Kliethermes, 2012). A recent meta-analysis found that pharmacists providing direct patient care were able to improve clinical outcomes in patients with diabetes, hypertension, and hyperlipidemia (Chisholm-Burns et al., 2010). While some of these patient care activities were provided in pharmacist-managed clinics (Okamoto & Nakahiro, 2001) or community pharmacies (Nola et al., 2000), others were provided in group practices or multidisciplinary clinics (Odegard, Goo, Hummel, Williams, & Gray, 2005; Taylor, Byrd, & Krueger, 2003), where there are opportunities to promote interprofessional exchanges and foster streamlined patient-centered care (Carter & Helling, 1992).

To implement and disseminate team-based approaches involving pharmacists in primary care settings requires an understanding of the context that can either facilitate or prohibit the translation of evidence established in randomized controlled trials. There have been several studies examining the team-level determinants of team effectiveness in health care (Buljac-Samardzic, Dekker-van Doorn, van Wijngaarden, & van Wijk, 2010; Lemieux-Charles & McGuire, 2006; Poulton & West, 1999; San Martin-Rodriguez et al., 2005), but few studies have examined the influence from higher levels, such as organizational characteristics (Lemieux-Charles & McGuire, 2006; Mathieu et al., 2008; San Martin-Rodriguez et al., 2005). Recent studies evaluating implementation of new

practice models have indicated that organizational support is crucial for success (IOM, 2001; P. A. Nutting et al., 2010; Yano, 2008). Yet the lack of knowledge of what essential organizational support is needed to improve team effectiveness is an important problem because organizations may be wasting dollars implementing futile organizational changes and frontline healthcare team members may be frustrated with unmet needs to improve their practice. Therefore, this study sought to examine the organizational influences on primary care teamwork, as well as how pharmacists have been incorporated in clinic practices.

Literature Review

The Integrated (Health Care) Team Effectiveness Model (ITEM) has been developed to understand the determinants of team effectiveness and was adapted for use in this study (**Table 5-1**) (Lemieux-Charles & McGuire, 2006). It incorporates organizational context and characterizes organizational influence on team outcomes through the mediation of team inputs, team processes, and team psycho-social traits.

Organizational context in this model refers to influences higher than the team level and generally includes organizational goals, rewards, structure, resources, training, and space (Ducanis & Golin, 1979; Lemieux-Charles & McGuire, 2006). Organizational goals have been defined as "desired state of affairs which the organization attempts to realize" (Etzioni, 1964), and may be reflected in organizational mission statements (Fairhurst et al., 1997). One example is the teaching status of the organization. Academic settings with an education mission are often willing to participate in interdisciplinary training programs and practice redesign demonstration projects to improve the effectiveness of patient care (Haines et al., 2011; Reuben et al., 2004), despite the potential loss in efficiency of care (Ducanis & Golin, 1979). A closely related concept, organizational reward for teamwork, has also been found to impact team functioning if absent or insufficient, especially when extra time and efforts are required to attend team

meetings with increased workload (Cashman et al., 2004; Gladstein, 1984; Reuben et al., 2004; Xyrichis & Lowton, 2008).

Organizational structure has been proposed to impact team functioning through bureaucracy (Ducanis & Golin, 1979) and has been shown to impact the quality of chronic care management (Rittenhouse & Robinson, 2006; Russell et al., 2009; Shi et al., 2003; Shi et al., 2010; Starfield et al., 1994). In a study conducted in Ontario, community health centers (CHCs) which have extensive multidisciplinary teamwork helping the underserved were found to be associated with better performance on diabetes process measures, when compared to fee-for-service, family health network, and health service organization models (Russell et al., 2009). Similar findings were seen in a U.S. study comparing patient experiences in CHCs with those in health maintenance organizations (HMOs) (Shi et al., 2003). While there may be many patient-level reasons explaining the differences, the organizational structure and dynamics of teamwork may play a role and were further explored in this study.

Organizational resources in terms of perceived resource availability and the degree of training have both been found to influence team effectiveness (Gladstein, 1984; Temkin-Greener et al., 2004), but perhaps clinical information system is the infrastructure component that has been studied most often regarding improvement of patient outcomes (Coleman et al., 2009; Fleming et al., 2004; M. L. Pearson et al., 2005; Si et al., 2005). A recent survey showed that 62% of medical offices had fully implemented electronic records (Sorra et al., 2012); however, how the implementation of electronic records influences teamwork in primary care offices is less clear.

Finally, through ethnographic studies, the design of space and time is beginning to receive more attention in regards to how it affects interprofessional teamwork in health care settings (I. F. Oandasan et al., 2009; Rapport et al., 2006; Rapport et al., 2007). Oandasan and colleagues (2009) observed and interviewed staff in three family health

centers and found providers visible to each other were more likely to collaborate effectively and interact socially. These factors were scrutinized in this study.

Other main components of the ITEM including team inputs, team processes and psycho-social traits will be examined in this study to supplement the findings of organizational context. Team inputs are shaped by organizational context and include two dimensions – team composition and task design. Framed as "practice redesign", these dimensions have been emphasized in Wagner's Chronic Care Model, and delegation of tasks to respective non-physician team members is essential in moving into proactive, planned care for patients with chronic diseases (Wagner et al., 1996).

The mediators between team inputs and effectiveness are team processes and psycho-social traits (Lemieux-Charles & McGuire, 2006). The four concepts that were examined in this study are communication, coordination, collaboration (in terms of care sharing activities), and team climate (N. R. Anderson & West, 1998; N. Anderson & West, 1996; Sicotte et al., 2002). All of these concepts have been found to be positively associated with perceived team effectiveness (Lemieux-Charles & McGuire, 2006). Team climate, defined by Anderson and West as the team's shared perceptions of vision, participation safety, task orientation, and support for innovation (N. R. Anderson & West, 1998; N. Anderson & West, 1996), has specifically been found to be associated with better care processes for diabetes and patient evaluations of practice (Bower et al., 2003).

As an outcome, team effectiveness has been conceptualized in different perspectives from patients, providers, and organizations (Lemieux-Charles & McGuire, 2006). While provider-level outcomes were the emphasis of this study, providers' perceptions of patient care and organizational efficiency were used to proxy other patient-level and organizational-level outcomes (Poulton & West, 1999).

Objectives

The three objectives of this study were to (1) characterize team-based approaches in primary care clinics, (2) describe and explain how organizational factors influence the effectiveness of healthcare teams incorporating pharmacists in primary care clinics, and (3) describe how pharmacists function in primary care clinics beyond traditional dispensing responsibilities.

Methods

Design

To study the organizational context of primary care teamwork in naturalistic settings, this study used a multiple-case study design. According to Yin (2009), "A case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (p. 18). By using multiple sources of evidence to study multiple variables of interest in a limited number of settings, multiple-case studies are valuable in providing rich descriptions of the phenomenon of interest and foundations for theory building (Eisenhardt, 1989; Yin, 2009).

Case Definition & Selection

For this study, a case was defined as a unique physical site of a primary care practice setting with pharmacist service. Purposeful sampling was used to identify primary care clinics providing pharmacist services beyond dispensing in the Midwestern US. Maximum variation in organizational context was sought, including differences in health-system affiliation, university-based, location, and physician specialty. Clinics participating in the Collaboration Among Pharmacists Physicians To Improve Outcomes Now (CAPTION) trial were deliberately excluded from this study to avoid response burden, as similar interview questions were asked previously. Key informants at the

American College of Clinical Pharmacy Practice-Based Research Network (ACCP PBRN), the Minnesota Pharmacy Practice-Based Research Network (MPPBRN), and eight colleges of pharmacy in the Midwestern US assisted with identifying potentially eligible clinics. The ACCP PBRN provided a list of its members who met the sampling criteria and agreed to be contacted by the researchers. The director of MPPBRN emailed all of its members with his personal message and a standardized invitation letter as attachment in early January 2013, and members interested in participating in the study were asked to contact the PI directly. Between January and July 2013, pharmacists from 24 clinics identified through the ACCP PBRN and faculty from colleges of pharmacy were also contacted by email with a personal message and the same standardized invitation letter by the PI. If there was no response within one week of the first email, a reminder email was sent. The PI explained about the project and screened for clinic eligibility by phone with the pharmacists who indicated interest in participating. The pharmacists who agreed to participate in the study in the phone call served as the main site contacts and assisted with obtaining clinic administrator approval and planning for the data collection site visits.

Data Collection

This study followed a triangulation approach and collected data based on observations, individual interviews, questionnaires, and document review from each site. Between February and July in 2013, the principal investigator (PI) spent one to three days at each site and worked with the contact pharmacist and/or clinic administrator to identify one to two individuals in each of the different roles as study participants. Typical site visits started with shadowing clinic staff to understand clinic workflow, followed by one-on-one interviews with study participants during lunch hours. At the end of the interviews, questionnaires with stamped envelopes were given to be returned to the PI either on site or by mail. Study participants were given a lunch box as compensation. The

PI also kept reflexive memos to facilitate iterative data analysis and improve the trustworthiness of the qualitative inquiry (Lincoln & Guba, 1985).

Observations

The observations focused on the physical environment, e.g., shared space, as well as team processes, e.g., communication, coordination, and collaboration between clinic members. Most of the observations were accomplished by shadowing clinic nurses, clerks, and pharmacists. The PI also sat in clinic team meetings if they were available during the site visit. The findings from the observations were documented in field notes and any clarifying questions that came up were asked during the individual interviews.

Individual Interviews

Semi-structured interviews were used to understand the organizational factors influencing the effectiveness of the primary care team at each site. Two versions of the interview guide were developed: one for pharmacist participants and one for non-pharmacist participants, such as administrators, physicians, physician assistants, nurses, clerks, and other professionals in the clinic (**Appendix A**).

Most of the non-pharmacist interviews were completed in 20-30 minutes. The pharmacist interviews were completed in 30-45 minutes with additional questions regarding pharmacist role. To improve response rates and accommodate for clinic workflow, interviews were separated into different segments whenever needed. All interviews were audio-recorded and transcribed verbatim by the PI and two students (C.L. & Y.Z.). All transcripts were checked for accuracy by the PI.

Questionnaires

The 3-page questionnaire included items regarding team effectiveness, team processes, and team climate (**Appendix A**). Pharmacists were asked to fill out a questionnaire for each of the provider team that agreed to participate in the study. If

questionnaires were not returned within two weeks after the end of the site visit, the site pharmacists were contacted to send a one-time reminder to the individuals who have not responded as a measure to improve response rate.

The 15 items (Items #2-16) for team effectiveness included domains of teamwork, organizational efficiency, health care practices, and patient-centered care based on Poulton & West (1999) and Gerteis, Edgman-Levitan, Daley, & Delbanco (1993). These items were measured on a 7-point response format ranging from "not at all effective" (1) to "highly effective" (7).

Team processes (Items #17-31) were measured using a modified version of the instrument for the intensity of interdisciplinary collaboration (Sicotte et al., 2002). The two domains included care sharing activities (Cronbach's alpha=0.907) and interdisciplinary co-ordination (Cronbach's alpha=0.887). Both were measured on a 7-point Likert response ranging from "strongly disagree" (1) to "strongly agree" (7).

Finally, team climate was measured using a short version of the Team Climate Inventory (TCI) which has been shown to be a valid and reliable instrument (N. R. Anderson & West, 1998; N. Anderson & West, 1996; Kivimäki & Elovainio, 1999). Three of the four domains were retained in this study, which were participatory safety (Items #32-35, Cronbach's alpha=0.892), task orientation (Items #36-38, Cronbach's alpha=0.855), and support for innovation (Items #39-41, Cronbach's alpha=0.864). Participatory safety and task orientation were measured on a 7-point Likert response ranging from "strongly disagree" (1) to "strongly agree" (7), and support for innovation was measured on a 7-point response format ranging from "to a very little extent" (1) to "to a very great extent" (7).

Document Review

The CDTM agreements from each site were collected and examined to supplement pharmacist interviews regarding the role of the clinic pharmacist.

Data Analysis

Data analysis for this study was conducted in two phases: First, within-case analysis was conducted to provide a case summary for each site. Second, cross-case analysis was conducted to contrast salient organizational factors and their influences across the sites, as well as the differences in pharmacist roles in the clinic.

The immersion/crystallization (I/C) method was used throughout the data collection and analysis process (Borkan, 1999; Miller & Crabtree, 1994). Briefly, this method involves cycles of engaging in the subject and data, followed by crystallizing patterns. First, the PI conducted a literature review and engaged in the subject for extensive periods of time. Reflection of personal biases on the topic was documented prior to entering the field. Next, initial crystallization of patterns during field data collection were documented in reflexive memos. After returning from the field, the PI spent extensive periods of time immersing in the data by listening to the audio recordings (while checking for transcript accuracy), and reading transcripts reorganized by domains in the theoretical framework (**Table 5-1**) for this study. Then, narrative descriptions of each domain in each case were written into within-case summaries based on all qualitative data gathered. Triangulation between different data sources was used to improve the validity of the inquiry. To ensure consideration of alternative interpretations, peer debriefing with a graduate student (B.U.), was conducted for data from one of the seven cases (Lincoln & Guba, 1985; Spall, 1998). The peer debriefer was not involved with any study procedures but had read through all transcripts for this site. Finally, cross-case comparisons that included both qualitative data and quantitative data from questionnaires were made and the final summary was peer-debriefed with one of the coauthors (W.D.). Questionnaire data were aggregated to the clinic level and descriptive statistics were reported. The mean for each item was used as a pharmacist's response if more than one questionnaire for each provider team were returned.

This study used Atlas.ti 7 (ATLAS.ti GmbH, Berlin, Germany) for organization of qualitative data and IBM SPSS, Version 21 (IBM Corp., Armonk, NY) for quantitative data analysis. The project was approved by the University of Iowa Institutional Review Board (IRB ID#: 201301708).

Results

A total of seven clinics were included in this multiple case study (**Table 5-2**). These clinics were affiliated with five different health systems, two of which were university-based. The two university-based clinics (Clinics 1A & 7E) routinely had medical and pharmacy trainees throughout the year. There were also two clinics affiliated with medical residency programs (Clinics 4C & 5C) that served as resident continuity clinics. Only Clinic 6D was located in a rural community. There was a mix of family medicine and internal medicine clinics, in addition to some multi-specialty clinics. The number of providers (i.e., physician, nurse practitioner or physician assistant) ranged from two to twelve at each site location. Two of the clinics (Clinics 4C & 5C) were located in the same building and shared some staff members. Many of these clinics had either obtained state-certified medical home status (Clinics 4C & 5C) or were in the process of seeking National Committee for Quality Assurance (NCQA) recognition (Clinic 7E). Only four of the clinics incorporated pharmacists in special patient care teams, such as the diabetes care teams in Clinics 4C & 5C, the pharmacist-dietitian team for diabetes education in Clinic 6D, and the interprofessional care management team involving multiple professionals for complex patient cases in Clinic 7E.

An overview of the data collected during the site visits is summarized in **Table 5-3**. The length of site visits ranged from one to three days. After excluding individuals working in more than one clinic in this study, a total of 56 individuals were interviewed (**Table 5-4**), including a regional pharmacy manager whose interview was conducted by phone instead of face-to-face. A total of 60 individuals were surveyed and

57 of them returned completed questionnaires (**Table 5-5**; response rate = 95%). While most of the individuals were both interviewed and given questionnaires, five individuals were only given questionnaires due to limited availability for interviews. A regional pharmacy manager was only interviewed but not given a questionnaire because the manager worked at a different location and would be less knowledgeable of local team functioning. All sites had been providing pharmacy services since at least three years ago. The number of CDTM agreements in place ranged from two disease states (Clinic 7E) to three or more (Clinics 2B, 3B, and 6D).

Questionnaire results are summarized by clinic in **Table 5-6**. For team processes and team climate, Clinic 5C rated higher than other clinics, while Clinic 3B rated lower than other clinics. The same trend was observed for team effectiveness items where Clinic 5C rated the highest on most items and Clinic 3B rated the lowest on most items. Another way of viewing the table is by identifying strengths and weaknesses within clinics. In general, competence of practitioners and respect for patient's values, preferences and expressed needs were rated higher than other items, while staff development, organizational process improvement, and keeping within budgets were rated lower than other items.

The remainder of the results section is separated into two parts: brief descriptions of clinic context organized by clinics, followed by a cross-case analysis organized by themes.

Clinic Descriptions

Clinic 1A

This case was a public university-based, internal medicine clinic located in a metropolitan area. The mission of its health system specifically highlighted interprofessional education and multi-disciplinary, team-based care. There were 12 faculty physicians and roughly 45 support staff, including pharmacists, medical assistants

(MA's), nurses, social workers, clerks, and administrators, who provide services at this location. At different times, there were medical residents, medical students, physician assistant students, pharmacy residents, and pharmacy students who rotated through this site. This clinic had implemented electronic medical records (EMR) a long time ago. The clinic recently moved into a new building. In this new building, the front desk and back office was at a distance that physicians rarely see the front desk staff and clerks perceived a disconnection from the rest of the office.

Patient visits started with checking in at the front desk. Notified by the electronic dashboard, instant message or phone, an MA roomed the patient, took vitals, checked the patient into the computer system, and went through a series of standardized questions. The physician, who worked side-by-side with the MA, then went to see the patient. Each physician-MA pair (and sometimes their assigned residents or medical students) shared one work area with three to four computer stations, and the faculty physician and resident physician each got assigned a MA. The newly designed work space had the capacity to host eight physician-MA pairs at the same time. Four work areas were on one side of the building, and they were only separated by barriers low enough for staff to look over the top of them. An additional four work areas were on the other side of the building. The physician and the MA worked closely to finish follow-ups with the patient and then sent the patient to the check-out desk for scheduling. Roughly 6-7 patients were scheduled per half-day with the faculty and 5 patients were scheduled per half-day with the residents, which totaled about 20-25 patients per day.

Clinics 2B & 3B

Clinics 2B & 3B were affiliated with the same health system, and both clinics were located in a metropolitan area. The mission of the health system highlighted teamwork led by physicians. The pharmacist typically spent one full day a week in Clinic

2B and three full days a week in Clinic 3B. Often there was one pharmacy student that rotated with the pharmacist.

Clinic 2B was a family physician clinic, staffed by five physicians, two rooming staff (either RN or MA background) working with each physician (totaled ten), two lab personnel, one x-ray technician, one referral nurse, five clerks (two at front desk, one at check-out desk, one phone, one billing), and an administrator. This clinic had been at its current location for four years. As part of a health-system initiative, one of the five physicians (Physician #1) had implemented "Family Team Care" two years ago (Anderson, 2005). While all physicians at this clinic were assigned two rooming staff, their organization of care was different. In Physician #1's team, MA #1 roomed a patient, worked on vitals, took extensive patient history, and then huddled with the physician. Next, MA #1 entered the room with the physician and stayed in the room to do recording on the EMR and placed orders for the physician. This allowed MA #1 to learn more about patient care and be knowledgeable of the care plans decided in the room, so that MA #1 is better equipped to answer questions from patients or other staff after the patient visit. MA #2 would do the same things as MA #1, allowing the physician to work from patient to patient more efficiently. There was also more planning for patient visits the night before, and Physician #1's team developed routine maintenance worksheets that are now used by other physicians' teams in the clinic. In contrast, the rooming staff for other physicians in the clinic did not stay in the room with the physician, and only returned to the exam room if there were orders made for the visit.

In Clinic 2B, the front office was away from the back office, causing some segregation and the need for staff to use phones. In the back, each physician had an office and was assigned to three exam rooms. The pharmacist also had an office. The nursing staff sat in an open hallway that facilitated cross-coverage. The laboratory staff sat in an open hallway parallel to the nursing staff. Despite the open design, there was separation between the East side and the West side of the nursing hallway. On one side sat nursing

staff for three physicians, while on the other side sat nursing staff for two other physicians. The pharmacist's office was on the side with the two physicians. At this clinic, each physician saw 25-35 patients a day, adding up to 130-140 patients when four physicians were at the clinic.

Clinic 3B was a multi-specialty clinic with a total of 10 providers: Family practice was provided by five physicians and one nurse practitioner; holistic counseling was provided by one physician; sports medicine was provided by one physician; and urgent care was provided by two physicians. Three physical therapists were also on site. In addition, there were 40 staff members, including 23 clinical staff – Certified Medical Assistants (CMAs), Registered Nurses (RNs), Licensed Practical Nurses (LPNs), a Medical Laboratory Technician (MLT), Radiologic Technologists (Rad Techs) – and 17 office staff.

Clinic 3B opened 18 years ago and had undergone several mergers and acquisitions, some fairly recently. The space was arranged into two pods. Each pod hosted CMA's for three providers. In addition, each pod had a pod coordinator (CMA or LPN) that handled phone calls and EMR tasking (such as laboratory follow up or prescription refill requests), and a float CMA that helped with rooming and provider-assigned clinical tasks. The interviewees MD #1 and MA #1 used Pod #1, while interviewees MD #2 and MA #2, #3 (float) used Pod #2. The physicians also had their own offices further in the back of the clinic. The pharmacist's office was located right next to Pod #2. In addition, there was one MLT and two CMA's in the lab area, one RN who assisted with walk-in urgent care, sports medicine, and triaging, and two Rad Techs who helped perform x-rays.

A patient visit started at the front desk. There was a light notification system that informed the rooming staff to get the patient and pick up paper work. The same MA then gathered vitals and went through EHR checklists in the exam room. If lab work was needed after the physician saw the patient, the MA put in the orders and took the patient

to the lab while passing on billing forms. The lab was centrally located behind the front desk and office area and was easily accessible from either side of the building. Communication between a physician and rooming staff were typically done by written orders typically left outside each exam room so that the physician could move from one room to the next one quickly. Each family practice physician typically saw 20-30 patients per day at this clinic.

As a single pharmacist staffs both Clinic 2B and Clinic 3B, the pharmacist was able to discern some differences between the two clinics. In Clinic 3B, each provider was only assigned 1.5 nurses compared to 2 nurses in Clinic 2B, and the nurses in Clinic 3B were less engaged with patients due to spending less time in the exam room with the patients. Also, there had been more staff turnover in Clinic 3B, so fewer nurses knew their patients as readily, especially regarding "the psycho-social aspects" such as life events the patients were going through. This affected how the pharmacist did handoffs with nurses as more explanations would be needed in Clinic 3B.

Clinics 4C & 5C

Clinic 4C and Clinic 5C were part of an integrated health system. They were located in the same building in a metropolitan area. The front desk staff, administration staff, and interpreters were shared between both clinics, so was an on-site laboratory with x-ray. There was also an on-site external chain pharmacy. These two clinics had become state-certified health care homes since two years ago. There was one pharmacist that was on site for both clinics three days a week. This pharmacist hosts a pharmacy student for a few months a year.

Clinic 4C was located at the front side of the building and provided internal medicine and pediatrics services. It was a continuity clinic for a medicine-pediatrics residency program. This clinic served many patients with low income and those just coming out of incarceration. There were seven physicians and a nurse practitioner, in

addition to a dietitian. The staff seating area was split into two open areas. The separation of the two areas made it difficult sometimes for cross-coverage between nursing staff. Most of the seats were not assigned to a specific role or person, although full-time staff members typically sat in their regular spots. Some physicians chose to sit next to their rooming staff, while others did not.

Clinic 5C was located at the back side of the building, and was a mixed internal medicine and psychiatry clinic. It primarily served non-English speaking immigrants and refugees, and the providers and staff typically spoke more than one language. There were multiple interpreters who provided on-site service. The clinic also served as a continuity clinic for an internal medicine residency program. There were eight physicians (including a psychiatrist), two physician assistants, a psychologist, and a social worker. In this clinic, the providers all sat in one area, and nine nursing staff all sat in one narrow hallway that was barely passable when two nurses were sitting back-to-back. The staff called the nursing station a "submarine", but they have "made the best of the situation" (RN at Clinic 5C). They established close relationships like a "family" to survive, although it got noisy at times. Each provider saw roughly 16-18 patients a day.

Workflow was designed similarly between the two clinics, except that Clinic 5C used interpreter services more frequently. Each provider was assigned a rooming staff. After a patient checked in at the front desk, a rooming staff – informed through the office communicator – located an interpreter if needed, and then brought the patient to one of the exam rooms. There they took vitals, went through a standardized checklist on the EMR, and then reported to the doctor, either face-to-face or through the EMR light system. The physician then saw the patient, and worked with the rooming staff to finish up the visit. Staff in Clinic 5C tended to do more face-to-face communications, mostly due to the space arrangements and personal preferences.

In both clinics, there were also RNs who triaged phone calls and supported rooming staff. In addition, each RN was assigned 2-3 providers and coordinated care for

their providers' patient panels within the health care home. The patients were either pulled from a list based on complexity tier structures (tied to state reimbursement), or were referred by providers based on recent emergency room visits.

