ALDERMAN, JENNIFER TAYLOR, Ph.D. Hotspotting in Home Health: The Impact of Interprofessional Student-Team Home Visits on Health Outcomes of Super-Utilizers of the Health Care System. (2019)
Directed by Dr. Susan Letvak. 108 pp.

The purpose of this study was to examine the impact of interprofessional student-team home visits on the health outcomes of super-utilizers of the health care system. The cost of health care continues to increase at an unsustainable pace. Innovative educational approaches integrated with existing models of care are an example of a potential strategy aimed at reducing costs and improving outcomes. The model implemented in this study is referred to as hotspotting, an emerging term that describes an intervention during which super-utilizers are the focus of the intervention. Teams of interprofessional health professions students performed home visits on these patients in conjunction with the patients being in the care of one home health agency. This study analyzed 30-day hospital readmission rates and emergency department visits of the super-utilizers.

There were twenty patients in the intervention group and twenty patients in the control group. Data analysis revealed a statistically significant difference in 30-day readmission rates between the two groups, with the group receiving interprofessional student-team home visits having fewer 30-day hospital readmissions. The number of emergency department visits were too small to warrant analysis. Home health agencies may find hotspotting an effective intervention to decrease costs and improve patient outcomes.

HOTSPOTTING IN HOME HEALTH: THE IMPACT OF INTERPROFESSIONAL STUDENT-TEAM HOME VISITS ON HEALTH OUTCOMES OF SUPER-UTILIZERS OF THE HEALTH CARE SYSTEM

by

Jennifer Taylor Alderman

A Dissertation Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Greensboro
2019

Approved by

_____
Committee Chair

I thank God for His guidance and provision in my life, for leading me into the profession of nursing, and for always sustaining me through each stage of my nursing career.

I dedicate this dissertation to my husband, Travis, who has cheered me on and supported me throughout my entire PhD journey. He never doubted me for a second and knew the value of the work and that it was worth the sacrifice of time to accomplish the goal.

APPROVAL PAGE

This dissertation written by Jennifer Taylor Alderman has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

Committee Chair _____
Susan Letvak

Committee Members _____
Nancy Hoffart

_____
Laurie Kennedy-Malone

_____
Jay Poole

_____
Date of Acceptance by Committee

_____
Date of Final Oral Examination

ACKNOWLEDGEMENTS

I would like to acknowledge some key people who were influential on my PhD journey. To my dissertation chair, Dr. Susan Letvak, thank you for being the consummate cheerleader, always available and ready to help! To my dissertation committee, Dr. Nancy Hoffart, Dr. Laurie Kennedy-Malone, and Dr. Jay Poole, I thank you for your ongoing support, encouragement, expertise, and feedback.

To Brandi Robinson, for being a phenomenal project coordinator, I thank you, for without you, I would have had no data! To my dear friends and colleagues at UNC-Chapel Hill, Dr. Kathy Alden, Dr. Carol Durham, and Dr. Meg Zomorodi, I consider myself to be standing on the shoulders of giants when I think about all the mentoring, caring, and friendship we have shared for many years. You are all trailblazers in nursing and it is my continued privilege to know and work alongside you.

To my parents, Arles and Bradie, who have always encouraged me to do my best, set goals, and help others. To my parents-in-law, Freddie and Debbie, who spent countless hours cheering me on and telling me that the time would pass anyway, I might as well get a PhD. To my son Nicholas, who is too young now to realize the significance of this achievement, but it is my hope that, one day, he will be proud of his mom and strive to help his fellow humankind. I thank my lifelong friends, particularly Amber and Jana, who have known me the longest of any of my friends and who have always been there to offer words of encouragement, faith, and love.

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CHAPTER I

INTRODUCTION

Interprofessional education (IPE) occurs when two or more health professions learn from, with, and about each other (World Health Organization, 2010). A premise exists that when health care professionals learn together, whether at the pre-licensure level, or when they are already practicing, they will be able to better communicate with each other, thus improving patient outcomes (Reeves et al., 2016).

There are many intended aims of IPE. Interprofessional education is meant to improve the knowledge, skills, and attitudes of health professions students and practitioners and has been shown to do so in many studies (Reeves et al., 2016). Currently, the primary goal of IPE research is to show the impact of IPE on the health outcomes of patients. This area is one in which evidence is still lacking and offers an opportunity for new studies to address this gap.