For each adult team in both clinics, there were formal monthly care team meetings, coordinated by the clinic administrator. Meeting attendants included the provider, rooming staff, and the pharmacist or diabetic educator based on their availability. These meetings ran between 30-60 minutes. Their current focus was on diabetes, making sure that patients met their A1c, lipids, blood pressure goals and were tobacco-free (tied to clinic-level public reporting). They went through patients on their diabetes list, discussed recent updates and came up with care plans. Either the pharmacist or the diabetic educator would join the meeting when they were on site. According to the regional pharmacy manager, this process started out as a pilot program within the integrated health system 8 months before the site visit, and had continued since improvements in outcomes were shown as early as 3 months into the program.

Clinic 6D

Clinic 6D was part of a rural area health system that had one main campus and four satellite clinics. It was located at the main campus, right next to the hospital and nursing home. Many of the clinic staff members had responsibilities across different areas. There were six physicians and three physician assistants in the clinic. They also staffed in the hospital, emergency room, nursing home, and satellite clinics. Clinic nursing staff included a nurse supervisor, one RN who handled phone triage, two referral nurses, and ten rooming personnel (half LPN, half CMA). They staffed both the main campus and satellite clinics. There was a dietitian and a social worker that staffed at the hospital and clinic. There was also a quality assurance person that conducted performance improvement audits and provided quality reports for the clinic (tied to state public reporting). Physical therapy, occupational therapy, laboratory, radiology services,

and a specialty clinic were available on site. The primary nursing station was at the center of the clinic, hosting four stations for four provider-nurse teams separated on two sides of the walkthrough area, and surrounded by patient exam rooms. There was a fifth station further away, at which the interviewed physician assistant (PA) and LPN worked. The clinic pharmacists' office had two computer stations and was located close to the primary nursing station. On the other side of the pharmacist office was the laboratory. The dietitian office and referral nurse office were located toward the back of the clinic.

A typical clinic visit started at the front desk. After check-in, the front desk printed a billing sheet on the printer in the nursing station, which notified the MA or LPNs that a patient had arrived. Next, a nurse brought the patient from the waiting area into the back area, measured the patient's weight, and then roomed the patient. The nurse then went through a checklist on the electronic charting system, including medication reconciliation, and then notified the physician that the patient was ready by color signs on the door. The physician saw the patient and worked back and forth with the nurse to finish the visit, communicating by face-to-face, written notes, or objects, such as empty vials that need to be charted. On average a physician saw 18-20 patients a day, and a physician assistant saw an average of 15 patients a day. Physician compensation was productivity-based whereas the physician assistants were on a salary basis.

Being in a small town, the staff members developed strong personal relationships beside professional relationships. Additionally, the community also "gets to know you." Face-to-face communications were used most often, and as the different computer systems for charting, lab, scheduling, etc., did not automatically feed into each other, "it'd take longer to communicate through technology."

Clinic 7E

Clinic 7E was a private, university-based family medicine clinic located in a metropolitan area. There was an emphasis on supporting health professions education in

the mission of the medical group. In addition, there was a center for interprofessional education on campus where some faculty members were appointed. There were three locations that the family medicine faculty practiced in: two physicians practiced at Location #1 (including Physician #1), three practiced at Location #2 (including Physician #2), and three practiced at Location #3. Due to limited provider availability, the site visit only included Location #1. Medical students (1st, 3rd, and 4th year) and pharmacy students (4th year) rotated through these clinics throughout the year. The department of family medicine had received grant support to pilot and develop a medical home for the university employees and their dependents covered by university health plans. The program started three and a half years before the site visit. The benefit design allowed university employees to see multidisciplinary professionals for free. While this specific benefit was limited to university plan beneficiaries, the three clinics were also in the process of gathering data and seeking NCQA Level-3 PCMH Accreditation for all patients seen.

For the university employee medical home, there were biweekly administration meetings and biweekly interprofessional care management meetings. The interprofessional care management meetings had only been implemented for a few months prior to the site visit. Physicians would refer high utilizers or complicated patient cases to the meeting if the patients were in the employee medical home. Team meetings would start with a presentation by the referring physician, followed by discussions between the nurse case manager, pharmacist, social worker, dietitian, physical therapy, occupational therapy, behavior health, public health, and the director from the interprofessional education center, who served as the facilitator. Other than the physicians, nurse case manager, pharmacist, and social worker who were regularly in the clinic, the rest of the members served on a consulting basis for the medical home project. Prior to the meeting, team members would individually review a patient case on the EMR, and each discipline would send written recommendations to the nurse case

manager or the pharmacist. At the meeting, the team would develop team recommendations and a follow up plan, which would be docented on the EMR. Team members might be assigned with follow-up responsibilities. So far the team only discussed 1-2 cases during each biweekly meeting.

At Location #1, there was a nurse care manager who did both office management and population management for medical home patients. Each physician was assigned two exam rooms and there was an additional one for overflow. The physicians' office was right next to where the MA's were seated, but they did not sit side-by-side. An EMR color coding system was used to know where the patient was in the process of being checked in, roomed, or waiting for procedures. Physicians on average saw 10 to 12 patients in a half day.

Findings of Cross-Case Analysis

Objective 1: Characterization of team-based approaches in primary care clinics

Five different team-based approaches were identified in the seven primary care clinics in this study, including provider-rooming staff teams, pod teams, care teams, interprofessional consultant teams, and quality improvement teams (**Table 5-7**). The first three teams were considered work teams, the units responsible for providing service, and the latter two were considered parallel teams, as team members were pulled from different work units (S. G. Cohen & Bailey, 1997). These teams differ by team goal, composition, workspace, communication strategies, and the use of huddles or meetings. Individual clinic personnel may serve as members of more than one team. Each team is described as followed.

Provider-Rooming Staff Teams

While not always described explicitly as teams, the provider-rooming staff teams were the core teams at all of the seven clinics. Each provider was typically assigned one to two rooming staff members, who usually held credentials such as Certified Medical Assistants (CMAs), Registered Medical Assistants (RMAs), Licensed Practical Nurses (LPNs), or Registered Nurses (RNs). Working closely with each other, the teams' primary goals were to get through the workflow for the day, including taking care of scheduled or walk-in patient appointments, and processing orders or results associated with the appointments. There were typically a lot of face-to-face interactions between team members, but on busy days, the provider would go from room to room, relying on electronic medical records, paperwork, or objects (such as empty vials to be charted on the EMR as administered medications) to communicate with one another.

A specific type of provider-rooming staff team was the family care teams in Clinic 2B, where the medical assistant stayed in the exam room when the physician saw the patient. The medical assistants were more knowledgeable about the care plans for their patients and more involved with patient care, but the team was focused on patient appointments and follow-up work associated with the appointments. Therefore, it was still considered as provider-rooming staff teams rather than care teams.

Pod Teams

Clinics 1A, 2B, 3B, 5C and 6D were designed so that rooming staff members for different providers were seated close to one another, and cross-coverage for different providers was easily provided when the clinics became busy. The physical distance, or proximity, defined the pod teams:

> It is so spread out there's a, East and a West side, and I would definitely say that we are closer with the ones that are on our side. Because we're, we're closer together. I can't hear what Dr. #4 and Dr. #5 and their nurses are discussing. I don't, I don't yell down and say hey, how do you do this, or would you do that……We're constantly bouncing things off of each other. (Medical assistant #1 at Clinic 2B)

Depending on the physical space available in the pod area, some providers worked with their rooming staff in the pod area. For example, providers in Clinics 1A and 6E worked side-by-side with their rooming staff, whereas providers in Clinics 2B, 3B, and 6D tended to work in their own individual or centralized provider office nearby the nursing stations. Pod teams accommodating space for providers found in Clinics 1A and 6E tended to have more communications between providers and rooming staff of different provider-rooming staff teams.

Care Teams

Care teams can be defined by their goal of providing population management apart from patient appointments. They typically work on a list of patients, and make sure these patients are receiving guideline-based preventive care and/or chronic disease management needed to reach their clinical goals. An example of care teams were seen in Clinics 4C and 5C, where each provider, their associated rooming staff, and a pharmacist or dietitian sat down each month to discuss care plans for patients who were not meeting their diabetic treatment goals. In this case, the composition of care teams overlapped with the provider-rooming staff teams in these two clinics, but the goals of the two teams were different: care teams focused on population management while provider-rooming staff teams focused on day-to-day appointment visits. There may be other types of care team arrangements where the support nurse is not the same person as the rooming staff for a provider, but these arrangements were not identified in this study.

Interprofessional Consultant Teams

Another specialized team was the interprofessional consultant team, such as the interprofessional care management team seen in Clinic 7E. The goal of this team was to pull in interdisciplinary professions and provide recommendations for care on a consultant basis. Team meetings were held every other week. Patients referred to this team typically were high utilizers of health care or had complex conditions requiring

special attention. Disciplines participating in this team may include a nurse case manager, a pharmacist, a social worker, a dietitian, a physical therapist, occupational therapist, behavioral health, and public health, etc. As these disciplines were pulled from different departments on campus, they did not share a common workspace and communicated primarily through electronic means, such as EMRs or emails.

Quality Improvement Teams

As seen in Clinics 2B, 4C, and 5C, clinic management may implement quality improvement teams to improve processes and issues identified in the workplace. In Clinic 2B, front desk staff members were mixed with back office staff members to work on improvements in communication and paperwork process. In Clinic 4C and 5C, a committee was formed to educate the staff on "healthy" and "unhealthy" behaviors between coworkers in the workplace and how to provide good patient experience throughout the care process.

Objective 2: Organizational Influence on Teamwork

This study examined organizational context including organizational rewards, organizational training, organizational structure, technology, space allocations, and teaching activities. The salient themes are summarized below.

Theme 1: Teamwork was expected in health care, but there was often lack of organizational rewards for teamwork.

Several respondents mentioned that teamwork is a necessity in health care, especially because more activities and checklists are required in routine care and it is impossible to operate well without good teamwork in the clinic:

> "I can't say that there's, a reward system for team, teamwork, I think it's just a belief that you have to have when you work in a clinic. You know, you can't, you, I don't think you can come to work in a clinic and not believe in the teamwork approach just from the basic concept of how clinics set up. You, you have to have that." (Administrator at Clinic 2B)

Health-system initiatives and clinic managers often emphasize the importance of teamwork to clinic staff members:

> "I think as far as, as far as I know it, ever since I was hired, which is almost… I want to say 12 years ago, it's always been emphasized teamwork, teamwork, teamwork. I mean, it's something that is drilled in us, and it's become part of us now. Even when they have new policies, new protocols, it always entails working as a team. It's never individualized. And of course, there's an individual responsibility, but you know, there's always that component of knowing that this is, you know, that we're working as a team." (Nurse at Clinic 5C)

However, as most of the care is reimbursed based on productivity, i.e. patients seen, the additional time it takes to do good teamwork is rarely acknowledged:

> "a lot of that [teamwork] is non-reimbursed services and we have to pay to keep the lights on, unfortunately" (Physician #1 at Clinic 7E).

One physician at Clinic 7E even mentioned that sometimes only when the patient satisfaction scores look bad is there any mention made of clinic teamwork:

> "I don't think that the organization even knows whether our team is working well or not, except from that. I see… it's only if there're problems, if there're personnel issues, then as medical director, I have to be involved in that. And then I report back to the chair. So teamwork isn't rewarded, or acknowledged, it's expected. But only if it's not working, is any mention made of it." (Physician #2 at Clinic 7E)

Some insurance companies have started to provide incentives at provider and clinic levels for clinical quality targets, such as meeting a certain threshold of HbA1c values; yet, only few providers, pharmacists, and lab personnel associated these quality contracts as rewards for teamwork. Most often, it was internal psychological rewards that drove individuals to do interprofessional work:

> "It's rewarded by the experience. It's fun to work here. I like working here now, you know, I… I like seeing my patients, I like chatting with my colleagues, I like chatting with the nurses, and, you know, talking to people in the hallway, and giving them a hard time, and tease a little bit, and poke some fun at M at radiology. And I just, I like the camaraderie, and I think that that's reward enough. But I don't think, I don't, we're not really acknowledged for teamwork for anything." (Physician at Clinic 6D)

Theme 2: Health-system initiatives and leadership were imperative drivers for practice redesign, yet redesign alone was not sufficient for achieving team effectiveness.

The innovative practice designs observed in this study – such as family team care in Clinic 2B, care teams in Clinics 4C and 5C, and interprofessional care management teams in Clinic 7E – were all initiatives implemented by health-system initiatives (Clinics 2B, 4C, and 5C) or university leadership (Clinic 7E). However, while going through the same practice redesign under the same health-system at the same location, such as in Clinics 4C and 5C, differences in perceived team effectiveness could still be observed. For example, Clinic 5C scored higher than Clinic 4C on most of the team effectiveness items, especially on communication strategy, use of clinical protocols, and innovative practice. While there may be several reasons leading to such differences, including the unique population Clinic 5C served and the tight workspace the nurses used, other plausible explanations are the unique composition of staff members – most of which have an international background. These could have led to high levels of team climate (more participative safety, better task orientation, and more support for innovation) and subsequent team effectiveness. The staff members called each other as "family":

> "We have very small nurses'… room, and, and I would say it is bad, and it's 9 nurses, in a little little room and bunch of computers, and if we wouldn't be good co-workers and good friends, or like a family, we call it, I would say family, I don't know if we will survive in this little space." (Medical assistant at Clinic 5C)

Theme 3: Despite past interprofessional experience and organizational training on teamwork, it took time to learn to how to work in a new team.

Respondents from some of the clinics mentioned having organizational retreats focused on teamwork, such as half-day events that incorporated activities or games to improve on communications and body languages. These were typically done on an

organizational basis or building basis that encouraged clinic staff to work with individuals outside of their usual work zone. At the clinic level, it was mostly social events that pulled people together, such as pot locks at work or parties outside of work:

"Teamwork isn't just built within the clinic, sometimes it's built through your associations outside of clinic as well." (Physician assistant at Clinic 5C)

Few of the participants recalled that they learned to work with different professions in school or on clinical rotations. Of those that did, it was sometimes limited by how their faculty member functioned as team members.

"the training than I'd had, the pharmacist always sat at the end of the table, the attending always sat at that end of the table, so there wasn't … they would talk to each other, and they would be friendly to each other, but I don't think that they used the pharmacist nearly as much as they could, because I think they were protecting their own turf" (Physician #2 at Clinic 7E)

Sometimes trainees sought out shadowing experiences that enhanced their perspectives on different roles in health care:

"As a medical student, I even found it useful just to sit and listen and talk with all of the non-physician professionals who, who I interacted with, to try to understand what they brought to the care of the patient, rather than just, you know, seeing each of those other groups as a black box. You know, we sent them off, and then the patient came back to us, but you know, working more integrally with them, so, you know, I would, you know, find time as a med student to go spend time with a physical therapist to see, you know, to understand what they did, so that then I could bring that into my practice in the future, not realizing that was really what I was going to be doing." (Physician #1 at Clinic 7E)

Regardless of team members' past experiences or organizational training, it took time learn to work in a new team. One of the reasons identified in the interviews was that each physician – usually the team leader – liked to do things differently or be communicated differently.

"It was……finding out what the doctor would like that you're working with, how he wants things handled at that point……we've had… , activities or, you know, events, where we have to attend, trying to make it all standardized for everybody to do the same thing, but not every provider wants to do the same thing (Laugh). (Medical assistant at Clinic 4C)"

"I think a lot it's just trial and error. So, knowing what works, how, each team, or each provider likes to be communicated with. I do treat each of them a little bit different, based on their style. Some like to be more in control of helping make the decision where others, don't want to be bothered and they just want me to, to finalize and do the busy work behind the scene. They don't necessarily, care, they just want to make sure it gets done. So, each of my providers I work with just has a little bit different style of. It just comes, over time to know, how they want to be approached or, what kind of things, they want me to take care of or what things, they'd like to have a voice in." (Pharmacist at Clinics 2B & 3B)

"I think some of the things that are challenging that I've, I've kind of have to work through, but now, I kind of understand. You know, every doc likes to communicate differently, so, I mean [we] have a pretty loose collaborative practice agreement that we follow, and some docs, they would like it even looser, cause they'll just say, here's this other problem that you normally deal with, can you just figure out and take care of it, and, you know, they just want it taken care of. They don't, don't want feedback, they don't want anything, they just want us to take care of it and they don't want to hear about it anymore. Whereas some of the other providers, their personalities, you know, they like, they like us bringing options to them, like, 'hey, here's our options; you pick what you want to do'. So just the different personalities of each provider, I mean, now I feel real comfortable cause I've gotten to know that. But in the beginning that's difficult." (Pharmacist at Clinic 6E)

Theme 4: Technology facilitated existing teamwork, but clinic members' efforts in maintaining a personal connection with one another was also important.

Except for Clinic 6D, all the other clinics had comprehensive EMRs. These comprehensive EMRs allowed clinic staff members to track patients' statuses in the clinic, have access to more complete patient histories and profiles of patient care, and helped delegate tasks to team members and communicate about specific patient cases at different times and locations:

"I mean, just having everything there at your fingertips, you can see they went down to lab, did they start yet? You know, you don't have to call them, and you know, try to figure out where this patient is, as you can see in the computer, Ok, they did collect their labs specimen, so now they should be coming back up. You could almost time the process, and you don't have to call, or go down the hallway, looking for them or anything, you can see a lot of it right there on the computer." (Medical assistant at Clinic 4C)

For some providers, the EMR communication process worked so well between team members that some providers were not aware that their clinic pharmacist was not at the clinic full time.

"The workflow process in our electronic medical record is such that, we are able to have that communication back and forth, either through, you know, instant messaging, through emails, but more importantly, through the electronic medical record. So when I make the referral to our clinical pharmacist, it is very clear to the pharmacist, why I want that referral, and when she in turn does her note, and sends it back to me, it's very clear what the outcome of that, of that clinical encounter was and what the patient's goals are. And also any action that I need to take as follow-up, and also a clear indication of what the clinical pharmacist is going to do for follow-ups. So everybody understands their roles at the end of that, at the end of that encounter…… I never knew [the pharmacist] was here 3 days a week. Yah, I mean, it works so well that I really don't even… I mean, there are times where I will get up out of my chair and walk in to see if [the pharmacist] is there, 'cause I have a question for her at the time, but, you know, that's true of all of us, if she is not there, I'll either remember it, or I'll send her a… an in-basket note on it, and she'll get back relatively quickly." (Physician assistant at Clinic 5C)

Despite the convenience of technology, personal relationships with team members were still important for clinic staff. One of the pharmacists previously worked at a centralized corporate office that used EMRs to follow up with patients and providers, and she contrasted her experiences:

"I think that I have a much better relationship with the providers here [in clinic], because they see me, they see what I do, they see how I can interact with the patients and how I can help, versus what I did when I was at [the centralized location], where it was more or less, you send a message to the provider, and you might have met the provider, maybe twice a year at a meeting, but you never really got to know the provider, they never got to know you, they knew you were working on their, you know, you were given a list of their patients, and you worked off of this list, but they didn't really know you as a person, whereas here, I mean…… so you saw how we sat, we sat in one big area, so that's where I'm usually at, that's where they know to find me if I'm not in, not seeing patients. And just to be there as a reference for questions, if they have questions on a drug, or how it's given, they can just turn their chair around and ask me versus sending me a message, you know, not knowing if I'm there or not there. So I think this by far, is a much better practice, and it's better for me, because if I have questions or I think, you know, I just want to bring this up to the doctor, they're right there. I'm not sending a message, wondering if they're in and waiting for them to get back, all I have to do is, I wait until they're, at their desk, for a couple of minutes, or in between patients, just to ask them a question. So I think that it's much better, I think I get to see a lot more patients, you know, versus, you know, before it was which just centered on cholesterol, and this time it's, it's everything." (Pharmacist at Clinics 4C & 5C)

Another pharmacist worked fewer hours at the relocated clinic and missed the personal relationships she had previously established with physicians:

"Sometimes some of the physicians if I run into them they'll joke that they're like we don't hardly see you anymore and, I say I know, and you know, and so you do kind of lose some maybe that more personal connection. Not so much professional connection because I think you're still professionally connected when you're emailing them and they know who I am and things like that. But you definitely lost a little bit of maybe that personal connection." (Pharmacist #4 at Clinic 1A)

Theme 5: Physical proximity significantly influenced team processes.

As discussed above, moving a professional from outside to inside the clinic dramatically increased that person's visibility and allowed that person to develop personal relationships which could stimulate teamwork. This also applied to the physical distance between team members within clinic. For example, when a large clinic is split into two pod teams, the distance can cause segregations of the clinic:

"The pod system greatly affects our teamwork, because we are very segregated in our groups. Pod one is very connected to pod one; pod two is very connected to pod two. The two of them do not interact.The front office, is a really good group, but, and they interact with pod one, they interact with pod two, but they don't interact great with pod one and pod two. Because they're not, fed together. Same with the walk-in, they are on separate sides of the building. They have different patient populations, they have different, uh, workflows. And sometimes that actually feeds into problems, because they have, they don't see each other's side. They don't see what the other one's doing." (Administrator at Clinic 3B)

One pharmacist mentioned that having an office close to the nurse's station allowed him to hear discussions about patients that he could sometimes participate in and provide "unintentional assistance":

"So as I'm sitting here at my desk, and I have my door open, I can hear questions or conversations that come up. So if I hear the, the nurse, who's on the telephone all day talking to patients, I may pick up on, last names of patients that I take care of, and that I can, learn then, sometimes even help intervene if I know a piece of the puzzle that she doesn't know. Or try to help answer some questions that come up; whereas I don't hear those conversations in the front pod, just because of my distance away from them. So, so it's kind of, it doesn't happen intentionally, it's just unintentional assistance that I provide." (Pharmacist at Clinics 2B & 3B)

For physicians, the distance between their office and the pharmacist's office also led to differences in frequency of consults, even if it was only a hundred feet further away:

> I think it would be excellent if, the clinical pharmacist was in that same [central] position [in the clinic], which he's not. Now I'm happy because he's in my hallway. But I think because of that, I utilize the clinical pharmacist more than the other physicians do. I think it's, I also see a huge majority of those patients who, would need anticoagulation or type-two diabetes support care and that sort of thing. But, I bet if you look at the percent of my patients that utilize that, particular service verse the other physicians, and you can ask [the pharmacist], but I bet my percent is higher simply because he's more accessible to me. So, organization there, is beneficial to one physician but maybe not to the other. (Physician #2 at Clinic 3B)

Nevertheless, if a provider sees a need or prefers to seek out a distant team member intentionally, the segregation by space becomes less of a barrier to teamwork.

> "[The pharmacists] might be in the pharmacy, they might be in the hospital, they might be in the nursing home, they might be in the satellite clinic, they might be at a meeting uptown with the pharmacist, trying to smooth things out to make our lives better there. They might be in that clinics seeing patients, they might be in administrative meetings. So I mean the only issue is, having them readily available, but they do have a clinic space right in the clinic, so usually I can find them, or one of their students, or whatever, and. But that, that'd be the only thing which is be, clone them and have them around all the time. That's the only issue. And, if I would just call their cell phone, and I wouldn't have that issue, but I hate telephones, so (laugh) I'd run around the building trying to find them and, so all of that, but that's just my hang-ups." (Physician at Clinic 6D)

Theme 6: Other than having more exposure to different perspectives, clinics involved with teaching health professional trainees did not perceive much difference in teamwork.

While university-based clinics usually had more resources for incorporating different disciplines into their practice, there was little difference in teamwork, other than spending more time on teaching activities. Physicians would consult with whomever was needed, as usual, and would also incorporate the trainee through a similar process:

> "Depending on where we are, I, if we have say a question about a medication, I might just go into the pharmacists' room and ask the question. I might send the resident or student who then will report later to me. Sometimes the pharmacist will come over, and look up the question and come back as a team, typically with one of their residents and, discuss with the whole team. So the pharmacist will interact with the residents, with

the students, with me, with the nurses, independently or together. Sometimes the nurses have a question, a patient will call about say a medication they just got, they didn't understand exactly how to take it or they forgot or, they heard from the pharmacist that there may be a drug interaction, so the nurse will, just directly talk to the pharmacist and report back to me or send me a note already with the, final product saying patient called, they checked with the pharmacist that's what they recommend is that ok with you. So that's. So we have a variety of, ways, to interact." (Physician #2 at Clinic 1A)

The same applied to residency continuity clinics; trainees were incorporated into the same care process in the interprofessional environment:

"We try to incorporate those students into our same kind of workflow process, and how we do things. [Teaching] certainly affects the dynamics sometimes, because students who are just here for a brief period of time don't necessarily understand, you know, how we create that kind of environment…… A lot of [teaching] is for [students] to develop their practice style, so learning how, how our clinic works, for an example, which is very face-to-face, versus other clinics that are very, maybe a little bit impersonal, and recognizing the importance of working as a team. So it's more of having students realize that this is their opportunity to kind of establish their, their clinical personality, so to speak. And one size doesn't fit all there, it's not, you know, like textbook medicine, where things are pretty cut-and-dry." (Physician assistant at Clinic 5C)

Objective 3: Pharmacist Roles in Primary Care Clinics

Types of practice

In this study, all of the pharmacists were undoubtedly integral members in the clinics and routinely responded to drug information questions asked by providers and staff members in the clinic. Depending on the amount of independent pharmacist visits and how pharmacists were incorporated into the primary care clinic workflow, the role of clinic pharmacists could be categorized as limited integration, moderate integration, and extensive integration.

Limited integration

Pharmacist roles in Clinics 1A, 2B, 3B, and 6D were categorized as limited integration, as pharmacists typically saw most of their patients apart from physician visits, and communications with providers were mostly through the EMR or occasional, brief huddles.

In Clinic 1A, two full-time and a number of part-time pharmacists were available. With collaborative practice agreements in place, they typically saw patients with anticoagulation medications (anticoagulation clinic), diabetes, dyslipidemia, or hypertension (pharmacotherapy clinic) independent of physician visits. Since relocation, the pharmacotherapy clinic had been expanded from one half-day a week to five full days a week, and pharmacists became more independent and consult-based rather than working off of the physician's schedule. Between these pharmacists, they saw about 10-20 patients a day and made an average of 10 phone follow-up calls a day. Each anticoagulation clinic appointment lasted 10-20 minutes while pharmacotherapy clinic appointments lasted 30-60 minutes. Pharmacists usually tried to coordinate their visits with patients' physician visits on the same day. When they received referrals, they would call patients to explain the service and schedule initial visits. In a typical pharmacist visit, a patient would check in at the front desk, and then a pharmacist would room the patient and finish the visit. If it was a joint visit, the pharmacist would go and find the MA of the physician to determine where to room the patient. Scheduling was usually done by clinic staff, although pharmacists often got involved with rescheduling no-shows.

In Clinics 2B and 3B, a pharmacist who had additional credentials as a Certified Diabetic Educator (CDE) provided services four days a week (one day at Clinic 2B and three days at Clinic 3B). Physician-pharmacist collaborative practice agreements were in place for the entire health system and were shared with clinic pharmacists at other practice sites. Pharmacists were allowed to manage patients with polypharmacy or chronic conditions including, but not limited to, asthma, hypertension, hyperlipidemia, diabetes, metabolic syndrome, coagulation disorders, nicotine dependence, obesity, and thyroid disorders. However, the primary emphasis at these two clinics was diabetes education, diabetes monitoring, pre-diabetes education, and anticoagulation (2-4 patients at Clinic 2B and 35-40 patients at Clinic 3B). On average the pharmacist saw a total of six patients a day at these clinics. Initial visits were scheduled for an hour, and returning

visits were typically scheduled for 30 minutes. Some of the activities included education about diabetes, glucometer training, carbohydrate counting, medication education, and insulin titration. In addition, the pharmacist took drug information questions, formulary questions and helped patients obtain glucometers when needed. Through EMR tasking, the pharmacist received messages from front desk staff, phone clerks, MA's, or occasionally, physicians. Also, the pharmacist had incorporated telephonic management in the last 2 years. These clinics had an emphasis on shared visits where physicians and the pharmacist saw the patients on the same day, although separately. This occurred in either order. After a patient checked in with the front desk, the pharmacist brought the patient into the pharmacist's office for the visit. Scheduling was typically done by clinic staff. As the pharmacist spent more time in Clinic 3B compared to Clinic 2B, more drug information questions could be answered at Clinic 3B and the pharmacist had more opportunities to "bounce things off of each other on patient-related things" through face-to-face interactions.

At Clinic 6D, the first pharmacist worked with providers and set up the clinic pharmacy services almost 20 years ago. Back then, the services were more curbside consults rather than independent visits. Only in the last 15 years did pharmacists start providing dispensing services and formulary management for the hospital and long-term care facility. There was a "scope of practice" policy that guided pharmacists' ability to order laboratory tests and adjust medication dosages in the clinic for antihistamines, anticoagulants, cardiovascular drugs, CNS drugs, smoking cessation agents, GI drugs, hormones, respiratory smooth muscle relaxants, and antihyperglycemic medications. The clinical services "expanded and contracted" over the last 20 years, depending on the number of pharmacists available – which ranged from two to five at various times. One pharmacist recently retired, and the department was short-staffed with only two pharmacists and a technician during the site visit. Diabetes and anticoagulation were the two primary disease states the pharmacists managed. There was also 5-10% of

medication therapy management – mostly involving comprehensive medication reviews – either referred by providers or self-referred. When fully staffed, one pharmacist would typically be in the hospital, one would be seeing clinic patients, and one would be working on projects in the clinic office, "so there was always somebody that the physicians could go talk to that's always sitting in the office." (Pharmacist #1) The pharmacists saw about 150-170 patients a month. They also did phone follow-up for these patients, phone management for patients from satellite clinics, and management by fax for nursing home/assisted living facilities. In a typical pharmacist visit, patients would arrive at the laboratory to get blood work done. As the pharmacist office was right next by, the pharmacist and the laboratory staff frequently communicated to make sure orders were put in the system and all necessary blood drawing tests were consolidated. Then the pharmacist would pick up the patient from the laboratory waiting room, and bring the patient to the pharmacist's exam room to finish the visit. There was frequent face-to-face communication with providers and nurses, especially because of the proximity. Often times a provider would stop by to ask drug information questions, or would grab a pharmacist to provide patient education on inhaler use. With nurses, a lot of the communication involved refills or prior authorizations for patients the pharmacists saw. The pharmacists typically refilled the prescriptions they were allowed to on their own, and then handed the nurses pre-filled refill and prior authorization forms for medications requiring physician signatures.

At Clinic 6D, the pharmacists also worked closely with the dietician to provide diabetes self-management education, which was recognized by the American Diabetes Association. There were quarterly meetings for the Diabetes Advisory Committee, which included providers. The rest of the communication was more often curbside consults. After a provider referred a newly diagnosed type-two diabetes patient to receive diabetes education, the dietitian would see the patient, focusing on lifestyle changes and getting the patient started with a glucometer. Roughly a week later, both the dietitian and a

pharmacist would see the patient to evaluate if medications are needed, and finish the initial education within a total of 3-4 visits over 6 months. The frequency of follow-up after the initial education depended on the patient's A1C level.

Moderate integration

Pharmacist roles in Clinics 4C and 5C were considered as moderately integrated. In addition to seeing patients independently, pharmacists were incorporated into provider care teams to discuss patient progress regularly.

There was one pharmacist that practiced 3 days a week in Clinics 4C and 5C. This pharmacist used to work from a centralized office, primarily doing phone visits and contacts. Seven years ago, the health system decided to decentralize pharmacists into clinics, and this pharmacist was the first one to work at Clinic 4C. Clinic 5C moved into the same building shortly thereafter. The pharmacist reported to a regional pharmacy manager, and the health-system pharmacy department budgeted for the rent for clinic space, which was based on the amount of time the pharmacist was at the clinic.

There were a number of collaborative practice agreements in place within Health System C that allowed pharmacists to manage and modify therapies in the clinical areas of asthma, benzodiazepine withdrawal, COPD, diabetes, hypertension, lipids, opioid tapering, and smoking cessation. Pharmacists' work was called medication therapy management (MTM), and was defined as a disease management service that did not carry a co-pay for health plan beneficiaries in the integrated health system. The pharmacist typically saw 8 patients a day, and most of the patients were from Clinic 5C, even though the pharmacist was listed under Clinic 4C on the website. Appointments were set up to last 30 minutes or 60 minutes. Most patients required some level of follow up. Clinic staff mentioned that the pharmacist "helps out so much by keeping track of their labs, their medications, vitals, different things like that for every patient [the pharmacist] sees" (MA at Clinic 4C). In addition, the pharmacist had all the providers' diabetes lists and

selectively sat in meetings of care teams whose diabetes control rates were less than 40%. Most of the pharmacist visits were independent visits. Because of the zero copay structure, a number of patients who could not afford to see the physician or lost insurance temporarily due to misunderstanding of insurance paperwork were often referred to see the pharmacist instead, so that the pharmacist could "keep them on for medications". In addition, because the clinic's patient population had a lot of transportation difficulties, the pharmacist and clinic staff coordinated patient visits and lab tests. For example, the pharmacist would notify the nurse that the patient may be due for a lab test, even though the patient was only scheduled to see the provider or nurse. Because of the unique patient population, one major function of this pharmacist was to educate patients on how to take their medications correctly. The pharmacist worked closely with interpreters and the social worker to help patients navigate through the system and understand what they needed to do.

Extensive integration

The pharmacist role in Clinic 7E was considered as extensively integrated into the physician's workflow, as the pharmacist reviews the list of all patients coming to see their physicians each day. This pharmacist was typically in one of the three clinics for a total of 6-8 half-days a week, spending three days at Location #1 – which was right next to the University campus – and then one day each at Location #2 and #3. There were two collaborative practice agreements (diabetes and anticoagulation) put in place within the last year. The pharmacist scanned the physicians' schedules in advance and selectively focused on the patients that may benefit from pharmacist's work. There were only 2-3 appointments a week that the patients only saw the pharmacist. Even for well-child visits, the pharmacist would help review immunization status in advance. Combining independent pharmacist visits and the physician visits assisted by the pharmacist, there were at least 4 patients each half day, which averaged 40-70 patients a week.

The current pharmacist was the first one in their family medicine department. Over the years, the pharmacist had "moved from more a hundred percent collaborative kind of team, working directly off the physician, to a little bit more of the autonomous clinic and sort of being a supplement", providing more phone management and pharmacist-only visits. However, the pharmacist role in this clinic was still classified as *extensively integrated* into physician workflow, given all patient profiles for physician visits were at least scanned by the pharmacist, if not worked up comprehensively. The pharmacist was 100% funded by the college of pharmacy; therefore, teaching pharmacy students was a priority. The pharmacist also assisted with "on-the-fly education" for medical students. Patients were given the pharmacist's a direct line to call if needed, and the number of calls averaged 2-4 calls per day. Patients could also contact the pharmacist through an EMR portal. As far as space allocation, the pharmacist sat in the physician's room at Location #1 and #2 and was in a side office close to the MA's at Location #3. Being close to the physicians and MA's helped with being able to address curbside issues right away.

Challenges to collaborative practice

There were four main challenges that the interviewed pharmacists identified. First, billing for patient visits was difficult because pharmacists were not considered as providers by Medicare Part B. Pharmacists could only bill for facility fees in hospital outpatient clinics or "incident to" physician visits, and neither one was sufficient to compensate for pharmacists' salary.

> "even though I do believe I'm providing a level comparable to a nurse practitioner, a PA in terms of, what I call interval visits, chronic care management. That, I think we should be able to bill at a higher level. So to be able to bill at similar level of what a nurse practitioner, a PA, would bill. And that would help justify bringing in more dollars, to pay off my time, so knowing that, with my 99211 [incident to] billing, I'm not, paying for my salary with revenue. So, if this model were to grow in the future, I think the administrative people; they want to see more of a profit potential. (Sure) So I think that's one big, struggle." (Pharmacist at Clinic 2B and 3B)

Even in Clinics 4C and 5C that had the capability to bill for pharmacist visits as MTM services through their health plan and their state Medicaid program, that revenue was insufficient to justify the clinic pharmacists' time and effort:

> "It's not something that breaks even by any means, and if it's close to breaking even, they don't bring in enough revenue to cover their salaries. But the, they certainly provide benefits to the patients, and they reduced total cost to care. So, that's really the way the approach that we take to it." (Regional pharmacy manager for Clinics 4C & 5C)

Second, pharmacists sometimes found it difficult to explain their roles to the patients. It was occasionally confusing when pharmacists were mistaken as specialist physicians by the patients when the pharmacist was called "Dr." so and so by clinic staff members. It took time to explain to new patients that the clinic pharmacist was serving as a pharmacist-provider and educator, which was different than how the patients used to know pharmacists in dispensing roles.

Third, while most of the physicians in these clinics were much more receptive to pharmacists than in other settings, there were still areas that pharmacists felt that they were not utilized to the maximum potential:

> "These are some of the, the most accepting doctors of having pharmacists on the teams too, from what I've seen. You know there's even still times that, it seems like we could be more involved. That, you know sometimes they, and it might just be a, a, you know, it's hard to break old habits, so you know a lot of these doctors didn't have pharmacists for the longest time. So, I would just say, you know, trying to let people realize the full potential of what we're able to do and, you know we really are, medication therapy experts. So, I, we still kind of find ourselves looking through notes and, occasionally cringing at what gets started just because it's like oooooh. You know, that's, that is not, you know first line therapy and. And it's hard to tell just looking through notes without……it's hard to, to just look at something, see a recommendation, and especially a lot of notes are not that well written. It's hard to tell what they were thinking when they started that. So it's hard to, you know, make that judgment of ooooh. But when you look through it like that and you don't have all the facts, it just kind of makes you think ooooh, so where is it, you know, you wish you would have been involved in that conversation." (Pharmacist #3 at Clinic 1A)

Finally, there were areas identified by the pharmacists that they wished to be more involved in, such as medication reconciliation, but they were usually limited by their

ability to staff for all providers in the clinic, especially when they had to travel and cover for different sites.

> "Definitely one downside is that we're not able to complete, med reviews for, the majority of patients that come in to clinic. That would be one area for improvement. And would require obviously more manpower……to be able to…… I guess the ideal model would be allowing those pharmacists who are working with kind of more med reconciliation to be in those set areas with the provider, after the MA does the vitals, we go in, do a medication review and then the provider sees them. I think that's probably one of the biggest things that has been an issue even before we moved out here and, and something that is very important, but that we haven't quite found the flow, to, to work that into that yet." (Pharmacist #1 at Clinic 1A)

Discussion

This multiple-case study provided rich data concerning primary care teamwork, organizational factors influencing primary care teamwork, and different roles of pharmacists as members of primary care clinics. Observations of a variety of practices were made, and we identified several themes based on the similarities and differences found across clinics.

One of the major contributions of the study was development of a typology of different types of teams implemented in primary care clinics, including provider-rooming staff teams, pod teams, care teams, interprofessional consultant teams, and quality improvement teams. While health care reform has often emphasized promoting team-based approaches in primary care to provide better care for patients with chronic disease (American Academy of Family Physicians (AAFP) et al., 2007; IOM, 2001; Wagner et al., 1996), the definitions for teams have not always been specified (Lemieux-Charles & McGuire, 2006; Wagner, 2000). In addition, lack of distinction between front-line staff members' and policymakers' perceptions of teams would often lead to discussion of teamwork as "rhetoric" rather than "reality", which stymies implementation of reform efforts (Grumbach & Bodenheimer, 2004; P. Pearson & Jones, 1994). For example, in this study most nurses and medical assistants were proud of the teamwork that they experienced, where they helped out each other whenever needed; however, upon closer

examination, the teamwork they were mostly referring to was helping providers as members of "provider-rooming staff teams" – which has been the core unit of service delivery in most primary care clinics for a long time – and helping their fellow "pod teams" in the same work area. This was different from "care teams" or "interprofessional consultant teams" often established in medical home projects, where population management and interdisciplinary teamwork is given priority.

The benefit of adopting this new team typology is two-fold. First, acknowledging different types of teams existing in primary care clinics helps clarify team goals, and more specifically, allows measurable objectives to be developed to enhance team effectiveness (Grumbach & Bodenheimer, 2004). For example, concrete productivity goals could be set for provider-rooming staff teams and pod teams, while population clinical goals could be set for care teams. Some clinics have adopted a hybrid of provider-rooming staff teams and care teams, called "core teams" or "teamlets" (Bodenheimer & Laing, 2007; Sinsky, Sinsky, Althaus, Tranel, & Thiltgen, 2010), where providers "shared the care" with their rooming staff to do more care coordination and population management outside of patient visits (Ghorob & Bodenheimer, 2012; Sinsky et al., 2013). These hybrid teams could have dual productivity and population clinical goals.

Second, characterization of different team types in primary care clinics could facilitate alignment of organizational rewards for each type of team to maximize team effectiveness. Previous studies have identified that adoption of team-based human resources policies and alignment of team rewards with team tasks were associated with better team effectiveness (Kirkman & Benson Rosen, 1999; Wageman, 1995). In this study, while some providers mentioned external insurance shared savings programs as rewards for teamwork, other clinic staff members rarely associated any external rewards with teamwork. This could be explained by the design of the shared savings programs, which provided incentives on provider and clinic levels. As such, providers were more

likely to be influenced by provider-level incentives, but other staff members in the clinic were less likely to perceive any influence once the clinic-level incentives were diffused to individuals. In other words, without aligning incentives on a team level where teamwork is conducted, the effect of incentives on teams likely is lessened. While it may not be practical to have external quality-based incentives designed at the level of provider-rooming staff teams, pod teams, or care teams, it may be helpful for the clinic administration to devise additional team-level performance feedback and appraisals, as well as recognition programs, so that their team effectiveness could be improved.

In this study, most of the innovate practice redesigns were implemented due to health-system or university initiatives. This could be explained by the busy workflow in the day-to-day operations in primary care clinics where provider-rooming staff teams worked in "frantic bubbles" to finish patient visits for the day (Chesluk & Holmboe, 2010). Providers and staff members could easily be too consumed in the daily workflow that without external funding and leadership guidance from the health-system or larger organization, innovative practices could not be experimented or implemented to move beyond the "primacy of patient flow" (P. A. Nutting et al., 2012). However, in our study we also found that health-system initiatives alone were not sufficient for achieving team effectiveness. When team members shared in creation of a desirable team climate, team effectiveness was enhanced. A meta-analysis of team composition studies identified that personality traits – such as agreeableness, conscientiousness, and openness to experience – as well as values – such as team collectivism and preferences for teamwork – were all important predictors of team performance (Bell, 2007). These findings may inform the hiring practices and team designs by clinic managers as measures to improve the effectiveness of the teams in primary care clinics.

Another key finding from this study was each provider has differences in practice style, and it takes time for nurses, pharmacists, and other professions to learn the intricacies of working with a new provider or a new team. An important implication from

this finding is that high staff turnover rates could significantly affect how teams operate and ultimately impact team effectiveness. Previous research of self-managing work teams in a non-health care setting have found that team turnover affected task flexibility and team learning behavior, which then has negative effects on team effectiveness (van der Vegt, Bunderson, & Kuipers, 2010). Another study in primary care settings identified staff participation in decision-making to be associated with higher productivity and lower staff turnover (Hung, Rundall, Cohen, Tallia, & Crabtree, 2006). As the push for increasing medical homes continues and more work in primary care is carried out by teams, it would be important for administrators and physicians to implement a participative approach where clinic staff members can provide inputs regarding quality improvement, practice change, and clinic operations. In addition, more research is needed to investigate the relationships between staff turnover and team effectiveness in health care.

In this study, we also categorized pharmacists' roles in primary care clinics as limited, moderate, and extensive integration into the clinic workflow. Smith, Bates, and Bodenheimer (2013) developed a similar six-level categorization of pharmacist collaboration models that ranged from minimal collaboration, basic collaboration, basic on-site collaboration, close on-site collaboration, partial collaboration, and full collaboration. The first two were considered coordinated care; the middle two were considered co-located care; and the last two were considered integrated care. The typology in this study partially matched with the upper three levels of pharmacist collaboration in primary care models by Smith and colleagues – namely close on-site collaboration, partial collaboration, and full collaboration. However, some minor differences exist: as most pharmacists in this study had developed close relationships with providers and clinic staff members, pharmacists with limited integration still had opportunities to huddle with providers and staff members, unlike the close on-site collaboration proposed by Smith et al. In addition, pharmacists with extensive integration

into clinic workflow did not have the staffing capability to conduct routine medication reconciliation, as in full collaboration. We suggest that the terminology of limited, moderate, and extensive integration more closely reflects current pharmacist roles in primary care practices, while Smith and colleagues' model is more theoretically-derived. Future survey research with a large sample of pharmacists would help better understand the extent of pharmacist integration into primary care clinics, and the factors influencing the implementation of different types of integrated care models.

In all of the study clinics, pharmacists routinely answered drug information questions, formulary and insurance questions, as well as found cost-effective alternatives, all greatly appreciated by clinic staff. This helped strengthen relationships through demonstration of pharmacist expertise and patient-centeredness. With developed relationships in place, it was then relatively easy for the pharmacists to take opportunities to expand their services when there was restructuring of healthcare delivery. For example, Clinic 1A expanded their independent pharmacist clinic schedule after relocation to a new building; Clinics 4C and 5C incorporated pharmacists into care teams when the providers started to have regular care team meetings; and the pharmacist in Clinic 7E had become an integral member in the medical home project, extending beyond her typical responsibilities and duties. Therefore, it is important for pharmacists to build relationships with clinic providers and staff, who may then be able to support pharmacists wishing to expand the scope of pharmacy services.

This study is not without limitations. First, given limited resources, the PI only spent 1-3 days at each clinic site, and was only able to observe selected parts of clinic operations. This may have limited the comprehensiveness of observation data. Nevertheless, triangulation of observations and interview data significantly enhanced the multiple-case study compared to using interview data alone. Second, one-on-one interviews were time-intensive for clinic staff, and several clinics declined to participate due to busyness or other priorities in the clinic. This raises concern because these clinics

may be different from clinics included in the study in unknown ways. In addition, because of the limited number of days in the field, the site pharmacists were asked to assist in identifying providers and staff members that were willing to participate in the study. As such, it should be cautioned that the findings from this study may not be fully representative of all primary care clinics incorporating clinical pharmacists. Third, as this study only examined primary care clinics with established clinical pharmacist positions, the results may not be the same as if the study included clinics without pharmacists. However, several pharmacists were able to recall the challenges they dealt with when starting at a new clinic, and such information may be helpful in assisting pharmacists seeking new practices incorporated in primary care clinics. Finally, this study was conducted by a research pharmacist, and data collection and analysis may have been subjected to personal biases. Nevertheless, steps were taken to minimize such biases by reflecting and documenting biases, spending time immersing in the data, and peer-debriefing with another individual to consider alternative interpretations.

Conclusion

This multiple-case study investigated the types of teams in primary care clinics, the organizational influence on primary care team effectiveness, and the role of pharmacists in primary care clinics. We identified five types of teams, including provider-rooming staff teams, pod teams, care teams, interprofessional consultant teams, and quality improvement teams. We also found that there was a lack of reward mechanism for teamwork. Despite organizational training, it often took time for individuals to learn how to work in a team with providers. Finally, we categorized the role of pharmacists in primary care clinics as limited integration, moderate integration, and extensive integration into the clinic workflow. These findings can inform organizational leaders in providing resources for redesigning primary care clinics.

Table 5-1. Theoretical Framework

Input	**Process**	**Outcome**

Team Inputs
• Task Design
  ○ Interdependence
  ○ Use of clinical protocols
  ○ Workload
• Team Composition
  ○ Age, gender, tenure & discipline
  ○ Team size
  ○ Team tenure
Organizational Context
• Goals & Rewards
• Structure
• Resources (incl. information system)
• Training
• Space
	Team Processes
	• Communication
	• Coordination
	• Care sharing activities
	Team Psycho-Social Traits
	• Team climate
	  ○ Participation safety
	  ○ Support for innovation
	  ○ Task orientation
		Team effectiveness
		• Perceived team effectiveness

Adapted from the Integrated (Health Care) Team Effectiveness Model (ITEM) (Lemieux-Charles & McGuire, 2006).

Table 5-2. Clinic Characteristics

Clinic ID	**1A**	**2B**	**3B**	**4C**	**5C**	**6D**	**7E**
Health-System	A	B	B	C	C	D	E
University-based	Yes	No	No	No	No	No	Yes
Medical residency affiliation	Yes	No	No	Yes	Yes	No	Yes
Teaching scope	Med resident; Med student; PA student; Pharm resident; Pharm student	Pharm student; NP student	Pharm student; Med student	Med resident; Pharm student	Med resident; Pharm student; PA student	Pharm student; MA student; PA student; Med student	Med student; Pharm student
Rural/Metropolitan	Metropolitan	Metropolitan	Metropolitan	Metropolitan	Metropolitan	Rural	Metropolitan
Physician specialty	Internal medicine	Family medicine	Family medicine; Sports medicine	Internal Medicine; Pediatrics	Internal Medicine; Psychiatry	Family medicine	Family medicine
Number of providers listed on clinic website	12 physicians	5 physicians	9 physicians 1 ARNP 3 PT 1 PharmD	7 physicians 1 NP-P 1 PharmD 1 RD	8 physicians 2 PA-C 1 psychologist 1 social worker	6 physicians 3 PA-C	Location #1: 2 physicians Location #2: 3 physicians Location #3: 3 physicians
Medical home	-	In planning	-	State-certified health care home	State-certified health care home	-	In planning; medical home as a benefit to employees
Special clinical teams involving pharmacist(s)	-	-	-	DM care team	DM care team	-	Interprofessional care management team

Note: Clinics 4C and 5C were co-located in the same building.