Many national and international organizations, including nursing, medical, and pharmacy schools' accreditors, recommend the implementation of IPE in health professions schools (National Academy of Sciences, 2015). For example, the American Association of Colleges of Nursing's (AACN) recommendation for baccalaureate education is to provide education on interprofessional communication and collaboration to improve patient health outcomes (AACN, 2008). The Accreditation Council for Graduate Medical Education (ACGME) specifies that medical schools must contain

programs that promote interprofessional, team-based care (ACGME, 2017). The Accreditation Council for Pharmacy Education (ACPE) requires that interprofessional learning experiences are integrated into pharmacy school curricula as well (ACPE, 2015).

Further, in 2016, the National Academy of Sciences issued a report entitled, *A Framework for Educating Health Professionals to Address the Social Determinants of Health.* This report emphasizes the importance of including information about the social determinants of health (SDOH) in the education of all health professions. Social determinants include "the conditions in which people are born grow, live, work, age, including the health system" (WHO, 2016). It is widely understood that the best way to address learning about SDOH is interprofessionally through service-learning experiences. Service-learning refers to programs that have a strong collaboration with the community (National Academy of Sciences, 2016).

The purpose of this study was to examine the impact of an interprofessional student-team home visit intervention on the number of 30-day hospital readmissions and emergency department visits of patients classified as super-utilizers of the health care system. The intervention is referred to as hotspotting. Both super-utilizers and hotspotting are further described below. This study's purpose incorporates the need to advance the science around the impact of IPE on patient outcomes, the need to include IPE in health professions schools for accreditation purposes, and the need to increase knowledge about SDOH in health professions education.

The home health care agency described in this study defines super-utilizers through a hospital readmission-risk screening tool, called the LACE. This acronym

represents length of stay, acuity of last admission, comorbidities, and number of emergency department visits (Walraven et al., 2010). Patients are scored and categorized as Levels 1-4. Patients who are scored at Levels 3 and 4 are considered super-utilizers. This tool is described in further detail in Chapter 3 of this dissertation.

The process of targeting populations who overuse the health care system (i.e. super-utilizers), thus increasing health care costs, is not new. Hotspotting is an emerging term used to describe this process (Bedoya et al., 2017). Teams of interprofessional students are the "hotspotters" who engage with this patient population with the aim of decreasing the population's use of the health care system, thus decreasing costs and improving population health (Bedoya et al., 2017). Preliminary results of hotspotting interventions utilizing interprofessional student teams show promise in improving patient outcomes, such as reducing hospital readmissions, emergency department visits, and length of stay in home health (Bedoya et al., 2017; Zomorodi et al., 2018).

Background and Significance

The economic problem that drove this study is the current state of health care in the United States. Increasing costs and poor outcomes are critical issues that need to be addressed (Brandt, Lutfiyya, King, & Chioreso, 2014). National health expenditures in 2016 increased by 4.3%, to $3.3 trillion, or $10,348 per person (Centers for Medicare and Medicaid Services [CMS], 2016). This level of spending encompassed 17.9% of the Gross Domestic Product (GDP). Each of the following sectors saw increases in spending in 2016: Medicare, Medicaid, private health insurance, out of pocket spending, hospital expenses, physician and clinical services, and prescription drugs (CMS, 2016).

Hospital Readmissions and Home Health Care

The Centers for Medicare and Medicaid services (n. d.) began a Hospital Readmissions Reduction Program based on legislature enacted through the Affordable Care Act. The aim of this program was to reduce reimbursements to hospitals with excessive readmissions, linking payment to quality of care (CMS, n. d.). From 2000-2014, the number of home health care agencies in the United States increased by 66%, with total home health care spending increasing by 108% (Centers for Medicare and Medicaid Services, 2017). Between 2013 and 2014, approximately 4.9 million patients received home health care from 12,400 home health agencies. Over half of these patients were admitted to home health after acute care hospitalizations (Shang, Larson, Liu, & Stone, 2015). Even with home health care services, hospital readmissions still cost the U. S. health care system $41.3 billion in 2011 (Hines, Barrett, Jiang, & Steiner, 2014). Preventing hospital readmissions is a critical priority (Ma, Shang, Miner, Lennox, & Squires, 2018).

Cost of Emergency Department Visits

Emergency department (ED) visits are a costly and preventable use of health care resources (Galarraga & Pines, 2016). In 2010, ED visits accounted for approximately $320 billion in health care costs, constituting 12.5% of national health expenditures. The most common type of ED visits can be classified as non-emergent outpatient. Avoidable ED visits totaled around $64 billion, or 2.4% of health expenditures in the United States (Galarraga & Pines, 2016).

Conceptual Framework

The National Academy of Sciences issued a report in 2015 about the current state of IPE and the types of measurement used in the field. One aspect of this report emphasized the need for more consistent, robust conceptual frameworks to be used in guiding IPE research studies. The committee that issued the report extensively searched the literature and concluded that no existing conceptual models contained all of the critical elements of IPE that are needed to design future studies. Many of the existing studies about IPE have utilized various conceptual models, frameworks, and theories, thus lacking consistency (National Academy of Sciences, 2015).

The committee also noted the need for improved alignment between educational settings and health care organizations in terms of the IPE continuum of learning (National Academy of Sciences, 2015). Students are exposed to IPE in their educational institutions and then move to practice settings where there is not a structured learning environment in which to advance interprofessional collaboration skill acquisition. The committee proposed a conceptual model linking IPE with learning, health, and system outcomes that needs to be tested empirically (National Academy of Sciences, 2015). Figure 1 depicts the Interprofessional Learning Continuum (IPLC) framework.

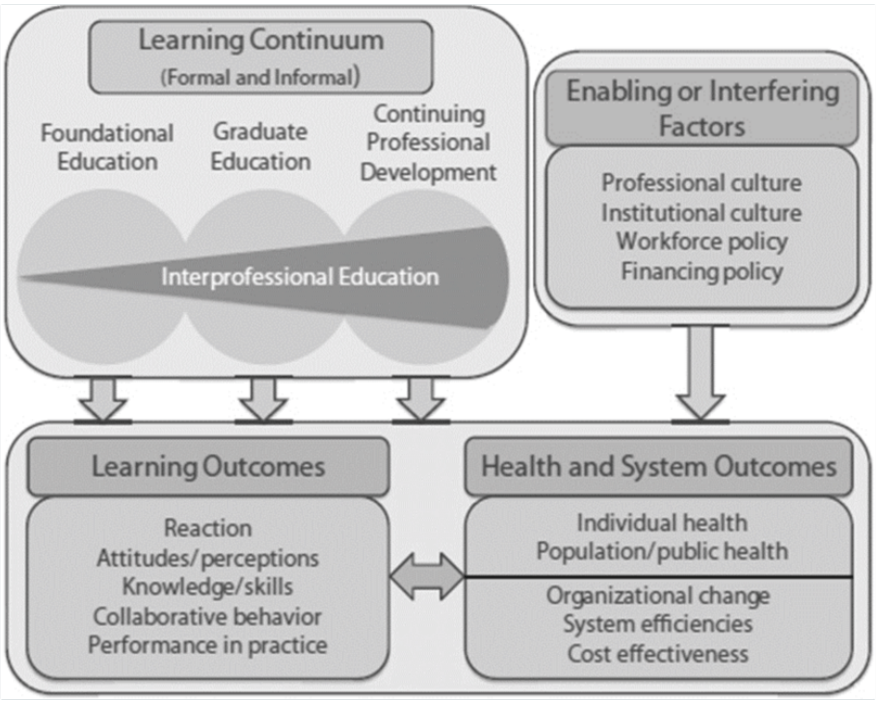


Figure 1. Conceptual Framework: Interprofessional Learning Continuum (IPLC), 2015. Reprinted with permission.

Conceptual Definitions

According to the National Academy of Sciences (2015), the IPLC conceptual model depicts the continuum of formal and informal IPE. Formal IPE is what students receive in their respective health professional programs. Informal IPE is learning that occurs later in practice and during the careers of health care professionals. The model depicted in Figure 1 shows four interconnected concepts: a learning continuum, learning outcomes, health and system outcomes, and enabling or interfering factors (National Academy of Sciences, 2015).

Learning continuum. The learning continuum shows the continuous nature of formal and informal IPE. IPE includes learning interventions throughout the education-to-practice continuum. This continuum is divided into segments of the learning trajectory for health professions students, from foundational education, to graduate education, to continuing professional development in practice. The funnel-like structure in the model shows that the amount of IPE should be increasing as the health care professional advances across the learning continuum. The premise is that IPE can be formal or informal at any stage of the learning continuum, with informal learning increasing across the learning continuum (National Academy of Sciences, 2015).

Foundational education is the beginning education of any health profession (National Academy of Sciences, 2015). Core competencies for IPE have been established by Interprofessional Education Collaborative (IPEC) (2016). The establishment of these four competencies, teams and teamwork, roles and responsibilities, values and ethics, and interprofessional communication, has provided national guidelines for health professions schools to create curricula and other learning experiences.