Table 5-3. Overview of Data Collection

Clinic ID	**1A**	**2B**	**3B**	**4C**	**5C**	**6D**	**7E**
Length of site visits	3 days	1 day	1 day	2 days (also at site 5C)	2 days (also at site 4C)	2 days	1.5 days at Location #1
# of individuals interviewed	13	9	7	7	6	10	8
# of individuals who completed questionnaires	13	9	7	7	6	9	9
Pharmacist collaborative drug therapy management agreements	Anticoagulation; Diabetes; Dyslipidemia; Hypertension	Anticoagulation; Polypharmacy; Chronic diseases	Same as Clinic 2B	Asthma; COPD; Diabetes; Hypertension; Dyslipidemia; Opioid & BZD taper; Tobacco cessation; Therapeutic interchange	Same as Clinic 4C	Scope of practice covering ambulatory care, inpatient and long term care	Anticoagulation; Diabetes

Table 5-4. Interview Respondents

Clinic ID	1A	2B	3B	4C	5C	6D	7E	Total Number of Individuals
Regional pharmacist manager	0	0	0	1[a] (also cover Clinic 5C)	1[a] (also cover Clinic 4C)	0	0	**1**
Administrator	1 (also MD)	1	1	1 (also at Clinic 5C)	1 (also at Clinic 4C)	1	1 (also RN)	**6**
Physician (excluding resident)	3 (include admin MD)	1	2	1	0	1[b]	2	**10**
Resident physician	1	0	0	1	0	0	0	**2**
Physician assistant	0	0	0	0	1	1[b]	0	**2**
Pharmacist (excluding resident)	3	1 (also at Clinic 3B)	1 (also at Clinic 2B)	1 (also at Clinic 5C)	1 (also at Clinic 4C)	2	1	**8**
Resident pharmacist	1	0	0	0	0	0	0	**1**
Registered nurse	1	1	0	1	1	0	1 (admin)	**5**
Medical assistant	2	2[c]	3	1	1	1[b]	1	**11**
Licensed practical nurse	0	0	0	0	0	1[b]	0	**1**
Clerk	2[d]	2	0	0	0	0	0	**4**
Lab technician	0	1	0	0	0	0	0	**1**
Dietitian	0	0	0	0	0	1	1	**2**
Social worker	0	0	0	0	0	1	1	**2**
Quality	0	0	0	0	0	1	0	**1**
Physical therapy	0	0	0	0	0	0	1	**1**
Total Number of Individuals	**13**	**9**	**7**	**7**	**6**	**10**	**8**	**56 (excluding duplicate counts)**

[a] Phone interview; [b] Joint interview; [c] Joint interview; [d] Joint interview

Table 5-5. Questionnaire Respondents

Clinic ID	1A	2B	3B	4C	5C	6D	7E	Total Number of Individuals
Administrator	1 (also MD)	1	1	1 (also at Clinic 5C)	1 (also at Clinic 4C)	1	1 (also RN)	**6**
Physician (excluding resident)	3 (include admin MD)	1	2	1	0	1	2	**10**
Resident physician	1	0	0	1	0	0	0	**2**
Physician assistant	0	0	0	0	1	0	0	**1**
Pharmacist (excluding resident)	3	1 (also at Clinic 3B)	1 (also at Clinic 2B)	1 (also at Clinic 5C)	1 (also at Clinic 4C)	2	1	**8**
Resident pharmacist	1	0	0	0	0	0	0	**1**
Registered nurse	1	1	0	2	1	0	1 (admin)	**6**
Medical assistant	2	2	3	1	1	1	1	**11**
Licensed practical nurse	0	0	0	0	1	1	0	**2**
Clerk	2	2	0	0	0	0	1	**5**
Lab technician	0	1	0	0	0	0	0	**1**
Dietitian	0	0	0	0	0	1	1	**2**
Social worker	0	0	0	0	0	1	1	**2**
Quality	0	0	0	0	0	1	0	**1**
Physical therapy	0	0	0	0	0	0	1	**1**
Total Number of Individuals	**13**	**9**	**7**	**7**	**6**	**9**	**9**	**57 (excluding duplicate counts)**

Table 5-6. Questionnaire Responses by Clinic

Domains [Possible Range]	Clinic ID Mean (SD)	1A (n=13)	2B (n=9)	3B (n=7)	4C (n=7)	5C (n=6)	6D (n=9)	7E (n=5[a])
Team Processes								
Care sharing activities [1-70] [b]		59.3 (6.0) [c]	57.4 (4.0)	53.6 (5.3)	57.1 (5.9)	61.5 (5.2)	55.3 (8.6)	58.8 (7.3)
Interdisciplinary co-ordination [1-35] [b]		27.5 (4.0) [c]	26.7 (2.5) [d]	26.9 (3.0)	26.0 (3.8)	29.8 (4.4)	28.2 (4.1)	25.8 (5.6)
Team Climate								
Participative safety [1-28] [b]		23.7 (0.8)	23.2 (0.8)	21.4 (0.5)	23.0 (0.9)	26.0 (0.8)	22.6 (0.9)	23.6 (0.9)
Task orientation [1-21] [b]		16.5 (2.7)	17.1 (2.2)	14.4 (3.0)	16.1 (3.1)	17.7 (2.7)	14.8 (3.2)	14.4 (3.8)
Support for innovation [1-21] [e]		16.2 (2.6)	16.6 (2.9)	14.0 (1.9)	15.0 (4.2)	17.3 (2.7)	15.8 (3.7) [f]	15.2 (3.4)
Team Effectiveness [g]								
Communication strategy [1-7]		5.5 (1.2)	5.8 (0.6)	5.1 (0.7)	5.6 (0.5)	6.2 (1.0)	5.6 (0.9) [f]	5.4 (1.1)
Shared learning [1-7]		5.4 (1.1) [c]	5.7 (0.9)	5.0 (0.8)	5.4 (0.5)	5.7 (1.0)	5.2 (0.6)	5.0 (1.6)
Staff development [1-7]		5.6 (1.1) [c]	5.7 (1.0)	4.3 (0.8)	5.3 (0.5)	5.7 (1.2)	4.6 (1.4)	4.0 (2.1)
Org. process improvement [1-7]		5.2 (1.2)	5.4 (0.9)	4.9 (0.7)	5.6 (0.8)	5.7 (1.0)	5.0 (0.9)	4.8 (1.6)
Use of clinical protocols [1-7]		6.1 (0.8) [h]	5.3 (1.0)	5.3 (0.8)	5.6 (0.8)	6.2 (0.8)	5.3 (1.0)	4.8 (1.6)
Innovative practice [1-7]		6.1 (0.8) [c]	6.1 (0.6)	5.2 (0.6)	5.9 (1.1) [d]	6.4 (0.9) [i]	5.2 (1.2)	5.6 (1.3)
Keeping within budgets [1-7]		5.8 (1.0) [j]	5.6 (1.5)	5.0 (0.8)	5.4 (1.5) [i]	5.8 (1.3) [i]	5.1 (1.3) [d]	4.0 (2.2) [k]
Competence of practitioners [1-7]		6.7 (0.5) [c]	6.6 (0.5)	6.1 (0.7)	6.4 (0.8)	6.3 (0.8)	6.1 (0.8)	6.6 (0.5)
Competence of supporting staff [1-7]		6.2 (0.9)	6.3 (0.5)	5.6 (1.1)	5.6 (1.0)	6.0 (0.9)	5.8 (1.1)	6.2 (0.8)
Respect for patient's values, preferences, and expressed needs [1-7]		6.5 (0.7)	6.6 (0.5)	5.8 (1.1)	6.4 (0.5)	6.8 (0.4)	6.2 (0.8)	6.6 (0.5)
Patient information & education [1-7]		6.2 (0.9)	5.8 (0.9)	5.6 (1.0)	6.0 (0.6)	6.3 (0.8)	5.7 (1.3)	5.8 (1.1)
Patient access to care [1-7]		6.0 (0.9)	6.0 (0.9)	5.9 (1.2)	5.9 (0.7)	6.0 (0.9)	5.9 (1.3)	6.2 (0.8)
Meeting patient BP goals [1-7]		5.7 (0.8) [h]	5.9 (0.8) [f]	5.8 (0.4)	5.5 (1.0) [k]	5.2 (0.8) [k]	5.8 (0.7) [f]	4.8 (1.0) [k]
Meeting patient HbA1c goals [1-7]		5.7 (0.7) [h]	5.9 (0.8) [f]	5.9 (0.4)	5.5 (1.0) [k]	4.7 (0.8) [k]	5.6 (0.7) [f]	5.0 (0.8) [k]
Meeting patient lipid goals [1-7]		5.7 (0.8) [h]	5.9 (0.8) [f]	5.8 (0.4)	5.7 (1.0) [k]	4.8 (1.0) [k]	5.4 (0.5) [f]	4.8 (1.0) [k]

[a] Only Location #1 was included; [b] individual items ranged from "strongly disagree" (1) to "strongly agree" (7); [c] n=12; [d] n=7; [e] individual items ranged from "to a very little extent" (1) to "to a very great extent" (7); [f] n=8; [g] individual items ranged from "not at all effective" (1) to "highly effective" (7); [h] n=11; [i] n=5; [j] n=9; [k] n=6; [l] n=4.

Table 5-7. Team-based Approaches in Primary Care Clinics

	Provider-Rooming Staff Teams	**Pod Teams**	**Care Teams**	**Interprofessional Consultant Teams**	**Quality Improvement Teams**
Team Type	Work team	Work team	Work team	Parallel team	Parallel team
Team Goal	To get through daily workflow, including patient appointments and follow-up work associated with previous appointments	To provide cross-coverage for daily workflow, typically rooming or procedure tasks	To provide population management of patient care apart from patient appointments	To provide interdisciplinary recommendations on complex patient cases	To provide recommendations for quality improvement
Team Composition	Typically 1 provider and 1-2 rooming staff (MA, LPN, or RN)	Typically the rooming staff (MA, LPN, or RN) of 2-4 providers	At least 1 provider and 1 RN, LPN, or MA. May also include pharmacist, dietitian, or other professionals who regularly see the population	Varies, may include nurse case manager, pharmacist, social worker, dietitian, physical therapy, occupational therapy, behavioral health, public health, etc.	Varies, typically includes members from different work teams
Workspace	Varies, some providers work side-by-side with their rooming staff	Pod team members are seated close enough to overhear each other's conversations	Varies, some members are seated close to each other	No common workspace	No common workspace
Primary Communication	Face-to-face	Face-to-face	Face-to-face or EMR	EMR or emails	Face-to-face or emails
Huddles/Meetings	Mostly huddles, frequency depends on daily workload	Not formal, but pod team members can overhear and see each other	Biweekly or monthly meetings with occasional huddles	Biweekly or monthly meetings	Monthly or quarterly meetings
Clinics using the team(s)	1A, 2B, 3B, 4C, 5C, 6D, 7E	1A, 2B, 3B, 5C, 6D	4C, 5C	7E	2B, 4C, 5C

Note: EMR – electronic medical records.

CHAPTER SIX:
DISCUSSION

This three-study dissertation examined the implementation of physician-pharmacist collaboration models as well as the organizational influences on primary care teamwork. Study One used questionnaires to gather physician and pharmacist perceptions of collaboration at baseline in the CAPTION trial. Study Two qualitatively characterized the experience of physicians, pharmacists, clinic administrators, and study coordinators participating in the CAPTION trial and explored potential contextual factors leading to differences in clinic-level blood pressure outcomes. Study Three took a multiple-case study approach in understanding the organizational factors impacting teamwork in primary care clinics, as well as the different roles of pharmacists in such settings.

A list of findings is summarized by study in **Table 6-1**. In Study One, only two of the 12 hypotheses were supported in physician responses. This may be attributed to measurement problems, especially the ceiling effects of the trustworthiness and relationship initiation scales. As such, there was limited variability of the dependent variables in regression models. In Study Two, very few of the expected findings were observed and some opposite findings were identified. This could be explained by the distance between input factors and objective clinical outcomes in the conceptual framework, where the remote relationships are difficult to observe in a relatively small sample of clinics that had limited variability in input factors. In Study Three, three of the six expected findings (organizational rewards, comprehensive electronic medical records, and team training programs) were not observed due to the limited variability between clinics. In addition, teaching institutions did not have much difference in task design potentially due to the role modeling approach in clinical teaching.

This chapter discusses the findings across three studies and is organized by five sections, including discussions on primary care teamwork, implementation of physician-

pharmacist collaborative models, the conceptual framework and methodology used in these studies, policy and practice implications, and future research.

Primary Care Teamwork

Providing primary care in clinics is a complex process that involves multiple roles and responsibilities to achieve desirable outcomes. Clinic providers and staff members work together as a large team to work through billing forms, insurance restrictions, quality checklists, and routine assessments while trying to pay attention to patient concerns in a limited scheduled time. As more attention has been placed on prevention and chronic care management, primary care clinics are facing increased workload, and it is easy to be buried in the day-to-day workflow. Providers and rooming staff members rush from exam room to exam room to see more patients, leaving little time for huddles or meetings to plan for the care of patients ahead of daily schedule, let alone population management.

Most of the primary care clinics in this study had already adopted team-based approaches to provide care, such as the use of provider-rooming staff teams or pod teams; however, the goals of these teams were typically centered on daily workflow and were used to maximize "productivity", i.e., the number of patients seen per day. Fee-for-service reimbursement has been blamed for the making physicians feel like "hamsters on a treadmill", moving from exam room to exam room with little time for planning (R. A. Berenson & Rich, 2010). Providers who do spend time planning and huddling with their team members may get penalized for falling behind their patient schedule. As such, team care presents opportunity costs to team members. As chronic disease management requires practice redesigns to accommodate planning activities outside of patient appointments, payment reform that acknowledges the extra time needed for care coordination and population management is needed. Current primary care reform models – such as tiered case-management fees for established PCMH , episode-based payments

capitation with performance incentives, as well as the Medicare shared savings program – have been piloted in practices, and are expected to address the downfalls seen with fee-for-service reimbursement structures (Rosenthal, 2008).

One of the major findings in Study Three was that there was often misalignment of organizational rewards and expected teamwork. Most study participants mentioned that teamwork was expected and few rewards was associated with team effectiveness. While some providers received additional incentives for meeting quality of care targets on a provider level, the clinic staff received incentives for meeting quality of care targets as a whole on a clinic level. Neither of these incentives were aligned with the work teams or parallel teams identified in the study. This misalignment may become problematic as clinic staff members are delegated with heavier responsibilities.

Another major finding was that space and distance mattered for the frequency of contacts and exchange of information. Being even a few hundred feet away led to differences in team processes and the formation of distinct pod teams. While information technology such as EMR messages served as a helpful asynchronous communication tool, proximity between providers, pharmacists, and clinic staff members still affected the ability to provide "unintentional" support. Therefore, it is important to include space designs in the practice redesign process to facilitate the day-to-day exchanges between primary care team members.

Implementations of Physician-Pharmacist Collaborative Models

As discussed earlier, there is a great need to involve more non-physician team members to fulfill the needs in primary care settings. One such approach is including clinical pharmacists in primary care settings. Across the three studies, pharmacists were involved with seeing patients, developing treatment recommendations, and implementing treatment plans as approved by physicians.

In Study One, it was found that physicians and pharmacists had varying views of facilitators and barriers. For example, pharmacist expertise was a facilitator for establishing trustworthiness for physicians, whereas no association between physician expertise and trustworthiness was identified for pharmacists. In addition, it was observed that insurance reimbursement level for pharmacist management was associated with role specification for pharmacists, but not physicians.

Study Two linked objective BP outcomes with facilitators and barriers reported by clinic staff in the physician-pharmacist collaboration. Some of the facilitators included presenting to clinic providers and staff members, having existing relationships between physicians and pharmacists, and support from medical leadership; whereas barriers identified included clinical inertia to change practice patterns and lack of sufficient reimbursement for collaboration. Among all variables, patient population and the extent of pharmacy services were found to be predictors of clinic-level outcomes: Clinics with higher proportions of minority and indigent populations despite high levels of pharmacy services were associated with worse outcomes, while clinics with lower proportions of minority and indigent populations with low levels of pharmacy services were associated with better outcomes.

It was also observed in Study Three that pharmacists incorporated into the clinics had established relationships with providers and clinic staff members and served integral roles by providing drug information, patient education, and disease state management while being easily accessible to providers and staff members.

Across all three studies, physician-pharmacist collaborative models were examined from different angles in different samples of clinics. Study One and Study Two examined primary care clinics participating in a practice-based research network, while Study Three examined a purposeful sample of primary care clinics. Study Three intentionally sampled clinics that were not participating in the CAPTION trial to minimize respondent burden. While clinics in all studies had incorporated clinic

pharmacists, there were some differences. First, CAPTION clinics were more often family medicine or internal medicine training sites where the pharmacists were employed as faculty in the medical residency program. As such, there may have been more interactions with the faculty physicians and medical residents either in classroom settings or in clinics. However, none of the pharmacists were employed by medical residency programs in Study Three, and the roles of pharmacists may have not been the same. Second, as CAPTION clinics were part of a practice-based research network and involved in a 9-month or 24-month long intervention, the interviewees may have been more aware of the pharmacist work than other clinics, and provided more socially desirable responses; whereas clinics in Study Three only participated in the study for one to three days, and there may have been less of an influence on the respondents. Finally, several of the clinics participating in the CAPTION trial had more than one pharmacist in each clinic, whereas many of the clinics in Study Three had one pharmacist for multiple clinics. The division of labor between pharmacists may have varied across sites and their capability to provide services may have also been different. These three differences should be noted while comparing between the three studies in this dissertation.

Conceptual Framework and Methodology

The conceptual framework (**Figure 2-2**) used in this dissertation was useful for organizing and understanding the multiple layers of influence on primary care team effectiveness. Specifically, it advanced the understanding of physician-pharmacist collaborations using a teamwork approach that has been well-established in other disciplines. This approach incorporated the organizational facilitators and barriers to teamwork, in conjunction with the attitudinal and relational aspects of working together.

However, there were also some limitations to the framework. For example, it was discovered that there were multiple types of teams within primary care clinics: provider-rooming staff teams and pod teams were useful in getting the daily patient appointments

covered; care teams were helpful in population management; and interprofessional consultant teams were helpful in pulling together multiple disciplines to improve management for complex patient cases. Including the typology of teams in the current conceptual framework may be useful in future studies to distinguish the effectiveness of each type of teams. In addition, acknowledging the different types of teams would also have theoretical contributions by opening the discussion of teamwork in terms of advantages and disadvantages of multiple team membership (O'Leary, Mortensen, & Woolley, 2011).

In this dissertation, it was also found that several organization factors had minimal influence on team processes and team effectiveness. For example, organization training on teamwork and organizational missions on interprofessional education had little influence on day-to-day team processes in the clinic. This could be explained in two ways. First, the limited number of organizations included in this study may have not provided sufficient variability to observe an effect. Future quantitative studies involving larger number of organizations and individuals may prove otherwise. Second, based on the original ITEM framework, organizational context was theorized to have less direct impact on team processes and team effectiveness, when compared to task design and team-level inputs. Therefore, the current results may also be reflecting what has been previously known.

Both quantitative and qualitative approaches were used in this dissertation that strengthened the understanding of physician-pharmacist collaboration. With quantitative methods, Study One gathered opinions from 225 physicians and 41 pharmacists across 32 primary clinics. However, it was difficult to understand the full clinic context behind each response of various factors being a major hindrance or extremely helpful. With qualitative methods, Study Three gathered rich descriptions of seven primary care clinics that complemented Study One in understanding each facilitator and barrier. This study also provided the opportunity to identify additional factors, such as personal

relationships, which is important for understanding the implementation of physician-pharmacist collaborations in clinic settings. Finally, Study Two used a structured interview guide to gather data from 63 physicians, 26 pharmacists, 13 administrators, and 23 study coordinators. While the responses were shorter than if a semi-structured interview guide was employed, the number of responses able to be gathered was significantly higher than those of Study Three.

There were a few methodological limitations in this dissertation. First, the team members involved in primary care clinics often have a diverse training and education background. While the interview guides in Study Three were designed for pharmacists and non-pharmacists separately, the questions could have been further tailored to each role in the clinic, so that the terminologies and complexity of questions could fit better with the training background of each role.

In addition, the intent to include multiple clinics and enhance generalizability of findings limited the amount of time the PI was able to spend at each clinic. Therefore, the length of time that the PI spent at each clinic site may have been less than ideal. Future multiple-case studies involving a research team may be helpful in gathering richer data and enhancing the process of data analysis and interpretation.

Policy and Practice Implications

Current health care reform efforts and the enactment of the Patient Protection and Affordable Care Act (2010) have propelled the experiementation and implementation of new delivery models, such as patient-centered medical homes (PCMH) and accountable care organizations (ACOs). The emphasis on quality and clinical performance is stronger than ever; quality measures have been developed for the performance of ACOs, Medicare Part C and Part D, and a lot of items are regarding medication management for at-risk populations (Centers for Medicare and Medicaid Services, 2012; Centers for Medicare and Medicaid Services, 2013). These reform efforts create an opportunity for pharmacists

to be incorporated into clinic settings to help with medication reconcilitation and chronic disease management, including diabetes, hypertension, heart failure etc, and improve clinic-level and organization-level quality measures. This dissertation provided additional knowledge on integration of pharmacists into primary care clinics. While many of the clinics had already incorporated pharmacists for many years, these clinics were also making changes to adapt to current health care reform efforts and improve patient-centeredness. With established relationships with clinic leaders, providers, and staff members, pharmacists have greater opportunities to expand their services and make the biggest impact they could provide for the clinic population. Study One and Two provided evidence of how pharmacist management of blood pressure could be done in clinic settings to improve patient blood pressure control. Study Three also provided several examples of pharmacist integration into clinic provider workflow that could be informative for clinics wishing to provide clinical pharmacy services.

As healthcare organizational leaders are moving to implement more team-based approaches to expand the number of patient-centered medical homes, it is also important to align the organizational rewards with the level of teamwork expected. While current incentives are typically provided at provider- and clinic-level, further detailed levels to acknowledge the smaller teams as identified in this dissertation may be helpful in improving the effectiveness of the smaller teams.

For practice managers, in addition to setting up appropriate reward systems for teamwork, there are other measures that can be helpful in improving team effectiveness. First, hiring teamwork-oriented staff members may be helpful in establishing teams with good climate that members are willing to support team performance. In addition, maintaining employee satisfaction and minimizing clinic staff turnover rates also may be helpful in improving team effectiveness. Second, despite previous training and education, it still takes time to learn how to work in a new team. In addition to shadowing activities, setting time for communication may be helpful in minimizing the “trial and error”

periods as described in this dissertation. Finally, it was recognized in Study Three that the physical distance between team members greatly affected how team processes were carried out. As clinics adopt new processes to become patient-centered medical home, it is also important to consider rearranging workstations to maximize the team effectiveness of future teams.

For pharmacists, while the lack of provider status for Medicare Part B has continued to be a barrier for incorporating pharmacists in clinics and expanding services, all of the clinics in this dissertation have successfully incorporated pharmacists. This dissertation has further identified areas that could be improved by clinic pharmacists. First, Study Two identified that clinics with the worst patient outcomes tended to be associated with higher proportions of patients with low socioeconomic status despite the high levels of pharmacist services provided. It is suggested that these patient populations may require more extensive attention and follow-up in order to overcome the barriers that these patients encounter. It was also shown in Study Three that collaborating with clinic providers and staff members and closely following up with patients could improve team processes and subsequent outcomes, even in clinics serving patients with more complex social needs, such as Clinic 5C.

In addition, as patient access to care is an important parameter in patient-centered medical homes, clinic pharmacists also should consider measures to improve access to pharmacist services. While expanding hours may be less of an option when there is difficulty in billing for services, another measure could take advantage of technology, such as providing direct lines or providing direct messaging functions through existing electronic medical records.

Conclusion and Future Research

It was discussed in Chapter Two that pharmacists are often underused in primary care settings and expansion of the physician-pharmacist collaborative model is not easy.

This dissertation provided additional insights to these problems. While limited reimbursement mechanisms and the lack of Medicare provider status continue to be a significant barrier for expanding pharmacist services in primary care clinics, additional barriers and facilitators were identified. Physician inertia to change practice and seek out pharmacists to support medication management was reported as a barrier by physicians in Study Two and Study Three. Across all three studies, clinic pharmacist workload was a barrier to collaboration especially when pharmacists had additional teaching or research responsibilities and/or had patient care responsibiites for more than one clinic. Pharmacists had to creatively integrate themselves into physician workflow in various ways depending on the resources and manpower available. While co-location with the physicians allowed the clinic pharmacists to demonstrate their abilities and develop personal relationships with clinic physicians and staff members, busy patient schedules for physicians and pharmacists respectively often require the use of asynchronous communication mediums such as emails or notes in the electronic medical records. In addition, buy-in from clinic leadership, especially medical leadership, was important in establishing pharmacy services and obtaining the resources needed for success.

Future research is warranted in the following areas: First, this dissertation characterized different types of teams in primary care clinics, including provider-rooming staff teams, pod teams, care teams, interprofessional consultant teams, and quality improvement teams. Future studies examining the relationship between the different types of teams and team-level incentives would be helpful in understanding how the design of teams in primary care clinics can be improved.

Second, many physicians have mentioned that they have been trained in settings with limited exposure to different disciplines, and it was often the students that had to seek out interprofessional knowledge on their own. In recent years, more focus has been placed on enhancing interprofessional education early in training, and a collaborative of six professional societies have identified four core competencies: values/ethics for

interprofessional practice, roles/responsibilities, interprofessional communication, as well as teams and teamwork (Interprofessional Education Collaborative Expert Panel, 2011). Future studies examining the effectiveness of interprofessional education programs may be helpful in dissolving the inertia to change and collaborate in primary care settings.