Learning outcomes. Learning outcomes depicted in the model are reaction, attitudes/perceptions, knowledge/skills, collaborative behavior, and performance in practice. These outcomes are based on Kirkpatrick's levels of learning outcomes. Kirkpatrick's model was adapted for IPE by Barr et al. (2005). Kirkpatrick's model has been criticized for being used in IPE, as it was a basic model aimed at leveling general organizational learning initially. It was thought to lack consideration of the complexities

of organizational and consumer change. The committee recognized this deficiency and decided to separate learning outcomes from health and system outcomes.

Health and system outcomes. To show the potential final impact of IPE, the committee added individual health/population health, and system outcomes to show that level of IPE impact, which is missing when reviewing literature about IPE (National Academy of Sciences, 2015). Addressing health and system outcomes in the framework shows the importance to evaluating IPE beyond the typical student learning outcomes and the assessment of team function. This framework provides a visualization of the whole IPE process, including the environments in which it occurs and the emphasis on better alignment between education and practice. The goal of providing the IPLC framework is to allow for more vigorous research studies to be designed with a consistent framework (National Academy of Sciences, 2015).

Enabling or interfering factors. The model includes enabling or interfering factors that affect the design and execution of any IPE educational initiative. These factors will differ by health care setting and the country in which the IPE is conducted. Measurable outcomes depend upon the interactions of these factors. The enabling or interfering factors in this model are professional culture, institutional culture, workforce policy, and financing policy (National Academy of Sciences, 2015).

Adaptation of Conceptual Model

Because the focus of this study was to determine the impact of IPE student-team home visits on patient outcomes, the IPLC model was adapted to depict specific components of this study. The learning continuum in this adapted model refers to the

foundational education the interprofessional student teams receive during the hotspotting orientation. Health and system outcomes in the adapted model refer to the outcomes being measured in this study at the population level, which are readmissions and emergency department visits. Learning outcomes in the adapted model refer specifically to the collaborative behavior outcome. In orientation (described in more detail in Chapter 3) students receive education about how to collaborate in interprofessional teams. Prior to performing a home visit, the student teams plan their approach and review patient information together. They use a structured interview guide to assist in establishing rapport with patients and review patient care goals with those they visit. Post-visit, the students again collaborate while writing the summary of the encounter. The arrows in the adapted model depict the interaction that occurs among the three concepts. Receiving foundational education about hotspotting, social determinants of health, and interprofessional collaboration is intended to set the stage for optimal communication among students and between student teams and patients, positively impacting health outcomes and collaborative behavior.

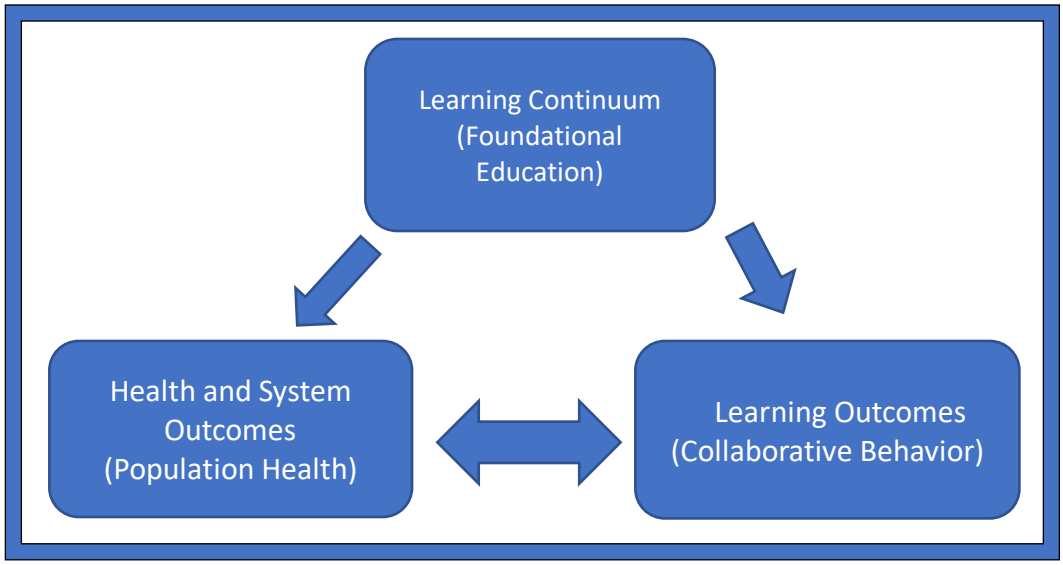


Figure 2. Adaptation of the Interprofessional Learning Continuum (IPLC).

Purpose

Considering the lack of research linking IPE to patient outcomes, and the need to decrease hospital readmissions and emergency department visits to ease the burden on the health care system, the purpose of this quasi-experimental study was to examine the impact of IPE student-team home health visits on the population health outcomes of hospital readmissions and emergency department visits. This study addressed the following research questions and hypotheses:

1. **Research Question:** What are the first-time 30-day hospital readmission rates for super-utilizers receiving interprofessional student teams' home visits in one home health agency?

2. **Research Question**: What is the number of emergency department visits for super-utilizers receiving interprofessional student teams' home visits in one home health agency?
3. **Research Question:** Is there a relationship between the number of home visits performed by interprofessional student teams and 30-day hospital readmission rates?
4. **Research Question:** Is there a relationship between the number of home visits performed by interprofessional student teams and the number of emergency department visits?
5. **Hypothesis:** Super-utilizers who receive home visits by interprofessional student teams will have fewer hospital readmissions than super-utilizers who do not receive home visits by interprofessional student teams.
6. **Hypothesis:** Super-utilizers who receive home visits by interprofessional student teams will have fewer emergency department visits than super-utilizers who do not receive home visits by interprofessional student teams.

Definitions of Terms

For the purposes of this quasi-experimental study, one of the four interconnected concepts in the conceptual model, health and system outcomes, were examined further. Specifically, population health outcomes were determined. Terms are defined below:

- Social determinants of health: include "the conditions in which people are born grow, live, work, age, including the health system" (WHO, 2016).

- Super-utilizers: one home health care agency's patients who receive a score of "L4" on the LACE readmission risk assessment tool
- Hospital readmissions: the number of readmissions of the patients visited by interprofessional student teams (individual health outcome) during the home health care (HHC) stay (Ma, Shang, Miner, Lennox, & Squires, 2018).
- Hospital readmission rate: the 30-day readmission rate that applies to the population of super-utilizers identified in the home health agency (population health outcome). The current readmission rate for this home health care agency is 14% (D. Thompson, personal communication, April 17, 2018). Thirty-day readmission rate for patients in this study was calculated by dividing the number of 30-day readmissions by the number of patients in the sample and then multiplying by 100.
- Health system: any acute care health care organization through which a super-utilizer would receive services and incur costs (Harris et al., 2016). In this case, health system refers to the home health agency through which home visits will be occurring.
- Readmission: defined by the home health agency, an "all-cause" readmission, meaning, any hospital readmission counts as a readmission—it does not have to pertain directly to the patient's diagnosis or reason for receiving home health care (D. Thompson, personal communication, April 17, 2018; Ma, Shang, Miner, Lennox, & Squires, 2018).

- Interprofessional student teams: groups of at least two students from different health professions, including nursing, medicine, pharmacy, public health, nutrition, and occupational therapy (WHO, 2010).

Limitations

This study had several limitations. These include small sample size, lack of intervention fidelity among varied interprofessional student teams who are performing the home visits, and difficulty distinguishing exactly how the interprofessional home visits impact patient outcomes. For example, the student-team home visits could be viewed as additional social support for the patients and any improved patient outcomes may or may not be a direct result of the student-team home visits. Patients in the care of the home health agency also receive varying amounts of supportive services, such as occupational therapy, physical therapy, and social work. Again, depending on the amount of supportive services in relation to the number of interprofessional student team home visits, it could be quite difficult to discern exactly which combination of interventions was most effective at improving patient outcomes. The timing of the student-team home visit in relation to when the 30-day readmission occurred also needs to be considered when discerning the impact of the student-team home visits. Finally, another limitation in this study is that the impact of the patient's mental health on their other health outcomes is not specifically addressed. Often super-utilizers have complex medical diagnoses, including a psychiatric component (Harris et al., 2016). This behavioral health component is an area that no doubt warrants further exploration. Other IPE models, primarily occurring in primary care clinics, have integrated behavioral health in their

approaches to providing care aimed at improving outcomes for populations very similar to super-utilizers (Selleck, Fifolt, Burkar, Frank, Curry, & Hites, 2017).