Third, as public reporting data of clinic-level objective outcomes become available, it would be illuminating to study the effect of organizational context on clinic control of conditions such as diabetes and blood pressure. This would greatly improve the understanding of optimal team designs and organizational facilitators for better chronic disease management.

Fourth, as multiple types of teams exist in primary care clinics, research on how to provide incentives to maximize team effectiveness of all types of teams is warranted. Membership in one team may provide expertise for another team; for example, pharmacist participation in care teams may provide insights for interprofessional consultant teams because of more knowledge of patient conditions. Yet, there is limited time of each team member. It would be important to understand the optimal incentive design.

Finally, this dissertation explored the roles of pharmacists and how they were incorporated into primary clinics. It was found that as a member in the clinic, pharmacists were often involved in a diversity of responsibilities, including disease state management, drug information questions, follow-up with lab results, formulary questions, and identifying cost-effective treatment options. Future studies quantifying the categories of direct services and consultant services may be helpful in documenting the level of assistance provided by pharmacists and providing support for justifying reimbursement of services.

Table 6-1. Summary of Findings by Study

Domain	Concept	Hypothesis or Expected Finding	Results
Study 1			
Organizational context	Rewards	• The helpfulness of pharmacist billing mechanism is positively associated with collaborative working relationship.	Not supported
		• The helpfulness of pharmacist compensation system is positively associated with collaborative working relationship.	Not supported
	Structure	• The helpfulness of clinic staff support for scheduling pharmacist visits is positively associated with collaborative working relationship.	Supported only for role specification
	Resources	• The helpfulness of communication technology is positively associated with collaborative working relationship.	Not supported
	Space	• The helpfulness of available designated space is positively associated with collaborative working relationship.	Not supported
Task design	Workload	• The helpfulness of patients' schedules is positively associated with collaborative working relationship.	Not supported
		• The helpfulness of pharmacist's time available for meeting with patients is positively associated with collaborative working relationship.	Not supported
		• The helpfulness of pharmacist workload is positively associated with collaborative working relationship.	Not supported
		• The helpfulness of physician workload is positively associated with collaborative working relationship.	Not supported
	Formal protocols	• The helpfulness of policies or procedures for referring patients to pharmacists is positively associated with collaborative working relationship.	Not supported
Team composition	Physician	• The helpfulness of physician's level of expertise is positively associated with collaborative working relationship.	Not supported
	Pharmacist	• The helpfulness of pharmacist's level of expertise is positively associated with collaborative working relationship.	Supported only for trustworthiness
Study 2			
Organizational context	Space	• Insufficient exam rooms are associated with worse disease state control at clinic level.	Not observed

Table 6-1. Continued

Task Design	Workflow	• Conducive workflow is associated with better disease state control at clinic level.	Not observed
	Workload	• Heavier pharmacist workload is associated with worse disease state control at clinic level.	Not observed in interviews but some evidence from pharmacy structure score and minority group %
	Formal agreement	• Having collaborative practice agreements is associated with better disease state control at clinic level.	Not observed
	Physician beliefs	• Positive physician beliefs about pharmacist's work are associated with better disease state control at clinic level.	Not observed
Team composition	Staff support	• Office staff support is associated with better disease state control at clinic level.	The opposite was observed
Patient factors	Barriers	• The more barriers patients encounter, the worse disease state control at clinic level will be.	Not observed
Team processes	Collaboration	• Higher acceptance of pharmacist recommendations is associated with better disease state control at clinic level.	Not observed
	Communication	• Poor communication is associated with worse disease state control at clinic level.	Observed in asthma group but the opposite observed in BP group
Team outcomes	Subjective outcomes	• Higher performance on subjective outcomes is associated with better disease state control at clinic level.	Not observed
<u>Study 3</u>			
Organizational context	Goals	• Clinics with organizational missions on healthcare professional education will have different team compositions and task designs than clinics without missions on healthcare professional education.	Teaching clinics had more extended roles, but the basic task designs were not much different from non-teaching clinics
	Rewards	• Clinics with organizational rewards for teamwork will have better team processes and outcomes than clinics without organizational rewards for teamwork.	Not observed due to few organizational rewards identified

Table 6-1. Continued

Structure	• Clinics employing multidisciplinary teamwork to help the underserved (i.e., clinics with organizational structure to community health centers) will have better team outcomes.	Observed
Resources	• Clinics with comprehensive electronic medical records will have better communications between healthcare professionals than clinics without comprehensive electronic medical records.	Not observed
Training	• Clinics with team training programs will have better team climate and team outcomes than clinics without team training programs.	Not observed due to few training programs identified
Space	• Physical proximity between team members will have a positive influence on communications.	Observed

APPENDIX A: STUDY INSTRUMENTS

[Study 1] Physician-Pharmacist Collaboration Index

Questionnaire (Physician Version)

Consider your working relationship with a pharmacist with whom you work the most. Think, in general, about the interactions you've had with this pharmacist over time (not just for hypertension). Please indicate your agreement with each of the following statements by using the scale listed below. Please circle the number that represents your agreement with the item.

SCALE: 1-Very Strongly Disagree 2-Strongly Disagree 3-Disagree 4-Neutral 5-Agree 6-Strongly Agree 7-Very Strongly Agree

Role Specification							
1. In providing patient care, I need this pharmacist as much as this pharmacist needs me.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. This pharmacist depends on me as much as I depend on him/her.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. I will work with this pharmacist to overcome disagreements on his/her role in managing drug therapy.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. This pharmacist and I are mutually dependent on each other in caring for patients.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. This pharmacist and I negotiate to come to agreement on our activities in managing drug therapy.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Trustworthiness							
6. The pharmacist is credible.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7. My interactions with this pharmacist are characterized by open communication of both parties.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8. I can count on this pharmacist to do what he/she says.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9. I intend to keep working together with this pharmacist.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10. I trust this pharmacists' drug expertise.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
11. Communication between this pharmacist and myself is two-way.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

SCALE: 1=Not at all---5=To a great extent

Please indicate the extent to which this pharmacist has……

Relationship Initiation					
12. Spent time trying to learn how he/she can help you provide better care	**1**	**2**	**3**	**4**	**5**
13. Provided information to you about a specific patient	**1**	**2**	**3**	**4**	**5**
14. Showed an interest in helping you improve your practice	**1**	**2**	**3**	**4**	**5**

[Study 1] Physician-Pharmacist Collaboration Index

Questionnaire (Pharmacist Version)

Consider your working relationship with a physician with whom you work the most. Think, in general, about the interactions you've had with this physician over time (not just for hypertension). Please indicate your agreement with each of the following statements by using the scale listed below. Please circle the number that represents your agreement with the item.

SCALE: **1-Very Strongly Disagree 2-Strongly Disagree 3-Disagree 4-Neutral 5-Agree 6-Strongly Agree 7-Very Strongly Agree**

Role Specification							
1. In providing patient care, the physician needs me as much as I need this physician.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. This physician depends on me as much as I depend on him/her.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. I will work with this physician to overcome disagreements on his/her role in managing drug therapy.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. This physician and I are mutually dependent on each other in caring for patients.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. This physician and I negotiate to come to agreement on our activities in managing drug therapy.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Trustworthiness							
6. The physician is credible.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7. My interactions with this physician are characterized by open communication of both parties.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8. I can count on this physician to do what he/she says.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9. I intend to keep working together with this physician.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10. I trust this physician's medical expertise.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
11. Communication between this physician and myself is two-way.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

SCALE: 1=Not at all---5=To a great extent

Please indicate the extent to which this physician has……

Relationship Initiation					
12. Spent time trying to learn how he/she can help you provide better care	**1**	**2**	**3**	**4**	**5**
13. Provided information to you about a specific patient	**1**	**2**	**3**	**4**	**5**
14. Showed an interest in helping you improve your practice	**1**	**2**	**3**	**4**	**5**

[Study 2] Physician Interview Guide

Hello, my name is _____, and I am a pharmacist on the CAPTION study that your clinic is participating in. As part of the study, we are hoping to complete an interview with select clinic physicians over the phone so we could gain insight into the effectiveness of physician-pharmacist collaboration. We are interested in knowing whether the study's intervention worked well, what didn't work well and what might be done to improve collaboration. The interview will take about 10-15 minutes. Would you have some time to do the interview now? Or could we set up a time to do the interview?

Let me go over some things before we begin.

If you have any questions, please feel free to ask me. Also, if you don't want to answer any questions just let me know.

With your permission, we will be recording this interview to ensure we accurately record what you say and so we can review your responses.

All information will be kept strictly confidential- I will use a random study ID number to identify you once we start recording.

Do you have any questions for me before we begin?

OK, I will begin recording now.

Hi, this is _____ with participant #_____. Today is _____.

Please tell me how long have you worked in this medical office? _____ years.

I have a series of questions. Please feel free to provide as much detail to each question as you feel is appropriate.

A. The first questions concern how physician-pharmacist collaboration has changed since the intervention was implemented:

    1. Prior to the intervention, did physicians in your clinic typically refer patients to the pharmacist for chronic disease management (e.g. where they could manage therapy relatively independently)?

        ___ Yes ___ No

        Comments:

        How has the pattern of collaboration changed as a result of the intervention?

    2. Prior to the intervention, were the physicians in your clinic generally receptive to pharmacist's recommendations?

        ___ Yes ___ No

        Comments:

3. Are the physicians in your clinic now receptive to treatment recommendations made by a clinic pharmacist?

   ___ Yes ___ No

   Comments:

4. Are there physicians in your clinic who believe this type of collaboration is not needed?

   ___ Yes ___ No

   Comments:

5. Do any of the physicians in your clinic believe that pharmacists do not have the expertise to manage chronic diseases?

   ___ Yes ___ No

   Comments:

6. Does your workload impact your willingness to collaborate with a pharmacist?

   ___ Yes ___ No

   Comments:

7. Does the pharmacist's workload impact your ability to collaborate with them?

   ___ Yes ___ No

   Comments:

8. Do you refer patients to the pharmacist for disease state management?

   ___ Yes ___ No

   Comments:

9. Does collaborating with a pharmacist impact your patient-physician relationship?

   ___ Yes ___ No

   If yes, in what way does it impact the relationship?

10. Do you spend the majority of your time at the clinic where the study was performed?

    ___ Yes ___ No

    Comments:

11. What is your preferred form of communication with the pharmacist? (ex. verbal, e-mail, electronic medical record notes, etc)

12. Does the clinic workflow negatively impact your ability to collaborate with the pharmacist?

    ___ Yes ___ No

    Comments:

13. Do you believe a pharmacist's involvement in chronic disease management can improve patient outcomes?

    ___ Yes ___ No

    Comments:

14. Did your clinic have a process in place for physician-pharmacist collaboration prior to the study?

    ___ Yes ___ No

    Comments:

15. Do you currently have a collaborative practice agreement with the pharmacist in place?

    ___ Yes ___ No

    Comments:

16. Did you develop a collaborative practice agreement with a pharmacist in your clinic as a result of your participation in this study?

    ___ Yes ___ No

    Comments:

    If you do NOT currently have a collaborative practice agreement in place:

    a. For what reasons would you create a collaborative practice agreement with a pharmacist in your clinic?

    b. For what reasons would you NOT create a collaborative practice agreement with a pharmacist in your clinic?

17. What percentage of the time did you accept the recommendations the pharmacist made?

    □ 0-25% □ 26-50% □ 51-75% □ 76-100%

    Comments:

18. What types of pharmacist recommendations are you MORE likely to accept?

19. What types of pharmacist recommendations are you LESS likely to accept?

20. Do you think having a pharmacist involved in chronic disease state management increases your workload?

    ___ Yes ___ No

    Comments:

21. Was collaboration with the physician successful for improving your patients' disease state control?

    ___ Yes ___ No

    If not, why not?

22. How did your patients perceive collaboration with the pharmacist?

23. Could this model be expanded to disease states other than blood pressure/asthma?

    ___ Yes ___ No

    Comments:

24. How can physician-pharmacist collaboration be integrated into usual primary care?

25. Should pharmacists be recognized as health care providers by Medicare and be able to bill for their clinical services?

    ___ Yes ___ No

    Comments:

26. What barriers do you see with implementing physician-pharmacist collaboration?

27. Do you have any suggestions for ways to help improve either the physician-pharmacist collaborative model or its implementation?

[Study 2] Pharmacist Interview Guide

Hello, my name is _____, and I am a pharmacist working with Dr. Barry Carter on the CAPTION study at the University of Iowa. As part of the study, I am calling to interview a study pharmacist over the phone so we can gain insight into the effectiveness of pharmacist-physician collaboration. We are interested in knowing what aspects of the intervention worked well, what parts did not work well, and how the intervention might be improved. The interview will take about 10-15 minutes.

Do you have some time to do the interview now? Or could we set up a time to do the interview?

Let me go over some things before we begin.

If you have any questions, please feel free to ask me. Also, if you don't want to answer any questions just let me know.

With your permission, we will be recording this interview to ensure we accurately record what you say and so we can review your responses.

All information will be kept strictly confidential. I will use a random study ID number to identify you once we start recording.

Do you have any questions for me before we begin?

OK, I will begin recording now.

Hi, this is _____. I am speaking with participant #_____.

Today's date is _____.

Please tell me how long have you worked in this medical office? _____ years.

I have a series of questions. Please feel free to provide as much detail to each question as you feel is appropriate.

A. The first questions concern how your pattern of collaboration with physicians has changed since the intervention was implemented:

    1. Prior to the intervention, did physicians in your clinic typically refer patients to you for chronic disease management (e.g. where you could manage therapy relatively independently)?

        ___ Yes ___ No

        If yes: Describe the proportion of physicians who did refer patients to you prior to the intervention:

        □ 0-25% □ 26-50% □ 51-75% □ 76-100%

Please estimate the frequency of physician referrals prior to the intervention:
__ One or more referrals weekly
__ One or more referrals monthly
__ Referrals received only episodically

What disease states did physicians refer to you to manage prior to the intervention?

How has the pattern of collaboration changed as a result of the intervention?

Describe the proportion of physicians who now refer patients to you:

□ 0-25% □ 26-50% □ 51-75% □ 76-100%

Please estimate the frequency of physician referrals:
__ One or more referrals weekly
__ One or more referrals monthly
__ Referrals received only episodically

Are there any new disease states physicians refer patients to you for management after the intervention?

2. Prior to the intervention, were the physicians in your clinic generally receptive to your recommendations?

___ Yes ___ No

Comments:

Were there physicians in your clinic who believe collaboration is not needed?

___ Yes ___ No

Comments:

Did any of the physicians believe pharmacists do not have the expertise to manage chronic diseases?

___ Yes ___ No

Comments:

How has physician receptivity changed?

3. Did you have a collaborative practice agreement with physicians in your clinic prior to the study?
___ Yes ___ No
Comments:

Do you have one now?
___ Yes ___ No
Comments:

4. Did you create a collaboration plan with the physicians in the clinic before seeing patients?

   ___ Yes ___ No

   Comments:

   Based on your experience in the study, how would you evaluate the importance of creating a collaboration plan prior to seeing patients?

5. What is your preferred form of communication with the physician? (ex. verbal, e-mail, electronic medical record notes, etc)
   ___ Verbal ___ E-mail ___ Electronic Medical Record notes
   ___ Other: _____

   What changes in communication would you try in the future?
   ___ Verbal ___ E-mail ___ Electronic Medical Record notes
   ___ Other: _____

6. In what ways were you able to influence decisions regarding the provision of pharmacist services in your clinic prior to implementation of the intervention?

   Has your ability to influence decisions regarding the provision of pharmacist services changed?

   ___ Yes ___ No

   Comments:

7. Were there specific things done that made it more likely for the physicians to collaborate during this intervention (e.g. things that facilitated the intervention)?

8. What percentage of the time did the physician accept your recommendations?

   □ 0-25% □ 26-50% □ 51-75% □ 76-100%

   Comments:

9. What types of recommendations were the physicians MORE likely to accept?

10. What types of recommendations were the physicians LESS likely to accept?

11. Was collaboration with the physician successful for improving your patients' disease state control?

    ___ Yes ___ No

    If not, why not?

12. How do your patients perceive your collaboration with their physician?

13. Do you have any general suggestions for ways to help improve overall pharmacist-physician collaboration in your clinic?

    ___ Yes ___ No

    Comments:

14. Could this model be expanded to disease states other than blood pressure and asthma?

    ___ Yes ___ No

    Comments:

15. How can pharmacist-physician collaboration be integrated into usual primary care?

B. The next questions concern barriers you encountered to the collaborative intervention and factors that facilitated the intervention:
    1. Do you spend the majority of your time in the clinic where the study was performed?

       ___ Yes ___ No

       If not, was your location a barrier?

       ___ Yes ___ No

       Comments:

    2. Who is involved in scheduling your patient appointments?

       □ Self-schedule □ Office staff □ Study Coordinator

       What challenges, if any, occurred in patient scheduling?

       Did patients not showing up to their appointments impact your ability to control their chronic disease?

       ___ Yes ___ No

       Comments:

    3. Did the physicians' workload impact their willingness to collaborate with you?

       ___ Yes ___ No

       Comments:

    4. Did your workload impact your ability to collaborate with the physicians?

       ___ Yes ___ No
       Comments:

5. Did the clinic workflow negatively affect your ability to see patients? If so, how?

   ___ Yes ___ No

   Comments:

6. Is the clinic workflow typically conducive to your seeing patients?

   ___ Yes ___ No

   Comments:

7. How did the clinic nurses and medical assistants support the pharmacist-physician collaboration?

8. How did the clinic nurses and medical assistants create barriers to collaboration?

9. Please describe any other barriers to the intervention you encountered.

10. Please describe any other facilitators of the intervention that you encountered.

[Study 2] Clinic Administrator Interview Guide

Hello, my name is _____, and I am the Clinical Sites Coordinator for the CAPTION study your clinic is participating in. As part of the study, a clinical pharmacist collaborated with clinic physicians in order to improve outcomes for patients who have asthma/hypertension. We now hope to conduct an interview over the phone with a member of the administrative team at each clinic so we can gain detailed insight into the impact of the study's intervention on your clinic. The interview will take about 10-15 minutes. Do you have some time to do the interview now? Or could we set up a time to do the interview?

Let me go over some things before we begin.

If you have any questions, please feel free to ask me. Also, if you don't want to answer any questions just let me know.

With your permission, we will be recording this interview to ensure we accurately record what you say and so we can review your responses.

All information will be kept strictly confidential. I will use a random study ID number to identify you once we start recording.

Do you have any questions for me before we begin?

OK, I will begin recording now.

Hi, this is _____. I am speaking with participant #_____.

Today's date is _____.

Please tell me how long have you been a member of the administrative team in this medical office?_____years.

A. My initial questions concern the challenges the clinic encountered with subjects:
   1. Are you aware of any concerns that patients had about the study intervention?

      ___ Yes ___ No

      Comments:

      Were you or anyone else on your administrative team ever contacted by a patient who was concerned about the study intervention?

      ___ Yes ___ No

      Comments:

   2. Did the clinic encounter problems when scheduling subjects for study visits with your pharmacist?

      ___ Yes ___ No

      Comments:

Did scheduling patients for visits with the pharmacist negatively impact clinic flow?
___ Yes ___ No

Comments:

3. How did the intervention protocol impact the clinic flow?

4. What unanticipated events occurred as a result of the study?

5. Did the workload associated with the intervention impact either the ability of the clinic to provide services or the ability of providers to complete their tasks?

___ Yes ___ No

Comments:

6. Did your clinic bill insurers for the pharmacist's clinical services before the study began?
___ Yes ___ No

Comments:

7. Did the clinic bill for the pharmacist's clinical services once the intervention was implemented?

___ Yes ___ No

Comments:

If so, did you encounter any barriers when billing for the pharmacist's clinical services?
___ Yes ___ No

Comments:

B. The next questions focus on the collaborative intervention's effect on routine clinic practice:

1. Are you aware of any ways in which patient subjects served as a barrier to implementation of the intervention?

___ Yes ___ No

Comments:

2. What feedback did subjects give to you or to providers regarding the effectiveness of the intervention or its value to them?

3. Did clinic nurses and medical assistants facilitate implementation of the intervention?
___ Yes ___ No
Comments:
4. Did clinic nurses and medical assistants serve as a barrier to implementation of the intervention?

___ Yes ___ No

Comments:

5. What problems, if any, arose between the study pharmacist and clinic physicians that impacted the clinic?

6. What problems, if any, arose between the study pharmacist and clinic physicians that served as a barrier to or decreased the effectiveness of the intervention?

7. Do your providers believe that the pharmacist-physician collaboration improved the quality of care your patients received?

   ___ Yes ___ No

   Comments:

8. Did the pharmacist intervention have any positive and/or negative effects on your revenue or cash flow?

   ___ Yes ___ No

   Comments:

[Study 2] Study Coordinator Interview Guide

Hello, this is _____, Clinical Sites Coordinator for the CAPTION study. As part of the study, we are trying to learn about the effectiveness of the study's pharmacist intervention and its effects on your clinic. The interview will take about 10-15 minutes. Do you have some time to do the interview now? Or could we set up a time to do the interview?

Let me go over some things before we begin.

If you have any questions, please feel free to ask me. Also, if you don't want to answer any questions just let me know.

With your permission, we will be recording this interview to ensure we accurately record what you say and so we can review your responses.

All information will be kept strictly confidential- I will use a random study ID number to identify you once we start recording.

Do you have any questions for me before we begin?

OK, I will begin recording now.

Hi, this is _____. I am speaking with participant #_____.

Today's date is _____.

Please tell me how long have you worked in this medical office?_____years.

Is your job typically focused on direct patient care or on research?

□ Patient Care □ Research □ Combination

Comments:

A. My initial questions concern the challenges that you or the pharmacist might have encountered with patients:

1. Did patients express any concerns about having a pharmacist help them manage their blood pressure?

□ Yes □ No

Comments:

2. Were patients willing or reluctant to make extra clinic visits to see the study pharmacist?

□ Willing □ Reluctant

Comments:

3. Did the pharmacist have with substantial problem with visit no-shows?

   □ Yes □ No

   Comments:

B. My next set of questions concern any challenges that the study protocol posed for your providers or clinic:

1. The study protocol required specific activities of your pharmacist, your physicians and your patients.

   i. What parts of the protocol worked the best?

   ii. What parts of the protocol did not work well?

2. Did any protocol deviations occur during the study?

   □ Yes □ No

   If yes, what types?

3. Did any unanticipated events occurred during the course of the study?

   □ Yes □ No

   If yes, what happened?

4. Did any of the protocol deviations or unanticipated events affect your clinic's work flow?

   □ Yes □ No

C. The next questions focus on the collaborative intervention's effect on routine clinic practice:

1. Did the pharmacist or your clinic staff have difficulty scheduling pharmacist appointments with subjects?

   □ Yes □ No

   Comments:

2. Were there problems in finding clinic space for pharmacist visits with subjects?

   □ Yes □ No

   Comments:

3. Did clinic nurses and medical assistants facilitate the pharmacist's work with patients?

   □ Yes □ No
   Comments:

4. Did clinic nurses and medical assistants impede the pharmacist's work with patients?

   □ Yes □ No

   Comments:

5. Did any problems arise between the study pharmacist and clinic physicians?

   □ Yes □ No

   Comments:

6. Did the pharmacist intervention confuse patients about who was in charge of their care?

   □ Yes □ No

   Comments:

7. What feedback did subjects give you regarding the effectiveness of the pharmacist intervention or its value to them?

[Study 3] Interview Guide for Pharmacists

Thank you for agreeing to participate in this interview regarding organizational determinants of primary care teamwork. It is estimated that this interview will last 30-45 minutes. I will be recording this session. Feel free to let me know at any moment if you do not wish to continue. Do you have any questions before we get started?

My first two questions concern general teamwork in your clinic.

[General Teamwork]

1. What is your role in patient care in this clinic, and how do you work with other staff in the clinic?
    A. Probe: What interactions do you have with other staff members?
    B. Probe: How is patient care coordinated between different team members at this clinic?
2. How do you communicate with your patient care team, and how effective is the communication between team members?
    A. Probe: How often do communications occur? Under which circumstances?
    B. Probe: Do you document on the electronic chart?

The next few questions are more specific regarding the determinants of team effectiveness.

[Organizational Context]

3. Do you teach students or residents in your practice? If yes, how do the teaching activities affect teamwork in patient care?
    A. Probe: How is teaching activities incorporated in your patient care routines?
4. How is teamwork rewarded or discouraged by your organization?
    A. Probe: Do you have protected time to participate in team meetings?
5. How does information technology, such as electronic records and electronic prescribing, affect your teamwork for patient care?

6. How did you learn to work with your team? Did your organization provide training?
7. Do you think your office space arrangements impact your teamwork?
    A. Probe: Do you have more interactions with other staff because of the space arrangement?

[Team Inputs]

8. How many patients do you see/help in a typical week?
9. How does your workload affect the performance of your patient care team?

My last few questions are specific to pharmacist involvement in this clinic.

[Pharmacist Involvement]

10. What does the clinical pharmacist do? Are there pharmacist-specific responsibilities?
11. How does the pharmacist contribute to the primary care team?
12. How has the role of pharmacists in this clinic changed over the years?
13. What challenges do you think pharmacists working in clinics face?

[Closing]

14. Is there anything else that you wish would be different that can improve your teamwork on patient care?
15. Does your clinic providers participate in any Accountable Care Organizations?
16. Is your clinic involved in any Patient-Centered Medical Home projects?

Thank you again for participating in this interview. Feel free to contact me if you have any further questions regarding this study.

[Study 3] Interview Guide for Non-Pharmacists

Thank you for agreeing to participate in this interview regarding organizational determinants of primary care teamwork. It is estimated that this interview will last 20-30 minutes. I will be recording this session. Feel free to let me know at any moment if you do not wish to continue. Do you have any questions before we get started?

My first two questions concern general teamwork in your clinic.

[General Teamwork]

1. What is your role in patient care in this clinic, and how do you work with other staff in the clinic?
    A. Probe: What interactions do you have with other staff members?
    B. Probe: How is patient care coordinated between different team members at this clinic?
2. How do you communicate with your patient care team, and how effective is the communication between team members?
    A. Probe: How often do communications occur? Under which circumstances?
    B. Probe: Do you document on the electronic chart?

The next few questions are more specific regarding the determinants of team effectiveness.

[Organizational Context]

3. Do you teach students or residents in your practice? If yes, how do the teaching activities affect teamwork in patient care?
    A. Probe: How is teaching activities incorporated in your patient care routines?
4. How is teamwork rewarded or discouraged by your organization?
    A. Probe: Do you have protected time to participate in team meetings?
5. How does information technology, such as electronic records and electronic prescribing, affect your teamwork for patient care?

6. How did you learn to work with your team? Did your organization provide training?
7. Do you think your office space arrangements impact your teamwork?
    A. Probe: Do you have more interactions with other staff because of the space arrangement?

[Team Inputs]

8. How many patients do you see/help in a typical week?
9. How does your workload affect the performance of your patient care team?

My last few questions are specific to clinical pharmacist involvement in this clinic.

[Pharmacist Involvement]

10. How long have you worked with a pharmacist in the clinic?
11. How does the pharmacist contribute to the primary care team?
12. What makes collaborating with pharmacists difficult? What makes collaborating with pharmacists easy?

[Closing]

13. Is there anything else that you wish would be different that can improve your teamwork on patient care?

Thank you again for participating in this interview. Feel free to contact me if you have any further questions regarding this study.

Code:_____

[Study 3] Questionnaire for Team Effectiveness, Team Process, and Team Climate

This survey examines primary care teamwork at your work place. All responses will remain confidential. It is estimated to be completed in roughly 15 minutes. When asked about items regarding your **patient care team**, consider (example: Dr. Phil's Wed AM Geriatric Clinic).

1. Which health professions and supporting personnel are represented on your patient care team? (Do not list names)_____
_____
_____

- How would you rate **your patient care team's effectiveness** on the following items with **1 representing 'not at all effective' to 7 representing 'highly effective'**? Please **circle the number** that corresponds to your response.

		not at all effective						highly effective
2.	Communication strategy	1	2	3	4	5	6	7
3.	Shared learning	1	2	3	4	5	6	7
4.	Staff development	1	2	3	4	5	6	7
5.	Organization process improvement	1	2	3	4	5	6	7
6.	Use of clinical protocols	1	2	3	4	5	6	7
7.	Innovative practice	1	2	3	4	5	6	7
8.	Keeping within budgets	1	2	3	4	5	6	7
9.	Competence of practitioners	1	2	3	4	5	6	7
10.	Competence of supporting staff	1	2	3	4	5	6	7
11.	Respect for patient's values, preferences, and expressed needs	1	2	3	4	5	6	7
12.	Patient information & education	1	2	3	4	5	6	7
13.	Patient access to care	1	2	3	4	5	6	7
14.	Meeting patient BP goals	1	2	3	4	5	6	7
15.	Meeting patient HbA1c goals	1	2	3	4	5	6	7
16.	Meeting patient lipid goals	1	2	3	4	5	6	7

- **Please write the number that corresponds to your level of agreement with the following statements, with 1=Strongly disagree, 4=Neither agree nor disagree, 7=Strongly agree:**

Strongly disagree			Neither agree nor disagree			Strongly agree
1	2	3	4	5	6	7

_____ **17.** Professional support is sought from other team members.

_____ **18.** There is a high level of collaboration among team members.

_____ **19.** There is information exchange with other team members.

_____ **20.** There is co-operation among team members to ensure patient follow-up.

_____ **21.** There is collaboration between team members to elaborate a common care plan.

_____ **22.** Interventions by team members take into account data collected by others in the team.

_____ **23.** Team members share common tasks.

_____ **24.** There is high tolerance of grey area (overlapping of jurisdictions between team members).

_____ **25.** The working relations among team members are egalitarian rather than hierarchical.

_____ **26.** There is high frequency of informal consultation between team members.

_____ **27.** From the patient's perspective, professional collaboration is harmonious.

_____ **28.** Our team-based routines between the different groups of professionals are well defined.

_____ **29** Team members do their own care without interfering with each other.

_____ **30.** Activities assumed by different team members concerning a particular patient are well coordinated.

_____ **31.** Daily collaborative behaviors are inserted in day-to-day program functioning.

_____ **32.** We have a 'we are in it together' attitude.

_____ **33.** People keep each other informed about work-related issues in the team.

_____ **34.** People feel understood and accepted by each other.

_____ **35.** There are real attempts to share information throughout the team.

_____ **36.** People in this team are always searching for fresh, new ways of looking at problems.

_____ **37.** In this team we take the time needed to develop new ideas.

_____ **38.** People in the team co-operate in order to help develop and apply new ideas.

- **Please write the number that corresponds to your level of agreement with the following statements, with 1=To a very little extent, to 7=To a very great extent.**

To a very little extent						To a very great extent
1	2	3	4	5	6	7

_____ **39.** Are team members prepared to question the basis of what the team is doing?

_____ **40.** Does the team critically appraise potential weaknesses in what it is doing in order to achieve the best possible outcome?

_____ **41.** Do members of the team build on each other's ideas in order to achieve the best possible outcome?

42. What is your profession (or role in the patient care team)? _____

43. How long have you practiced in this profession (excluding residency & fellowship)?

_____ years

1) Have you completed a residency? ❑ Yes ❑ No ❑ N/A. If Yes, how long? _____ years

2) Have you completed a fellowship? ❑ Yes ❑ No ❑ N/A. If Yes, how long? _____ years

44. What Board-certified specialties do you hold? _____

45. How long have you worked at this clinic? ____ yrs. For how long have you been working with the patient care team on which you based your responses to this survey? ____ yrs.

46. In a typical week, how many half-days do you see patients at this clinic? ___1/2 days

47. What is your age? _____ **48.** What is your gender? _____

49. What is your race (check one)?

❑ African-American ❑ Hispanic

❑ American Indian or Alaska Native ❑ White, not of Hispanic origins

❑ Asian or Pacific Islander ❑ Multi-racial: _____

50. What is your academic affiliation (check one):

❑ Full-time Faculty Appointment ❑ Part-time/Adjunct Faculty Appointment

❑ Resident or Fellow ❑ Not academically affiliated

----------Thank you for your participation----------

APPENDIX B: STUDY TABLE

Table B-1. Concept Mapping of End-of-study Interview Questions in Study Two

Category	Concept	Physician	Pharmacist	Clinic Administrator	Study Coordinator
Inputs	Workload & time in clinic	Q6-7, Q10	QB1, QB3-4	QA5	-
	Clinic workflow & space	Q12	QB2, QB5-6	QA2	QA3, QC1-2
	Provider beliefs	Q4-5, 13	QA2b-c	-	-
	Formal agreement	Q14-16	QA3-4	-	-
	Support from office staff	-	QB7-8	QB3-4	QC3-4
	Patient characteristics	-	-	QB1	QA2
	Other	Q26	QA7, QB9-10	QA4, QB5-6	QB1-4, QC5
Processes	Physician referrals to pharmacists	Q1, Q8	QA1	-	-
	Acceptance of recommendations	Q2-3, Q17-19	QA2a,d, QA8-10	-	-
	Communication preference	Q11	QA5	-	-
Patient outcomes	Disease state control	Q21	QA11	QB7	-
	Patient perception	Q9, Q22	QA12	QA1, QB2	QA1, QC6-7
Provider outcomes	Physician workload	Q20	-	-	-
	Pharmacist ability to influence decisions of pharmacist services	-	QA6	-	-
Clinic outcomes	Clinic workflow	-	-	QA3	-
	Billing for pharmacist service	-	-	QA6-7	-
	Revenue or cash flow	-	-	QB8	-
Future prospects	Suggestions for improvement	Q27	QA13	-	-
	Expansion to other disease states	Q23	QA14	-	-
	Integration into usual care	Q24	QA15	-	-
	Medicare provider status	Q25	-	-	-

REFERENCES

Abramowitz, P. W. (2009). The evolution and metamorphosis of the pharmacy practice model. *American Journal of Health-System Pharmacy, 66*(16), 1437-1446. doi:10.2146/ajhp090286

Abrons, J. P., & Smith, M. (2011). Patient-centered medical homes: Primer for pharmacists. *Journal of the American Pharmacists Association : JAPhA, 51*(3), e38-48; quiz e49-50. doi:10.1331/JAPhA.2011.11524

Accreditation Council for Pharmacy Education. (1997). *Implementation procedures for accreditation standards and guidelines for the professional program in pharmacy leading to the Doctor of Pharmacy degree.*

Adamcik, B. A., Ransford, H. E., Oppenheimer, P. R., Brown, J. F., Eagan, P. A., & Weissman, F. G. (1986). New clinical roles for pharmacists: A study of role expansion. *Social Science & Medicine (1982), 23*(11), 1187-1200.

Alkhateeb, F. M., Unni, E., Latif, D., Shawaqfeh, M. S., & Al-Rousan, R. M. (2009). Physician attitudes toward collaborative agreements with pharmacists and their expectations of community pharmacists' responsibilities in West Virginia. *Journal of the American Pharmacists Association : JAPhA, 49*(6), 797-800. doi:10.1331/JAPhA.2009.08111

American Academy of Family Physicians (AAFP), American Academy of Pediatrics (AAP), American College of Physicians (ACP), & American Osteopathic Association (AOA). (2007). *Joint principles of the Patient-Centered Medical Home*.

American Academy of Pediatrics, Council on Pediatric Practice. (1967). Pediatric records and a "medical home". *Standards of child care* (pp. 77-79). Evanston, IL: American Academy of Pediatrics.

American Society of Health-System Pharmacists. (2000). ASHP guidelines on the pharmacist's role in home care. *American Journal of Health-System Pharmacy, 57*(13), 1252-1257.

Anderson, N. R., & West, M. A. (1998). Measuring climate for work group innovation: Development and validation of the team climate inventory. *Journal of Organizational Behavior, 19*(3), 235-258. doi:10.1002/(SICI)1099-1379(199805)19:3<235::AID-JOB837>3.0.CO;2-C

Anderson, N., & West, M. A. (1996). The team climate inventory: Development of the TCI and its applications in teambuilding for innovativeness. *European Journal of Work and Organizational Psychology, 5*(1), 53-66. doi:10.1080/13594329608414840

Armour Forse, R., Bramble, J. D., & McQuillan, R. (2011). Team training can improve operating room performance. *Surgery, 150*(4), 771-778. doi:10.1016/j.surg.2011.07.076

Asch, S. M., Baker, D. W., Keesey, J. W., Broder, M., Schonlau, M., Rosen, M., . . . Keeler, E. B. (2005). Does the collaborative model improve care for chronic heart failure? *Medical Care, 43*(7), 667-675.

Axon, R. N., Gebregziabher, M., Echols, C., Msph, G. G., & Egede, L. E. (2011). Racial and ethnic differences in longitudinal blood pressure control in veterans with type 2 diabetes mellitus. *Journal of General Internal Medicine, 26*(11), 1278-1283. doi:10.1007/s11606-011-1752-3; 10.1007/s11606-011-1752-3

Baggs, J. G., & Schmitt, M. H. (1997). Nurses' and resident physicians' perceptions of the process of collaboration in an MICU. *Research in Nursing & Health, 20*(1), 71-80.

Baker, E. W. (1979). Overcoming the barriers that prevent community pharmacists from maximizing their contributions to health care. *American Journal of Pharmaceutical Education, 43*(4), 359-361.

Beatty, S. J., McCormick, K. M., Beale, D. J., Bruggeman, A. M., Rodis, J. L., Mehta, B. H., & Bennett, M. S. (2012). Current trends in outpatient pharmacy services and billing. *Journal of the American Pharmacists Association : JAPhA, 52*(2), 154-160. doi:10.1331/JAPhA.2012.11213

Bell, S. T. (2007). Deep-level composition variables as predictors of team performance: A meta-analysis. *Journal of Applied Psychology, 92*(3), 595-615. doi:10.1037/0021-9010.92.3.595

Berdine, H. J., & Skomo, M. L. (2012). Development and integration of pharmacist clinical services into the patient-centered medical home. *Journal of the American Pharmacists Association : JAPhA, 52*(5), 661-667. doi:10.1331/JAPhA.2012.10206

Berenson, R. A., & Rich, E. C. (2010). US approaches to physician payment: The deconstruction of primary care. *Journal of General Internal Medicine, 25*(6), 613-618. doi:10.1007/s11606-010-1295-z

Berenson, R. A., Hammons, T., Gans, D. N., Zuckerman, S., Merrell, K., Underwood, W. S., & Williams, A. F. (2008). A house is not a home: Keeping patients at the center of practice redesign. *Health Affairs, 27*(5), 1219-1230. doi:10.1377/hlthaff.27.5.1219

Billups, S. J., Okano, G., Malone, D., Carter, B. L., Valuck, R., Barnette, D. J., & Sintek, C. D. (2000). Assessing the structure and process for providing pharmaceutical care in veterans affairs medical centers. *American Journal of Health-System Pharmacy : AJHP : Official Journal of the American Society of Health-System Pharmacists, 57*(1), 29-39.

Bodenheimer, T., & Laing, B. Y. (2007). The teamlet model of primary care. *Annals of Family Medicine, 5*(5), 457-461. doi:10.1370/afm.731

Bodenheimer, T., Wagner, E. H., & Grumbach, K. (2002). Improving primary care for patients with chronic illness. *JAMA : The Journal of the American Medical Association, 288*(14), 1775-1779.

Borkan, J. (1999). Immersion/Crystallization. In B. F. Crabtree, & W. L. Miller (Eds.), *Doing qualitative research* (2nd ed., pp. 179-194). Thousand Oaks, CA: Sage Publications.

Borrill, C. S., Carletta, J., Carter, A. J., Dawson, J. F., Garrod, S., Rees, A., . . . West, M. A. (2001). *The effectiveness of health care teams in the National Health Service. Final report to Department of Health.*

Bosch, M., Halfens, R. J. G., van, d. W., Wensing, M., Akkermans, R., & Grol, R. (2011). Organizational culture, team climate, and quality management in an important patient safety issue: Nosocomial pressure ulcers. *Worldviews on Evidence-Based Nursing, 8*(1), 4-14. doi:10.1111/j.1741-6787.2010.00187.x

Boukus, E., Cassil, A., & O'Malley, . (2009). *A snapshot of U.S. physicians: Key findings from the 2008 Health Tracking Physician Survey.* (Data Bulletin No. 35). Washington, D.C.: Center for Studying Health System Change.

Bower, P., Campbell, S., Bojke, C., & Sibbald, B. (2003). Team structure, team climate and the quality of care in primary care: An observational study. *Quality & Safety in Health Care, 12*(4), 273-279.

Bradley, F., Elvey, R., Ashcroft, D. M., Hassell, K., Kendall, J., Sibbald, B., & Noyce, P. (2008). The challenge of integrating community pharmacists into the primary health care team: A case study of local pharmaceutical services (LPS) pilots and interprofessional collaboration. *Journal of Interprofessional Care, 22*(4), 387-398. doi:10.1080/13561820802137005

Braithwaite, R. S., Meltzer, D. O., King, J. T.,Jr, Leslie, D., & Roberts, M. S. (2008). What does the value of modern medicine say about the $50,000 per quality-adjusted life-year decision rule? *Medical Care, 46*(4), 349-356. doi:10.1097/MLR.0b013e31815c31a7

Brock, K. A., & Doucette, W. R. (2004). Collaborative working relationships between pharmacists and physicians: An exploratory study. *Journal of the American Pharmacists Association : JAPhA, 44*(3), 358-365.

Brown, J. B., Lewis, L., Ellis, K., Stewart, M., Freeman, T. R., & Kasperski, M. J. (2009). Mechanisms for communicating within primary health care teams. *Canadian Family Physician Medecin De Famille Canadien, 55*(12), 1216-1222.

Bryant, L., Coster, G., & McCormick, R. (2010). General practitioner perceptions of clinical medication reviews undertaken by community pharmacists. *Journal of Primary Health Care, 2*(3), 225-233.

Buljac-Samardzic, M., Dekker-van Doorn, C. M., van Wijngaarden, J. D., & van Wijk, K. P. (2010). Interventions to improve team effectiveness: A systematic review. *Health Policy (Amsterdam, Netherlands), 94*(3), 183-195. doi:10.1016/j.healthpol.2009.09.015

Campbell, R. K., & Saulie, B. A. (1998). Providing pharmaceutical care in a physician office. *Journal of the American Pharmaceutical Association (Washington,D.C.: 1996), 38*(4), 495-499.

Campion, M. A., Medsker, G. J., & Higgs, A. C. (1993). Relations between work group characteristics and effectiveness: Implications for designing effective work groups. *Personnel Psychology, 46*(4), 823-847. doi:10.1111/j.1744-6570.1993.tb01571.x

Canadian Interprofessional Health Collaborative. (2010). *A national interprofessional competency framework.* Vancouver, BC: Canadian Interprofessional Health Collaborative.

Capella, J., Smith, S., Philp, A., Putnam, T., Gilbert, C., Fry, W., . . . Remine, S. (2010). Teamwork training improves the clinical care of trauma patients. *Journal of Surgical Education, 67*(6), 439-443. doi:10.1016/j.jsurg.2010.06.006

Carpenter, W. R., Meyer, A. M., Wu, Y., Qaqish, B., Sanoff, H. K., Goldberg, R. M., & Weiner, B. J. (2012). Translating research into practice: The role of provider-based research networks in the diffusion of an evidence-based colon cancer treatment innovation. *Medical Care, 50*(8), 737-748. doi:10.1097/MLR.0b013e31824ebe13; 10.1097/MLR.0b013e31824ebe13

Carter, B. L., Ardery, G., Dawson, J. D., James, P. A., Bergus, G. R., Doucette, W. R., . . . Xu, Y. (2009). Physician and pharmacist collaboration to improve blood pressure control. *Archives of Internal Medicine, 169*(21), 1996-2002. doi:10.1001/archinternmed.2009.358

Carter, B. L., Bergus, G. R., Dawson, J. D., Farris, K. B., Doucette, W. R., Chrischilles, E. A., & Hartz, A. J. (2008). A cluster randomized trial to evaluate physician/pharmacist collaboration to improve blood pressure control. *Journal of Clinical Hypertension (Greenwich, Conn.), 10*(4), 260-271.

Carter, B. L., Clarke, W., Ardery, G., Weber, C. A., James, P. A., Vander Weg, M., . . . Collaboration Among Pharmacists Physicians To Improve Outcomes Now (CAPTION) Trial Investigators. (2010). A cluster-randomized effectiveness trial of a physician-pharmacist collaborative model to improve blood pressure control. *Circulation.Cardiovascular Quality and Outcomes, 3*(4), 418-423. doi:10.1161/CIRCOUTCOMES.109.908038

Carter, B. L., Coffey, C. S., Uribe, L., James, P. A., Egan, B. M., Ardery, G., . . . Collaboration Among Pharmacists and Physicians to Improve Outcomes Now (CAPTION) trial investigators. (2013). Similar blood pressure values across racial and economic groups: Baseline data from a group randomized clinical trial. *Journal of Clinical Hypertension (Greenwich, Conn.), 15*(6), 404-412. doi:10.1111/jch.12091; 10.1111/jch.12091

Carter, B. L., & Helling, D. K. (1992). Ambulatory care pharmacy services: The incomplete agenda. *The Annals of Pharmacotherapy, 26*(5), 701-708.

Carter, B. L., Rogers, M., Daly, J., Zheng, S., & James, P. A. (2009). The potency of team-based care interventions for hypertension: A meta-analysis. *Archives of Internal Medicine, 169*(19), 1748-1755. doi:10.1001/archinternmed.2009.316

Cashman, S. B., Reidy, P., Cody, K., & Lemay, C. A. (2004). Developing and measuring progress toward collaborative, integrated, interdisciplinary health care teams.

Journal of Interprofessional Care, 18(2), 183-196. doi:10.108/13561820410001686936

Castner, J., Foltz-Ramos, K., Schwartz, D. G., & Ceravolo, D. J. (2012). A leadership challenge: Staff nurse perceptions after an organizational TeamSTEPPS initiative. *The Journal of Nursing Administration, 42*(10), 467-472. doi:10.1097/NNA.0b013e31826a1fc1; 10.1097/NNA.0b013e31826a1fc1

Centers for Disease Control and Prevention (CDC). (2012). Chronic disease prevention and health promotion. Retrieved November 24, 2012, from http://www.cdc.gov/chronicdisease/overview/index.htm

CDC. (2013). Racial/Ethnic disparities in the awareness, treatment, and control of hypertension - United States, 2003-2010. *MMWR.Morbidity and Mortality Weekly Report, 62*(18), 351-355.

Centers for Medicare and Medicaid Services. (2012). Improving quality of care for medicare patients: Accountable care organizations. fact sheet. Retrieved Dec 6, 2013, from http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/sharedsavingsprogram/Downloads/ACO_Quality_Factsheet_ICN907407.pdf

Centers for Medicare and Medicaid Services. (2013). Part C and part D performance data. Retrieved Dec 6, 2013, from http://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovGenIn/PerformanceData.html

Chang, E. H., & Doucette, W. R. (2012). Factors influencing interprofessional collaboration: A literature review from 2004-2011 [Abstract]. *Value in Health, 15*(7) A622-A623. doi:doi:10.1016/j.jval.2012.08.125

Chesluk, B. J., & Holmboe, E. S. (2010). How teams work-or don't-in primary care: A field study on internal medicine practices. *Health Affairs, 29*(5), 874-9.

Chin, M. H., Drum, M. L., Guillen, M., Rimington, A., Levie, J. R., Kirchhoff, A. C., . . . Schaefer, C. T. (2007). Improving and sustaining diabetes care in community health centers with the health disparities collaboratives. *Medical Care, 45*(12), 1135-1143. doi:10.1097/MLR.0b013e31812da80e

Chisholm-Burns, M. A., Kim Lee, J., Spivey, C. A., Slack, M., Herrier, R. N., Hall-Lipsy, E., . . . Wunz, T. (2010). US pharmacists' effect as team members on patient care: Systematic review and meta-analyses. *Medical Care, 48*(10), 923-933. doi:10.1097/MLR.0b013e3181e57962

Choe, H. M., Mitrovich, S., Dubay, D., Hayward, R. A., Krein, S. L., & Vijan, S. (2005). Proactive case management of high-risk patients with type 2 diabetes mellitus by a clinical pharmacist: A randomized controlled trial. *The American Journal of Managed Care, 11*(4), 253-260.

Chrischilles, E. A., Carter, B. L., Lund, B. C., Rubenstein, L. M., Chen-Hardee, S. S., Voelker, M. D., . . . Kuehl, A. K. (2004). Evaluation of the iowa medicaid pharmaceutical case management program. *Journal of the American Pharmacists Association : JAPhA, 44*(3), 337-349.

Clancy, C. M., & Tornberg, D. N. (2007). TeamSTEPPS: Assuring optimal teamwork in clinical settings. *American Journal of Medical Quality : The Official Journal of the American College of Medical Quality, 22*(3), 214-217. doi:10.1177/1062860607300616

Cohen, S. G., & Bailey, D. E. (1997). What makes teams work: Group effectiveness research from the shop floor to the executive suite. *Journal of Management, 23*(3), 239.