Summary

Interprofessional education occurs when two or more health professions learn from, with, and about each other (World Health Organization, 2010). Many studies have shown the impact of IPE on health professions students' knowledge, skills, and attitudes. Some evidence exists showing the impact of an IPE on patient and organizational outcomes, although there is a gap in the literature with regard to this area of study. Health care costs continue to rise in the United States. Innovative interventions, such as hotspotting in home health, are needed to stem these costs. The purpose of this study was to examine the impact of IPE-related intervention on patient outcomes, specifically, the impact of IPE student home visits, through a hotspotting intervention, on hospital readmissions and emergency department visits of patients who are super-utilizers of the U. S. health care system.

CHAPTER II

LITERATURE REVIEW

Introduction

This chapter provides a comprehensive review of the literature related to hotspotting and how it has been used to improve patient health outcomes. Hotspotting will be reviewed first, as it is the focus of this proposed study. Other research literature reviewed includes super-utilizers, hospital readmissions, interprofessional education, including a brief history of interprofessional education (IPE) in nursing, and the use of IPE in community-based interventions. A synopsis of how this study's conceptual framework, the Interprofessional Learning Continuum (IPLC) has been used in IPE research is provided as well. A summary of the literature review and identified gaps in the literature concludes the chapter.

Hotspotting

Hotspotting is a way to identify super-utilizers of the health care system, implement targeted interventions, and realign ineffective patterns of health care utilization (Fader, Goldstein, & Vause-Earland, 2016). Hotspotting was initiated by the Camden Coalition of Health Care Providers and the Association of American Medical Colleges, leading to the creation of the Interprofessional Student Hotspotting Learning Collaborative, which began in 2014 (Bedoya et al., 2017). The aim of this collaborative is to train health professions students in interprofessional teams at academic medical centers

in the United States (Bedoya et al., 2017). The students help meet the needs of those patients who are super-utilizers of the health care system. Super-utilizers are defined as patients who have had three or more hospitalizations or two or more hospitalizations and two or more emergency department visits in a 6-month period (Harris et al., 2016). These patients usually have medical and social barriers that prevent them from accessing the quality care they need (National Center for Complex Health and Social Needs, 2018).

The students achieve the goals of the Collaborative by making home visits and providing close case management for as many as five patients over a six-month time frame (Bedoya et al.., 2017), although other models of hotspotting exist with differing time frames and processes for implementation. Hotspotting has been implemented across the United States, including Jefferson Medical Center, Johns Hopkins School of Medicine, Penn State College of Medicine, University of North Carolina at Chapel Hill School of Medicine, Duke University School of Medicine, and Virginia Commonwealth University School of Medicine (Bedoya et al., 2017).

Research on Implementation of Hotspotting

Most of the articles returned in the search for research on hotspotting were not research; they described different implementation models of hotspotting. Bedoya et al. (2017) utilized the Camden Coalition approach to hotspotting at Virginia Commonwealth University (VCU). This was part of the National Interprofessional Student Collaborative, previously mentioned. Nationally, fifty-seven students from the health professions of nursing, medicine, pharmacy, and social work participated in a project aimed at teaching students about social determinants' effects on the health of individuals. The project also

aimed to show how IPE can assist with meeting the medical and social needs of patients with complex medical issues. Interprofessional student teams performed home visits on patients who were super-utilizers. The project leaders focused on evaluating the student responses to the project, which were favorable (Bedoya et al., 2017).

Zomorodi et al. (2018) described a model of hotspotting in which interprofessional student teams provide home visits through a partnership with a local home health agency. In this model, interprofessional student teams composed of graduate nursing students (n=2), pharmacy students (n=4), and occupational therapy students (n=5). Student numbers were limited in this pilot study to determine feasibility of the model. Faculty members from each health professions' school acted as facilitators throughout this service learning experience (Zomorodi et al., 2018).

In terms of IPE outcomes, the hotspotting pilot project by Zomorodi et al. (2018) was evaluated by examining student outcomes. The Interprofessional Socialization and Valuing Scale-21 (ISVS-21) was used pre and post hotspotting experience. Results showed increased comprehension of the importance of interprofessional collaboration and working with other health care team members. One-minute paper reflections indicated an increased understanding of how difficult it is for patients to manage chronic illnesses and the influence of the illnesses on readmissions and other patient outcomes, such as quality of life (Zomorodi et al., 2018).

Another model of hotspotting is very similar to previous models. The difference is that the first patient visit occurs in the hospital, prior to patient discharge (Jones, Li, Zomorodi, Broadhurst, & Weil, 2018). The Triangle Interprofessional Partners for

Prevention (TIPP) began in 2014 in response to the call from the Camden Coalition. Students from medicine, nursing, pharmacy, social work, and public health participated. The TIPP had three primary goals—to provide students with an impactful interprofessional learning experience, to identify and address the needs of super-utilizers of the health system, and to determine if TIPP resulted in decreased use of health care services by the super-utilizers (Jones et al., 2018). Outcomes of TIPP included positive student evaluations of the learning experience and some favorable results with regard to impact on health care costs (Jones et al., 2018). After the intervention, monthly inpatient costs for five of the seven participating patients seen decreased. Three of the seven patients did not have a hospital admission after the intervention. This was a small sample size, which is major reason why more research is needed in determining the impact of IPE on patient outcomes (Jones et al., 2018).

Hotspotting has also been implemented in two other cities, Memphis, Tennessee (TN), and New Haven, Connecticut (CT) (Cutts, Rafalski, Grant, & Marinescu, 2014; Holzer, Canavan, Cherlin, & Bradley, 2014). Cutts and colleagues (2014) examined a partnership between a Memphis health care organization, Methodist Le Bonheur Healthcare, and the Congregational Health Network. This group called their process "participatory hotspotting." Those implementing this model use data from hospitals, geographic data, and information obtained from community partners, such as clergymen, to identify super-utilizers. The results of this work allowed the researcher to pinpoint a Memphis zip code that represented 36% of all inpatient and outpatient visits to the participating health system. This work allowed the health care organization to set up a

meeting in this targeted area and invited congregational and community partners to attend. Payer partners, including Cigna Healthcare were also invited. A series of community 'conversations' followed. Cigna awarded Methodist Le Bonheur Healthcare a grant to continue their work to decrease health disparities and costs for this area (Cutts et al., 2014).

Another example of hotspotting occurred in New Haven, CT (Holzer, Canavan, Cherlin, & Bradley, 2014). This research team used hotspotting in a similar manner as the Memphis group. They targeted geographic areas by analyzing hospital data. They determined that 34 addresses, referred to as hot spots, in one community in New Haven accounted for 70% of the total costs incurred with one health care organization. The researchers looked more closely at the community to identify any social determinants of health that contributed to these high costs. They looked at community-level data such as crime rates, foreclosures, and retail alcohol stores. There was a correlation between these community-level data and the addresses that were determined to incur the most health care costs. For example, 78% of violent crimes happened within 500 feet of a hot spot. The goal of this research was to help key stakeholders, such as hospital leadership and community members, examine data like these so that they can begin to form partnerships and ultimately generate some solutions to these problems (Holzer et al., 2014).

Two other papers described hotspotting models (Capp et al., 2017; Kaufman, Ali, DeFiglio, Craig, & Brenner, 2014). Capp et al. (2017) described a program that is emergency department-initiated, multidisciplinary, and community-based. A control group was used to compare outcomes, but the paper was not written as a research study,

rather it was written as a program evaluation. Outcomes for the super-utilizers in this paper improved, with fewer ED visits and hospitalizations (Capp et al., 2017).

Kaufman et al. (2014) also ran a model of hotspotting aimed at improving outcomes. Again, the format of the article is program evaluation, although a theoretical framework was used to guide the work. Using a health information exchange (HIE) to provide data about super-utilizers, the team implemented a care management intervention, in which super-utilizers were provided with focused care from an interprofessional outreach team. Outcomes such as hospital admissions and ED visits decreased for this group (Kaufman et al., 2014).

Finally, one study that is currently underway is a randomized controlled trial aimed at examining the outcomes of the Link2Care program, part of the Camden Coalition's work in New Jersey (Finkelstein & Brenner, 2018). The primary outcome measure is hospital readmissions. Super-utilizers are targeted and are randomly assigned to a control group and to an intervention group. The control group is receiving the standard care related to discharge planning from the hospital. The intervention group receives care from a multidisciplinary team at hospital discharge, and then receives a series of home visits, as well as accompaniment to primary care appointments. The estimated enrolled for the study is 800 participants. Data collection was set to end in fall 2018 (Finkelstein & Brenner, 2018)

Super-Utilizers

Super-utilizers, also referred to as "high-utilizers," "super-users," and "high-cost-high-need," compose about 5% of all patients, but generate about 50% of health care

costs (Dattalo, Nothelle, & Chapman, 2016; Thompson et al., 2018). This group has received increased attention since efforts in United States health care reform have been targeting the "Triple Aim" of improved health, improved patient experience, and decreased costs (Dattalo, Nothelle, & Chapman, 2016). This group is more likely to have mental health and substance abuse issues in addition to being diagnosed with multiple chronic conditions, such as congestive heart failure and diabetes. Many studies have been conducted examining characteristics of super-utilizers of the health care system and interventions that have been implemented to improve the outcomes of this group.