Cohen, S. G., Ledford, G. E., & Spreitzer, G. M. (1996). A predictive model of self-managing work team effectiveness. *Human Relations, 49*(5), 643-676. doi:10.1177/001872679604900506

Cohen, V., Jellinek, S. P., Hatch, A., & Motov, S. (2009). Effect of clinical pharmacists on care in the emergency department: A systematic review. *American Journal of Health-System Pharmacy : AJHP : Official Journal of the American Society of Health-System Pharmacists, 66*(15), 1353-1361. doi:10.2146/ajhp080304

Coleman, K., Austin, B. T., Brach, C., & Wagner, E. H. (2009). Evidence on the chronic care model in the new millennium. *Health Affairs (Project Hope), 28*(1), 75-85. doi:10.1377/hlthaff.28.1.75

Community Preventive Services Task Force. (2012). Cardiovascular disease prevention and control: Team-based care to improve blood pressure control. Retrieved July 2, 2012, from http://thecommunityguide.org/cvd/teambasedcare.html

Crabtree, B. F., Nutting, P. A., Miller, W. L., Stange, K. C., Stewart, E. E., & Jaen, C. R. (2010). Summary of the National Demonstration Project and recommendations for the patient-centered medical home. *Annals of Family Medicine, 8 Suppl 1*, S80-90; S92. doi:10.1370/afm.1107

Cuffee, Y. L., Hargraves, J. L., Rosal, M., Briesacher, B. A., Schoenthaler, A., Person, S., . . . Allison, J. (2013). Reported racial discrimination, trust in physicians, and medication adherence among inner-city african americans with hypertension. *American Journal of Public Health, 103*(11), e55-e62. doi:10.2105/AJPH.2013.301554

D'Amour, D., Goulet, L., Labadie, J., Martin-Rodriguez, L., & Pineault, R. (2008). A model and typology of collaboration between professionals in healthcare organizations. *BMC Health Services Research, 8*(1), 188.

D'Amour, D., Ferrada-Videla, M., San Martin Rodriguez, L., & Beaulieu, M. D. (2005). The conceptual basis for interprofessional collaboration: Core concepts and theoretical frameworks. *Journal of Interprofessional Care, 19 Suppl 1*, 116-131. doi:10.1080/13561820500082529

D'Amour, D., & Oandasan, I. (2005). Interprofessionality as the field of interprofessional practice and interprofessional education: An emerging concept. *Journal of Interprofessional Care, 19 Suppl 1*, 8-20. doi:10.1080/13561820500081604

Deering, S., Rosen, M. A., Ludi, V., Munroe, M., Pocrnich, A., Laky, C., & Napolitano, P. G. (2011). On the front lines of patient safety: Implementation and evaluation of

team training in Iraq. *Joint Commission Journal on Quality and Patient Safety / Joint Commission Resources, 37*(8), 350-356.

DeVol, R., Bedroussian, A., Charuworn, A., Chatterjee, A., Kim, I. K., Kim, S., . . . Klowden, K. (2007). *An unhealthy america: The economic burden of chronic disease - charting a new course to save lives and increase productivity and economic growth*. Santa Monica: Milken Institute.

Dey, R. M., de Vries, M. J., & Bosnic-Anticevich, S. (2011). Collaboration in chronic care: Unpacking the relationship of pharmacists and general medical practitioners in primary care. *The International Journal of Pharmacy Practice, 19*(1), 21-29. doi:10.1111/j.2042-7174.2010.00070.x; 10.1111/j.2042-7174.2010.00070.x

Dickerson, L. M., Denham, A. M., & Lynch, T. (2002). The state of clinical pharmacy practice in family practice residency programs. *Family Medicine, 34*(9), 653-657.

Dickerson, L. M., Kraus, C., Kuo, G. M., Weber, C. A., Bazaldua, O. V., Tovar, J. M., . . . Carter, B. L. (2007). Formation of a primary care pharmacist practice-based research network. *American Journal of Health-System Pharmacy : AJHP : Official Journal of the American Society of Health-System Pharmacists, 64*(19), 2044-2049. doi:10.2146/ajhp060650

Dobson, R. T., Henry, C. J., Taylor, J. G., Zello, G. A., Lachaine, J., Forbes, D. A., & Keegan, D. L. (2006). Interprofessional health care teams: Attitudes and environmental factors associated with participation by community pharmacists. *Journal of Interprofessional Care, 20*(2), 119-132. doi:10.1080/13561820600614031

Doran, D. M. I., Baker, G. R., Murray, M., Bohnen, J., Zahn, C., Sidani, S., & Carryer, J. (2002). Achieving clinical improvement: An interdisciplinary intervention. *Health Care Management Review, 27*(4), 42-56.

Doucette, W. R., Gaither, C. A., Kreling, D. H., Mott, D. A., & Schommer, J. C. (2010). *2009 National Pharmacist Workforce Survey.* Alexandria, VA: Pharmacy Manpower Project, Inc.

Doucette, W. R., Witry, M. J., Alkhateeb, F., Farris, K. B., & Urmie, J. M. (2007). Attitudes of Medicare beneficiaries toward pharmacist-provided medication therapy management activities as part of the Medicare Part D benefit. *Journal of the American Pharmacists Association : JAPhA, 47*(6), 758-762. doi:10.1331/JAPhA.2007.07041

Doucette, W. R., Nevins, J., & McDonough, R. P. (2005). Factors affecting collaborative care between pharmacists and physicians. *Research in Social & Administrative Pharmacy, 1*(4), 565-578. doi:10.1016/j.sapharm.2005.09.005

Ducanis, A. J., & Golin, A. K. (1979). *The interdisciplinary health care team: A handbook*. Germantown, MD: Aspen Systems Corp.

Eisenhardt, K. M. (1989). Building theories from case study research. *The Academy of Management Review, 14*(4), pp. 532-550.

Ellis, S. L., Carter, B. L., Malone, D. C., Billups, S. J., Okano, G. J., Valuck, R. J., . . . Amato, M. (2000). Clinical and economic impact of ambulatory care clinical pharmacists in management of dyslipidemia in older adults: The IMPROVE study. Impact of Managed Pharmaceutical Care on Resource Utilization and Outcomes in Veterans Affairs Medical Centers. *Pharmacotherapy, 20*(12), 1508-1516.

Ernst, F. R., & Grizzle, A. J. (2001). Drug-related morbidity and mortality: Updating the cost-of-illness model. *Journal of the American Pharmaceutical Association (Washington,D.C.: 1996), 41*(2), 192-199.

Etzioni, A. (1964). *Modern organizations*. Englewood Cliffs, NJ: Prentice-Hall.

Fairhurst, G. T., Jordan, J. M., & Neuwirth, K. (1997). Why are we here? managing the meaning of an organizational mission statement. *Journal of Applied Communication Research, 25*(4), 243-263. doi:10.1080/00909889709365480

Farrell, B., Pottie, K., Woodend, K., Yao, V., Dolovich, L., Kennie, N., & Sellors, C. (2010). Shifts in expectations: Evaluating physicians' perceptions as pharmacists become integrated into family practice. *J Interprof Care, 24*(1), 80-89. doi:10.3109/13561820903011968

Farrell, B., Pottie, K., Haydt, S., Kennie, N., Sellors, C., & Dolovich, L. (2008). Integrating into family practice: The experiences of pharmacists in ontario, canada. *International Journal of Pharmacy Practice, 16*(5), 309-315. doi:10.1211/ijpp.16.5.0006

Farrell, B., Ward, N., Dore, N., Russell, G., Geneau, R., & Evans, S. (2013). Working in interprofessional primary health care teams: What do pharmacists do? *Research in Social & Administrative Pharmacy : RSAP, 9*(3), 288-301. doi:10.1016/j.sapharm.2012.05.005

Finley, P. R., Rens, H. R., Pont, J. T., Gess, S. L., Louie, C., Bull, S. A., . . . Bero, L. A. (2003). Impact of a collaborative care model on depression in a primary care setting: A randomized controlled trial. *Pharmacotherapy, 23*(9), 1175-1185.

Fleming, B., Silver, A., Ocepek-Welikson, K., & Keller, D. (2004). The relationship between organizational systems and clinical quality in diabetes care. *The American Journal of Managed Care, 10*(12), 934-944.

Freeman, C., Cottrell, W. N., Kyle, G., Williams, I., & Nissen, L. (2012). Integrating a pharmacist into the general practice environment: Opinions of pharmacist's, general practitioner's, health care consumer's, and practice manager's. *BMC Health Services Research, 12*, 229-6963-12-229. doi:10.1186/1472-6963-12-229; 10.1186/1472-6963-12-229

Gabbay, R. A., Bailit, M. H., Mauger, D. T., Wagner, E. H., & Siminerio, L. (2011). Multipayer patient-centered medical home implementation guided by the chronic care model. *Joint Commission Journal on Quality and Patient Safety / Joint Commission Resources, 37*(6), 265-273.

Garcia, G. M., Snyder, M. E., McGrath, S. H., Smith, R. B., & McGivney, M. S. (2009). Generating demand for pharmacist-provided medication therapy management:

Identifying patient-preferred marketing strategies. *Journal of the American Pharmacists Association : JAPhA, 49*(5), 611-616. doi:10.1331/JAPhA.2009.08089

Ghorob, A., & Bodenheimer, T. (2012). Share the care: Building teams in primary care practices. *Journal of the American Board of Family Medicine : JABFM, 25*(2), 143-145. doi:10.3122/jabfm.2012.02.120007; 10.3122/jabfm.2012.02.120007

Giberson, S., Yoder, S., & Lee, M. (2011). *Improving patient and health system outcomes through advanced pharmacy practice. A report to the U.S. Surgeon General.* Rockville, MD: Office of the Chief Pharmacist. U.S. Public Health Service.

Giordano, C. (2009). *Interprofessional collaboration in health education: A mixed methods evaluation of the jefferson health mentors program.* (Educational Psychology, Educational Psychology). *ProQuest Dissertations and Theses.*

Gitlin, L. N., Lyons, K. J., & Kolodner, E. (1994). A model to build collaborative research or educational teams of health professionals in gerontology. *Educational Gerontology, 20*(1), 15-34. doi:10.1080/0360127940200103

Gladstein, D. L. (1984). Groups in context: A model of task group effectiveness. *Administrative Science Quarterly, 29*(4), pp. 499-517.

Goh, T. T., & Eccles, M. P. (2009). Team climate and quality of care in primary health care: A review of studies using the team climate inventory in the United Kingdom. *BMC Research Notes, 2*, 222. doi:10.1186/1756-0500-2-222

Goh, T. T., Eccles, M. P., & Steen, N. (2009). Factors predicting team climate, and its relationship with quality of care in general practice. *BMC Health Services Research, 9*, 138. doi:10.1186/1472-6963-9-138

Goldman, J., Meuser, J., Rogers, J., Lawrie, L., & Reeves, S. (2010). Interprofessional collaboration in family health teams: An Ontario-based study. *Canadian Family Physician Medecin De Famille Canadien, 56*(10), e368-74.

Gruen, R. L., Elliott, J. H., Nolan, M. L., Lawton, P. D., Parkhill, A., McLaren, C. J., & Lavis, J. N. (2008). Sustainability science: An integrated approach for health-programme planning. *Lancet, 372*(9649), 1579-1589. doi:10.1016/S0140-6736(08)61659-1

Grumbach, K., & Bodenheimer, T. (2004). Can health care teams improve primary care practice? *JAMA : The Journal of the American Medical Association, 291*(10), 1246-1251. doi:10.1001/jama.291.10.1246

Hackman, J. R. (2003). Learning more by crossing levels: Evidence from airplanes, hospitals, and orchestras. *Journal of Organizational Behavior, 24*(8), 905-922. doi:10.1002/job.226

Haines, S. L., DeHart, R. M., Flynn, A. A., Hess, K. M., Marciniak, M. W., Mount, J., . . . Zatzkin, S. W. (2011). Academic pharmacy and patient-centered health care: A model to prepare the next generation of pharmacists. *Journal of the American Pharmacists Association : JAPhA, 51*(2), 194-202. doi:10.1331/JAPhA.2011.10158

Hammond, R. W., Schwartz, A. H., Campbell, M. J., Remington, T. L., Chuck, S., Blair, M. M., . . . American College of Clinical Pharmacy. (2003). Collaborative drug therapy management by pharmacists--2003. *Pharmacotherapy, 23*(9), 1210-1225.

Hann, M., Bower, P., Campbell, S., Marshall, M., & Reeves, D. (2007). The association between culture, climate and quality of care in primary health care teams. *Family Practice, 24*(4), 323-329. doi:10.1093/fampra/cmm020

Harbrecht, M. G., & Latts, L. M. (2012). Colorado's patient-centered medical home pilot met numerous obstacles, yet saw results such as reduced hospital admissions. *Health Affairs (Project Hope), 31*(9), 2010-2017. doi:10.1377/hlthaff.2012.0359; 10.1377/hlthaff.2012.0359

Hepler, C. D., & Strand, L. M. (1990). Opportunities and responsibilities in pharmaceutical care. *American Journal of Hospital Pharmacy, 47*(3), 533-543.

Homer, C. J., Forbes, P., Horvitz, L., Peterson, L. E., Wypij, D., & Heinrich, P. (2005). Impact of a quality improvement program on care and outcomes for children with asthma. *Archives of Pediatrics & Adolescent Medicine, 159*(5), 464-469. doi:10.1001/archpedi.159.5.464

Horn, E., & Jacobi, J. (2006). The critical care clinical pharmacist: Evolution of an essential team member. *Critical Care Medicine, 34*(3 Suppl), S46-51. doi:10.1097/01.CCM.0000199990.68341.33

Huang, E. S., Zhang, Q., Brown, S. E., Drum, M. L., Meltzer, D. O., & Chin, M. H. (2007). The cost-effectiveness of improving diabetes care in U.S. federally qualified community health centers. *Health Services Research, 42*(6 Pt 1), 2174-93; discussion 2294-323. doi:10.1111/j.1475-6773.2007.00734.x

Hughes, C. M., & McCann, S. (2003). Perceived interprofessional barriers between community pharmacists and general practitioners: A qualitative assessment. *The British Journal of General Practice : The Journal of the Royal College of General Practitioners, 53*(493), 600-606.

Hung, D. Y., Rundall, T. G., Cohen, D. J., Tallia, A. F., & Crabtree, B. F. (2006). Productivity and turnover in PCPs: The role of staff participation in decision-making. *Medical Care, 44*(10), 946-951. doi:10.1097/01.mlr.0000220828.43049.32

Hunt, J. S., Siemienczuk, J., Pape, G., Rozenfeld, Y., MacKay, J., LeBlanc, B. H., & Touchette, D. (2008). A randomized controlled trial of team-based care: Impact of physician-pharmacist collaboration on uncontrolled hypertension. *Journal of General Internal Medicine, 23*(12), 1966-1972. doi:10.1007/s11606-008-0791-x

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From input-process-output models to IMOI models. *Annual Review of Psychology, 56*, 517-543. doi:10.1146/annurev.psych.56.091103.070250

Institute of Medicine. (2001). *Crossing the quality chasm: A new health system for the 21st century*. Washington, D.C.: National Academies Press.

Interprofessional Education Collaborative Expert Panel. (2011). *Core competencies for interprofessional collaborative practice: Report of an expert panel.* Washington, D.C.: Interprofessional Education Collaborative.

Jaen, C. R., Crabtree, B. F., Palmer, R. F., Ferrer, R. L., Nutting, P. A., Miller, W. L., . . . Stange, K. C. (2010). Methods for evaluating practice change toward a patient-centered medical home. *Annals of Family Medicine, 8 Suppl 1*, S9-20; S92. doi:10.1370/afm.1108

Jaen, C. R., Ferrer, R. L., Miller, W. L., Palmer, R. F., Wood, R., Davila, M., . . . Stange, K. C. (2010). Patient outcomes at 26 months in the patient-centered medical home National Demonstration Project. *Annals of Family Medicine, 8 Suppl 1*, S57-67; S92. doi:10.1370/afm.1121

Johnson, N. D. (1992). Collaboration--an environment for optimal outcome. *Critical Care Nursing Quarterly, 15*(3), 37-43.

Joint Commission on Accreditation of Healthcare Organizations. (2003). *Care delivery and the environment of care: A teamwork approach*. Oakbrook Terrace: Joint Commission Resources.

Kaboli, P. J., Hoth, A. B., McClimon, B. J., & Schnipper, J. L. (2006). Clinical pharmacists and inpatient medical care: A systematic review. *Archives of Internal Medicine, 166*(9), 955-964. doi:10.1001/archinte.166.9.955

Kaldy, J. (2010). Medical home 101: The pharmacist's role in this growing patient-centered care model. *The Consultant Pharmacist : The Journal of the American Society of Consultant Pharmacists, 25*(8), 468-474. doi:10.4140/TCP.n.2010.468

King, H. B., Battles, J., Baker, D. P., Alonso, A., Salas, E., Webster, J., . . . Salisbury, M. (2008). TeamSTEPPS: Team strategies and tools to enhance performance and patient safety. In K. Henriksen, J. B. Battles, M. A. Keyes & M. L. Grady (Eds.), *Advances in patient safety: New directions and alternative approaches (Vol. 3: Performance and tools)* Rockville (MD): Agency for Healthcare Research and Quality.

Kirkman, B. L., & Benson Rosen. (1999). Beyond self-management: Antecedents and consequences of team empowerment. *The Academy of Management Journal, 42*(1), 58-74.

Kivimäki, M., & Elovainio, M. (1999). A shorter version of the team climate inventory: Development and psychometric properties. *Journal of Occupational and Organizational Psychology, 72*(2), 241-246. doi:10.1348/096317999166644

Knapp, D. A. (1979). Barriers faced by pharmacists when attempting to maximize their contribution to society. *American Journal of Pharmaceutical Education, 43*(4), 357-359.

Knapp, K. K., Okamoto, M. P., & Black, B. L. (2005). ASHP survey of ambulatory care pharmacy practice in health systems--2004. *American Journal of Health-System Pharmacy : AJHP : Official Journal of the American Society of Health-System Pharmacists, 62*(3), 274-284.

Kozminski, M., Busby, R., McGivney, M. S., Klatt, P. M., Hackett, S. R., & Merenstein, J. H. (2011). Pharmacist integration into the medical home: Qualitative analysis. *Journal of the American Pharmacists Association : JAPhA, 51*(2), 173-183. doi:10.1331/JAPhA.2011.10188

Kressin, N. R., Orner, M. B., Manze, M., Glickman, M. E., & Berlowitz, D. (2010). Understanding contributors to racial disparities in blood pressure control. *Circulation.Cardiovascular Quality and Outcomes, 3*(2), 173-180. doi:10.1161/CIRCOUTCOMES.109.860841; 10.1161/CIRCOUTCOMES.109.860841

Krska, J., Cromarty, J. A., Arris, F., Jamieson, D., Hansford, D., Duffus, P. R., . . . Seymour, D. G. (2001). Pharmacist-led medication review in patients over 65: A randomized, controlled trial in primary care. *Age and Ageing, 30*(3), 205-211.

Kucukarslan, S., Lai, S., Dong, Y., Al-Bassam, N., & Kim, K. (2011). Physician beliefs and attitudes toward collaboration with community pharmacists. *Research in Social & Administrative Pharmacy, 7*(3), 224-232. doi:10.1016/j.sapharm.2010.07.003

Kulchaitanaroaj, P., Brooks, J. M., Ardery, G., Newman, D., & Carter, B. L. (2012). Incremental costs associated with physician and pharmacist collaboration to improve blood pressure control. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy, 32*(8), 772-780. doi:10.1002/j.1875-9114.2012.01103.x

Landon, B. E., Hicks, L. S., O'Malley, A. J., Lieu, T. A., Keegan, T., McNeil, B. J., & Guadagnoli, E. (2007). Improving the management of chronic disease at community health centers. *The New England Journal of Medicine, 356*(9), 921-934. doi:10.1056/NEJMsa062860

Lauffenburger, J. C., Vu, M. B., Burkhart, J. I., Weinberger, M., & Roth, M. T. (2012). Design of a medication therapy management program for Medicare beneficiaries: Qualitative findings from patients and physicians. *The American Journal of Geriatric Pharmacotherapy, 10*(2), 129-138. doi:10.1016/j.amjopharm.2012.01.002; 10.1016/j.amjopharm.2012.01.002

Lee, V. W., Fan, C. S., Li, A. W., & Chau, A. C. (2009). Clinical impact of a pharmacist-physician co-managed programme on hyperlipidaemia management in Hong Kong. *Journal of Clinical Pharmacy and Therapeutics, 34*(4), 407-414. doi:10.1111/j.1365-2710.2009.01024.x

Legault, F., Humbert, J., Amos, S., Hogg, W., Ward, N., Dahrouge, S., & Ziebell, L. (2012). Difficulties encountered in collaborative care: Logistics trumps desire. *Journal of the American Board of Family Medicine : JABFM, 25*(2), 168-176. doi:10.3122/jabfm.2012.02.110153

Lemieux-Charles, L., & McGuire, W. L. (2006). What do we know about health care team effectiveness? A review of the literature. *Medical Care Research and Review : MCRR, 63*(3), 263-300. doi:10.1177/1077558706287003

Lepine, J. A., Piccolo, R. F., Jackson, C. L., Mathieu, J. E., & Saul, J. R. (2008). A meta-analysis of teamwork processes: Tests of a multidimensional model and relationships

with team effectiveness criteria. *Personnel Psychology, 61*(2), 273-307. doi:10.1111/j.1744-6570.2008.00114.x

Lesshafft, C. T.,Jr. (1970). Pharmacist's role in outpatient clinics. *Journal of the American Pharmaceutical Association, 10*(4), 205-209.

Lichtenstein, R., Alexander, J. A., McCarthy, J. F., & Wells, R. (2004). Status differences in cross-functional teams: Effects on individual member participation, job satisfaction, and intent to quit. *Journal of Health and Social Behavior, 45*(3), 322-335.

Lincoln, Y. S., & Guba, E. G. (1985). Chapter 11: Establishing trustworthiness. *Naturalistic inquiry*. Newbury Park, CA: Sage Publications.

Liu, Y., & Doucette, W. R. (2011). Exploring stages of pharmacist-physician collaboration using the model of collaborative working relationship. *Journal of the American Pharmacists Association : JAPhA, 51*(3), 412-417. doi:10.1331/JAPhA.2011.10068

Liu, Y., Doucette, W. R., & Farris, K. B. (2010). Examining the development of pharmacist-physician collaboration over 3 months. *Research in Social & Administrative Pharmacy : RSAP, 6*(4), 324-333. doi:10.1016/j.sapharm.2009.11.002

Lounsbery, J. L., Green, C. G., Bennett, M. S., & Pedersen, C. A. (2009). Evaluation of pharmacists' barriers to the implementation of medication therapy management services. *Journal of the American Pharmacists Association : JAPhA, 49*(1), 51-58. doi:10.1331/JAPhA.2009.017158

Lu, C. Y., Ross-Degnan, D., Soumerai, S. B., & Pearson, S. A. (2008). Interventions designed to improve the quality and efficiency of medication use in managed care: A critical review of the literature - 2001-2007. *BMC Health Services Research, 8*, 75. doi:10.1186/1472-6963-8-75

MacIntosh, C., Weiser, C., Wassimi, A., Reddick, J., Scovis, N., Guy, M., & Boesen, K. (2009). Attitudes toward and factors affecting implementation of medication therapy management services by community pharmacists. *Journal of the American Pharmacists Association : JAPhA, 49*(1), 26-30. doi:10.1331/JAPhA.2009.07122

Mahoney, J. S., Ellis, T. E., Garland, G., Palyo, N., & Greene, P. K. (2012). Supporting a psychiatric hospital culture of safety. *Journal of the American Psychiatric Nurses Association, 18*(5), 299-306. doi:10.1177/1078390312460577; 10.1177/1078390312460577

Malone, D. C., Carter, B. L., Billups, S. J., Valuck, R. J., Barnette, D. J., Sintek, C. D., . . . Amato, M. G. (2000). An economic analysis of a randomized, controlled, multicenter study of clinical pharmacist interventions for high-risk veterans: The IMPROVE study. Impact of Managed Pharmaceutical Care Resource Utilization and Outcomes in Veterans Affairs Medical Centers. *Pharmacotherapy, 20*(10), 1149-1158.

Mangione-Smith, R., Schonlau, M., Chan, K. S., Keesey, J., Rosen, M., Louis, T. A., & Keeler, E. (2005). Measuring the effectiveness of a collaborative for quality improvement in pediatric asthma care: Does implementing the chronic care model improve processes and outcomes of care? *Ambulatory Pediatrics : The Official Journal of the Ambulatory Pediatric Association, 5*(2), 75-82. doi:10.1367/A04-106R.1

Marinac, J. S., & Kuo, G. M. (2010). Characterizing the American College of Clinical Pharmacy Practice-Based Research Network. *Pharmacotherapy, 30*(8), 865. doi:10.1592/phco.30.8.865

Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. *Academy of Management Review, 26*(3), 356-376. doi:10.5465/AMR.2001.4845785

Mathieu, J., Maynard, M. T., Rapp, T., & Gilson, L. (2008). Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future. *Journal of Management, 34*(3), 410-476. doi:10.1177/0149206308316061

Mayer, C. M., Cluff, L., Lin, W. T., Willis, T. S., Stafford, R. E., Williams, C., . . . Amoozegar, J. B. (2011). Evaluating efforts to optimize TeamSTEPPS implementation in surgical and pediatric intensive care units. *Joint Commission Journal on Quality and Patient Safety / Joint Commission Resources, 37*(8), 365-374.

McDonough, R. P., & Doucette, W. R. (2001). Developing collaborative working relationships between pharmacists and physicians. *Journal of the American Pharmaceutical Association, 41*(5), 682-692.

McGrath, J. E. (1964). *Social psychology: A brief introduction*. New York: Holt, Rinehart and Winston.

McGrath, S. H., Snyder, M. E., Duenas, G. G., Pringle, J. L., Smith, R. B., & McGivney, M. S. (2010). Physician perceptions of pharmacist-provided medication therapy management: Qualitative analysis. *Journal of the American Pharmacists Association : JAPhA, 50*(1), 67-71. doi:10.1331/JAPhA.2010.08186

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Miller, W. L., & Crabtree, B. F. (1994). Qualitative analysis: How to begin making sense. *Family Practice Research Journal, 14*(3), 289-297.

Miniño, A. M., Murphy, S. L., Xu, J., & Kochanek, K. D. (2011). Deaths: Final data for 2008. *National Vital Statistics Report, 59*(10).

Mitchell, P., Wynia, M., Golden, R., McNellis, B., Okun, S., Webb, C. E., . . . Von Kohorn, I. (2012). *Core principles & values of effective team-based health care.* (Discussion Paper). Washington, DC: Institute of Medicine.

Moczygemba, L. R., Goode, J. V., Gatewood, S. B., Osborn, R. D., Alexander, A. J., Kennedy, A. K., . . . Matzke, G. R. (2011). Integration of collaborative medication therapy management in a safety net patient-centered medical home. *Journal of the*

American Pharmacists Association : JAPhA, 51(2), 167-172. doi:10.1331/JAPhA.2011.10191

Morison, S. L. (2004). *Preparing tomorrow's doctors and nurses: A study to inform the development of interprofessional education for undergraduate medical and nursing students.* (Ph.D., Queen's University of Belfast (United Kingdom)). *ProQuest Dissertations and Theses*. (MSTAR_305083469).

Morse, J. M. (1991). Approaches to qualitative-quantitative methodological triangulation. *Nursing Research, 40*(2), 120-123.

Nathan, R. A., Sorkness, C. A., Kosinski, M., Schatz, M., Li, J. T., Marcus, P., . . . Pendergraft, T. B. (2004). Development of the asthma control test: A survey for assessing asthma control. *The Journal of Allergy and Clinical Immunology, 113*(1), 59-65. doi:10.1016/j.jaci.2003.09.008

National Committe for Quality Assurance (NCQA). (2013). *Standards and guidelines for NCQA's patient-centered medical home (PCMH) 2011.* Washington, D.C.: National Committe for Quality Assurance.

Nkansah, N., Mostovetsky, O., Yu, C., Chheng, T., Beney, J., Bond, C. M., & Bero, L. (2010). Effect of outpatient pharmacists' non-dispensing roles on patient outcomes and prescribing patterns. *Cochrane Database of Systematic Reviews (Online),* (7), CD000336. doi:10.1002/14651858.CD000336.pub2

Nola, K. M., Gourley, D. R., Portner, T. S., Gourley, G. K., Solomon, D. K., Elam, M., & Regel, B. (2000). Clinical and humanistic outcomes of a lipid management program in the community pharmacy setting. *Journal of the American Pharmaceutical Association (Washington,D.C.: 1996), 40*(2), 166-173.

Nutting, P. A., Crabtree, B. F., Miller, W. L., Stange, K. C., Stewart, E., & Jaen, C. (2011). Transforming physician practices to patient-centered medical homes: Lessons from the National Demonstration Project. *Health Affairs (Project Hope), 30*(3), 439-445. doi:10.1377/hlthaff.2010.0159

Nutting, P. A., Crabtree, B. F., Miller, W. L., Stewart, E. E., Stange, K. C., & Jaen, C. R. (2010). Journey to the patient-centered medical home: A qualitative analysis of the experiences of practices in the National Demonstration Project. *Annals of Family Medicine, 8 Suppl 1,* S45-56; S92. doi:10.1370/afm.1075

Nutting, P. A., Miller, W. L., Crabtree, B. F., Jaen, C. R., Stewart, E. E., & Stange, K. C. (2009). Initial lessons from the first national demonstration project on practice transformation to a patient-centered medical home. *Annals of Family Medicine, 7*(3), 254-260. doi:10.1370/afm.1002

Nutting, P. A., Crabtree, B. F., & McDaniel, R. R. (2012). Small primary care practices face four hurdles—including a physician-centric mind-set—in becoming medical homes. *Health Affairs, 31*(11), 2417-2422. doi:10.1377/hlthaff.2011.0974

Oandasan, I. F., Gotlib Conn, L., Lingard, L., Karim, A., Jakubovicz, D., Whitehead, C., . . . Reeves, S. (2009). The impact of space and time on interprofessional teamwork in Canadian primary health care settings: Implications for health care

reform. *Primary Health Care Research & Development, 10*(02), 151. doi:10.1017/S1463423609001091

Oandasan, I., D'Amour, D., Zwarenstein, M., Barker, K., Purden, M., Beaulieu, M. D., . . . Tregunno, D. (2004). *Interdisciplinary education for collaborative, patient-centred practice. Research and findings report.* Health Canada.

O'Brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity, 41*(5), 673-690. doi:10.1007/s11135-006-9018-6

Odegard, P. S., Goo, A., Hummel, J., Williams, K. L., & Gray, S. L. (2005). Caring for poorly controlled diabetes mellitus: A randomized pharmacist intervention. *The Annals of Pharmacotherapy, 39*(3), 433-440. doi:10.1345/aph.1E438

Okamoto, M. P., & Nakahiro, R. K. (2001). Pharmacoeconomic evaluation of a pharmacist-managed hypertension clinic. *Pharmacotherapy, 21*(11), 1337-1344.

Oladapo, A. O., & Rascati, K. L. (2012). Review of survey articles regarding medication therapy management (MTM) services/programs in the United States. *Journal of Pharmacy Practice,* doi:10.1177/0897190012442715

O'Leary, M. B., Mortensen, M., & Woolley, A. W. (2011). Multiple team membership: A theoretical model of its effects on productivity and learning for individuals and teams. *Academy of Management Review, 36*(3), 461-478.

Padiyara, R. S., & Rabi, S. M. (2006). Physician perceptions of pharmacist provision of outpatient medication therapy management services. *Journal of the American Pharmacists Association : JAPhA, 46*(6), 660, 663.

Patient Protection and Affordable Care Act, Public Law No: 111-148 (2010).

Pearson, M. L., Wu, S., Schaefer, J., Bonomi, A. E., Shortell, S. M., Mendel, P. J., . . . Keeler, E. B. (2005). Assessing the implementation of the chronic care model in quality improvement collaboratives. *Health Services Research, 40*(4), 978-996. doi:10.1111/j.1475-6773.2005.00397.x

Pearson, P., & Jones, K. (1994). The primary health care non-team. *BMJ (Clinical Research Ed.), 309*(6966), 1387-1388.

Pottie, K., Farrell, B., Haydt, S., Dolovich, L., Sellors, C., Kennie, N., . . . Martin, C. M. (2008). Integrating pharmacists into family practice teams: Physicians' perspectives on collaborative care. *Canadian Family Physician Medecin De Famille Canadien, 54*(12), 1714-1717.e5.

Pottie, K., Haydt, S., Farrell, B., Dolovich, L., Sellors, C., & Hogg, W. (2008). Narrative reports to monitor and evaluate the integration of pharmacists into family practice settings. *Annals of Family Medicine, 6*(2), 161-165. doi:10.1370/afm.815

Pottie, K., Haydt, S., Farrell, B., Kennie, N., Sellors, C., Martin, C., . . . IMPACT team members. (2009). Pharmacist's identity development within multidisciplinary primary health care teams in Ontario; qualitative results from the IMPACT project.

Research in Social & Administrative Pharmacy : RSAP, 5(4), 319-326. doi:10.1016/j.sapharm.2008.12.002

Poulton, B. C., & West, M. A. (1999). The determinants of effectiveness in primary health care teams. *Journal of Interprofessional Care, 13*(1), 7-18.

Punekar, Y., Lin, S. W., & Thomas, J.,3rd. (2003). Progress of pharmacist collaborative practice: Status of state laws and regulations and perceived impact of collaborative practice. *Journal of the American Pharmacists Association : JAPhA, 43*(4), 503-510.

Pyne, J. M., Fortney, J. C., Curran, G. M., Tripathi, S., Atkinson, J. H., Kilbourne, A. M., . . . Gifford, A. L. (2011). Effectiveness of collaborative care for depression in human immunodeficiency virus clinics. *Archives of Internal Medicine, 171*(1), 23-31. doi:10.1001/archinternmed.2010.395

Raisch, D. W. (1993). Barriers to providing cognitive services. *American Pharmacy, NS33*(12), 54-58.

Rapport, F., A Doel, M., & Elwyn, G. (2007). Snapshots and snippets: General practitioners' reflections on professional space. *Health & Place, 13*(2), 532-544. doi:10.1016/j.healthplace.2006.07.005

Rapport, F., Doel, M. A., Greaves, D., & Elwyn, G. (2006). From manila to monitor: Biographies of general practitioner workspaces. *Health:, 10*(2), 233-251. doi:10.1177/1363459306061790

Reebye, R. N., Avery, A. J., Bissell, P., & van Weel, C. (2002). The issue of territoriality between pharmacists and physicians in primary care. *International Journal of Pharmacy Practice, 10*(2), 69-75.

Reid, R. J., Coleman, K., Johnson, E. A., Fishman, P. A., Hsu, C., Soman, M. P., . . . Larson, E. B. (2010). The group health medical home at year two: Cost savings, higher patient satisfaction, and less burnout for providers. *Health Affairs (Project Hope), 29*(5), 835-843. doi:10.1377/hlthaff.2010.0158

Reuben, D. B., Yee, M. N., Cole, K. D., Waite, M. S., Nichols, L. O., Benjamin, B. A., . . . Frank, J. C. (2004). Organizational issues in establishing geriatrics interdisciplinary team training. *Gerontology & Geriatrics Education, 24*(2), 13-34. doi:10.1300/J021v24n02_03

Reynolds, E. R., Boyce, R. W., Haxby, D. G., Goldberg, B. A., & Stennett, D. J. (2000). Intervention assessment in an Indian health service pharmacy. *Journal of the American Pharmaceutical Association (Washington,D.C.: 1996), 40*(1), 41-45.

Rittenhouse, D. R., & Robinson, J. C. (2006). Improving quality in Medicaid: The use of care management processes for chronic illness and preventive care. *Medical Care, 44*(1), 47-54.

Rosenthal, M. B. (2008). Beyond pay for performance — emerging models of provider-payment reform. *N Engl J Med, 359*(12), 1197-1200. doi:10.1056/NEJMp0804658

Rothman, R. L., Malone, R., Bryant, B., Shintani, A. K., Crigler, B., Dewalt, D. A., . . . Pignone, M. P. (2005). A randomized trial of a primary care-based disease management program to improve cardiovascular risk factors and glycated hemoglobin levels in patients with diabetes. *The American Journal of Medicine, 118*(3), 276-284. doi:10.1016/j.amjmed.2004.09.017

Russell, G. M., Dahrouge, S., Hogg, W., Geneau, R., Muldoon, L., & Tuna, M. (2009). Managing chronic disease in Ontario primary care: The impact of organizational factors. *The Annals of Family Medicine, 7*(4), 309-318. doi:10.1370/afm.982

Sachdev, G., & Kliethermes, M. A. (2012). ASHP live webinar: Designing sustainable ambulatory pharmacist patient care services. Retrieved November 11, 2012, from http://www.ashp.org/DocLibrary/Education/Webinars/Designing-Sustainable-Patient-Care-Services.aspx

San Martin-Rodriguez, L., Beaulieu, M. D., D'Amour, D., & Ferrada-Videla, M. (2005). The determinants of successful collaboration: A review of theoretical and empirical studies. *Journal of Interprofessional Care, 19 Suppl 1*, 132-147. doi:10.1080/13561820500082677

Scott, D. M., Boyd, S. T., Stephan, M., Augustine, S. C., & Reardon, T. P. (2006). Outcomes of pharmacist-managed diabetes care services in a community health center. *American Journal of Health-System Pharmacy : AJHP : Official Journal of the American Society of Health-System Pharmacists, 63*(21), 2116-2122. doi:10.2146/ajhp060040

Scott, M. A., Hitch, B., Ray, L., & Colvin, G. (2011). Integration of pharmacists into a patient-centered medical home. *Journal of the American Pharmacists Association : JAPhA, 51*(2), 161-166. doi:10.1331/JAPhA.2011.10185

Shediac-Rizkallah, M. C., & Bone, L. R. (1998). Planning for the sustainability of community-based health programs: Conceptual frameworks and future directions for research, practice and policy. *Health Education Research, 13*(1), 87-108.

Shi, L., Lebrun, L. A., Tsai, J., & Zhu, J. (2010). Characteristics of ambulatory care patients and services: A comparison of community health centers and physicians' offices. *Journal of Health Care for the Poor and Underserved, 21*(4), 1169-1183. doi:10.1353/hpu.2010.0928

Shi, L., Starfield, B., Xu, J., Politzer, R., & Regan, J. (2003). Primary care quality: Community health center and health maintenance organization. *Southern Medical Journal, 96*(8), 787-795.

Si, D., Bailie, R., Connors, C., Dowden, M., Stewart, A., Robinson, G., . . . Weeramanthri, T. (2005). Assessing health centre systems for guiding improvement in diabetes care. *BMC Health Services Research, 5*, 56. doi:10.1186/1472-6963-5-56

Sia, C., Tonniges, T. F., Osterhus, E., & Taba, S. (2004). History of the medical home concept. *Pediatrics, 113*(5 Suppl), 1473-1478.

Sicotte, C., D'Amour, D., & Moreault, M. P. (2002). Interdisciplinary collaboration within Quebec community health care centres. *Social Science & Medicine (1982), 55*(6), 991-1003.

Sinsky, C. A., Sinsky, T. A., Althaus, D., Tranel, J., & Thiltgen, M. (2010). Practice profile. 'core teams': Nurse-physician partnerships provide patient-centered care at an Iowa practice. *Health Affairs (Project Hope), 29*(5), 966-968. doi:10.1377/hlthaff.2010.0356; 10.1377/hlthaff.2010.0356

Sinsky, C. A., Willard-Grace, R., Schutzbank, A. M., Sinsky, T. A., Margolius, D., & Bodenheimer, T. (2013). In search of joy in practice: A report of 23 high-functioning primary care practices. *Annals of Family Medicine, 11*(3), 272-278. doi:10.1370/afm.1531; 10.1370/afm.1531

Smith, M., Bates, D. W., Bodenheimer, T., & Cleary, P. D. (2010). Why pharmacists belong in the medical home. *Health Affairs (Project Hope), 29*(5), 906-913. doi:10.1377/hlthaff.2010.0209

Smith, M., Bates, D. W., & Bodenheimer, T. S. (2013). Pharmacists belong in accountable care organizations and integrated care teams. *Health Affairs (Project Hope), 32*(11), 1963-1970. doi:10.1377/hlthaff.2013.0542; 10.1377/hlthaff.2013.0542

Snella, K. A., & Sachdev, G. P. (2003). A primer for developing pharmacist-managed clinics in the outpatient setting. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy, 23*(9), 1153-1166. doi:10.1592/phco.23.10.1153.32758

Snyder, M. E., Zillich, A. J., Primack, B. A., Rice, K. R., McGivney, M. A. S., Pringle, J. L., & Smith, R. B. (2010). Exploring successful community pharmacist-physician collaborative working relationships using mixed methods. *Research in Social & Administrative Pharmacy, 6*(4), 307-323. doi:10.1016/j.sapharm.2009.11.008

Sorensen, L., Stokes, J. A., Purdie, D. M., Woodward, M., Elliott, R., & Roberts, M. S. (2004). Medication reviews in the community: Results of a randomized, controlled effectiveness trial. *British Journal of Clinical Pharmacology, 58*(6), 648-664. doi:10.1111/j.1365-2125.2004.02220.x

Sorra, J., Famolaro, T., Dyer, N., Smith, S., Liu, H., & Ragan, M. (2012). *Medical Office Survey on Patient Safety Culture 2012 User Comparative Database Report. (prepared by Westat, Rockville, MD, under Contract No. HHSA 290200710024C).* (No. 12-0052). Rockville, MD: Agency for Healthcare Research and Quality.

Spall, S. (1998). Peer debriefing in qualitative research: Emerging operational models. *Qualitative Inquiry, 4*(2), 280-292. doi:10.1177/107780049800400208

Speer, A., & Bess, D. (2003). Evaluation of compensation of nonphysician providers. *American Journal of Health-System Pharmacy, 60*(1), 78-80.

Stake, R. E. (2006). *Multiple case study analysis*. New York, NY: The Guilford Press.

Starfield, B., Powe, N. R., Weiner, J. R., Stuart, M., Steinwachs, D., Scholle, S. H., & Gerstenberger, A. (1994). Costs vs quality in different types of primary care settings. *JAMA : The Journal of the American Medical Association, 272*(24), 1903-1908.

Stead, K., Kumar, S., Schultz, T. J., Tiver, S., Pirone, C. J., Adams, R. J., & Wareham, C. A. (2009). Teams communicating through STEPPS. *The Medical Journal of Australia, 190*(11 Suppl), S128-32.

Strand, L. M., Morley, P. C., Cipolle, R. J., Ramsey, R., & Lamsam, G. D. (1990). Drug-related problems: Their structure and function. *DICP : The Annals of Pharmacotherapy, 24*(11), 1093-1097.

Stubbings, J., Nutescu, E., Durley, S. F., & Bauman, J. L. (2011). Payment for clinical pharmacy services revisited. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy, 31*(1), 1-8. doi:10.1592/phco.31.1.1

Taylor, C. T., Byrd, D. C., & Krueger, K. (2003). Improving primary care in rural alabama with a pharmacy initiative. *American Journal of Health-System Pharmacy : AJHP : Official Journal of the American Society of Health-System Pharmacists, 60*(11), 1123-1129.

Temkin-Greener, H., Gross, D., Kunitz, S. J., & Mukamel, D. (2004). Measuring interdisciplinary team performance in a long-term care setting. *Medical Care, 42*(5), 472-481.

Tesluk, P. E., & Mathieu, J. E. (1999). Overcoming roadblocks to effectiveness: Incorporating management of performance barriers into models of work group effectiveness. *Journal of Applied Psychology, 84*(2), 200-217.

Tsuyuki, R. T., Johnson, J. A., Teo, K. K., Simpson, S. H., Ackman, M. L., Biggs, R. S., . . . Taylor, J. G. (2002). A randomized trial of the effect of community pharmacist intervention on cholesterol risk management: The study of cardiovascular risk intervention by pharmacists (SCRIP). *Archives of Internal Medicine, 162*(10), 1149-1155.

Umscheid, C. A., Gross, R., Weiner, M. G., Hollenbeak, C. S., Tang, S. S., & Turner, B. J. (2010). Racial disparities in hypertension control, but not treatment intensification. *American Journal of Hypertension, 23*(1), 54-61. doi:10.1038/ajh.2009.201; 10.1038/ajh.2009.201

van der Vegt, G. S., Bunderson, S., & Kuipers, B. (2010). Why turnover matters in self-managing work teams: Learning, social integration, and task flexibility. *Journal of Management, 36*(5), 1168-1191. doi:10.1177/0149206309344117

Vargas, R. B., Mangione, C. M., Asch, S., Keesey, J., Rosen, M., Schonlau, M., & Keeler, E. B. (2007). Can a chronic care model collaborative reduce heart disease risk in patients with diabetes? *Journal of General Internal Medicine, 22*(2), 215-222. doi:10.1007/s11606-006-0072-5

Verrue, C. L., Petrovic, M., Mehuys, E., Remon, J. P., & Vander Stichele, R. (2009). Pharmacists' interventions for optimization of medication use in nursing homes : A

systematic review. *Drugs & Aging, 26*(1), 37-49. doi:10.2165/0002512-200926010-00003

Von Muenster, S. J., Carter, B. L., Weber, C. A., Ernst, M. E., Milchak, J. L., Steffensmeier, J. J., & Xu, Y. (2008). Description of pharmacist interventions during physician-pharmacist co-management of hypertension. *Pharmacy World & Science : PWS, 30*(1), 128-135. doi:10.1007/s11096-007-9155-6

Wageman, R. (1995). Interdependence and group effectiveness. *Administrative Science Quarterly, 40*(1), 145-180. doi:10.2307/2393703

Wagner, E. H. (1998). Chronic disease management: What will it take to improve care for chronic illness? *Effective Clinical Practice : ECP, 1*(1), 2-4.

Wagner, E. H. (2000). The role of patient care teams in chronic disease management. *BMJ (Clinical Research Ed.), 320*(7234), 569-572.

Wagner, E. H., Austin, B. T., & Von Korff, M. (1996). Organizing care for patients with chronic illness. *The Milbank Quarterly, 74*(4), 511-544.

Wagner, E. H., Glasgow, R. E., Davis, C., Bonomi, A. E., Provost, L., McCulloch, D., . . . Sixta, C. (2001). Quality improvement in chronic illness care: A collaborative approach. *The Joint Commission Journal on Quality Improvement, 27*(2), 63-80.

Warren, M. L., Houston, S., & Luquire, R. (1998). Collaborative practice teams: From multidisciplinary to interdisciplinary. *Outcomes Management for Nursing Practice, 2*(3), 95-98.

Weaver, S. J., Rosen, M. A., DiazGranados, D., Lazzara, E. H., Lyons, R., Salas, E., . . . King, H. B. (2010). Does teamwork improve performance in the operating room? A multilevel evaluation. *Joint Commission Journal on Quality and Patient Safety / Joint Commission Resources, 36*(3), 133-142.

Weber, C. A., Ernst, M. E., Sezate, G. S., Zheng, S., & Carter, B. L. (2010). Pharmacist-physician comanagement of hypertension and reduction in 24-hour ambulatory blood pressures. *Archives of Internal Medicine, 170*(18), 1634-1639. doi:10.1001/archinternmed.2010.349

Weinberg, D. B., Cooney-Miner, D., Perloff, J. N., Babington, L., & Avgar, A. C. (2011). Building collaborative capacity: Promoting interdisciplinary teamwork in the absence of formal teams. *Medical Care, 49*(8), 716-723. doi:10.1097/MLR.0b013e318215da3f

Weinstein, M. C. (2008). How much are americans willing to pay for a quality-adjusted life year? *Medical Care, 46*(4), 343-345. doi:10.1097/MLR.0b013e31816a7144

West, M. A., Borrill, C. S., & Unsworth, K. L. (1998). Team effectiveness in organizations. In C. L. Cooper, & I. T. Robertson (Eds.), *International review of industrial and organizational psychology. volume 13.* (pp. 1-48) John Wiley & Sons Ltd.

Witry, M. J., Chang, E. H., Mormann, M. M., Doucette, W. R., & Newland, B. A. (2011). Older adult perceptions of a self-reported medication risk questionnaire: A focus group study. *Innovations in Pharmacy, 2*(3), Article 50.

Wittenbaum, G. M., Vaughan, S. I., & Stasser, G. (1998). Coordination in task-performing groups. In R. S. Tindale, L. Heath, J. Edwards, E. J. Posavac, F. B. Bryant, Y. Suarez-Balcazar & . . . J. Myers (Eds.), (pp. 177-204). New York, NY, US: Plenum Press.

World Health Organization. (2012). Chronic diseases. Retrieved October 10, 2012, from http://www.who.int/topics/chronic_diseases/en/

Xyrichis, A., & Lowton, K. (2008). What fosters or prevents interprofessional teamworking in primary and community care? A literature review. *International Journal of Nursing Studies, 45*(1), 140-153. doi:10.1016/j.ijnurstu.2007.01.015

Yano, E. M. (2008). The role of organizational research in implementing evidence-based practice: QUERI series. *Implementation Science : IS, 3*, 29. doi:10.1186/1748-5908-3-29

Yawn, B. P., Pace, W., Dietrich, A., Bertram, S., Kurland, M., Graham, D., . . . Wollan, P. (2010). Practice benefit from participating in a practice-based research network study of postpartum depression: A National Research Network (NRN) report. *Journal of the American Board of Family Medicine : JABFM, 23*(4), 455-464. doi:10.3122/jabfm.2010.04.090246; 10.3122/jabfm.2010.04.090246

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Thousand Oaks, CA: Sage Publications.

Zillich, A. J., Doucette, W. R., Carter, B. L., & Kreiter, C. D. (2005). Development and initial validation of an instrument to measure physician-pharmacist collaboration from the physician perspective. *Value in Health : The Journal of the International Society for Pharmacoeconomics and Outcomes Research, 8*(1), 59-66. doi:10.1111/j.1524-4733.2005.03093.x

Zillich, A. J., McDonough, R. P., Carter, B. L., & Doucette, W. R. (2004). Influential characteristics of physician/pharmacist collaborative relationships. *The Annals of Pharmacotherapy, 38*(5), 764-770. doi:10.1345/aph.1D419

Zillich, A. J., Milchak, J. L., Carter, B. L., & Doucette, W. R. (2006). Utility of a questionnaire to measure physician-pharmacist collaborative relationships. *Journal of the American Pharmacists Association : JAPhA, 46*(4), 453-458.