Mautner et al. (2015) conducted a qualitative study aimed at identifying psychosocial factors and life experiences of super-utilizers that may affect their health care needs. Semi-structured interviews were conducted with 19 participants. Data were analyzed for themes. Three themes emerged: traumatic events in the early lives of the participants informed their health and experiences with the health care system; several of the participants described difficult encounter with health care professionals during their adult lives; and, more than half of the group described how important a positive relationship with a primary care provider is to their well-being. The research team concluded that new models of care delivery be developed that better address the traumatic health histories of these patients. The interviews provided critical insight into the lives of these patients, leaving a whole host of other research questions to investigate further (Mautner et al., 2015).

Mercer et al. (2015) implemented a quality improvement (QI) intervention with a retrospective pre/post analysis. The QI team partnered with an academic medical center

and analyzed a set of patient data to determine which patients met criteria for this project. Twenty-four super-utilizers were targeted and individualized care plans were created for them by a multidisciplinary health care team. Inpatient admissions decreased by 56% for the 6 months after the individualized care plan was initiated. Thirty-day readmissions decreased by 66%. Combined ED and inpatient costs decreased by an average of $15,117.30, 6 months after care plan implementation. This equated to a 45.3% reduction in costs. The QI team surmised that the individualized care plans raised awareness of providers as they cared for the patients, reconsidering that some the acute episodes were more chronic and could be better addressed in outpatient settings. The QI team also noted that the care plans provided a comprehensive communication tool, increasing the efficiency of care delivery (Mercer et al., 2015).

Harris et al. (2016) conducted a retrospective cohort study to gain insight about the characteristics of super-utilizers in a Tennessee health care system. They aimed to analyze this data in advance of an initiative called Safe Med, an innovative care transitions program zeroing in on medication management for super-utilizers. Characteristics included mean age of 60.3 years, 59% female, 74% African American, 77% with Medicare, 43% with a private primary care provider, and 40% with a diagnosis of congestive heart failure (CHF). Thirty-day hospital readmission rate for this group was 26%. The researchers proposed that super-utilizers with multiple co-morbidities would likely benefit from targeted care transition programs with components of both disease and medication management (Harris et al., 2016).

Durfee et al. (2017) examined the impact of tailored intervention services on cost and mortality for adult super-utilizers who were patients of a health care system in Denver, Colorado. All primary care practices in this organization changed their delivery model to team-based care coupled with elements of the patient-centered medical home. The Intensive Outpatient Clinic was developed as a specialized primary care venue for super-utilizers. There were higher staff-patient ratios, longer visits, availability for walk-in appointments, and more nursing and social work support of the patients. Results showed higher inpatient admissions, but with significantly lower lengths of stay. Mortality was significantly lower in the group that received the intervention (Durfee et al., 2017).

Thompson et al. (2018) examined a community navigator model aimed at improving outcomes of super-utilizers in Memphis, TN. Patients became connected to a navigator while they were still hospitalized. The navigator's role was to determine any underlying causes of the frequent hospital visits. The patient and the navigator committed to a year-long partnership. The researchers compared patients who were not connected to a community navigator to patients who were connected to one. Outcomes of both groups improved. The patients with the community navigators had fewer hospital readmissions and statistically fewer hospital encounters when compared to the comparison group (Thompson et al., 2018).

Hospital Readmissions

As part of the Patient Protection and Affordable Care Act of 2010, the Hospital Readmissions Reduction Program enforces a penalty on hospitals for 30-day readmission

rates that are above the benchmarked national average (Dattalo, Nothelle, & Chapman, 2016). Penalties are as much as 3% of total reimbursement for the patient's hospital stay. In the first year of this program, national penalties for 30-day readmissions above benchmark totaled $280 million (Dattalo, Nothelle, & Chapman, 2016). Readmissions account for approximately $17.4 billion in Medicare annual spending (Kripalani, Theobald, Anctil, & Vasilevskis, 2014). One in five Medicare beneficiaries are readmitted within 30 days of discharge (National Quality Forum, 2016). From 2007-2011, 19-19.5% of Medicare patients were readmitted within 30-days of discharge. In 2012, this rate decreased to 18.5% and in 2013, the rate was 17.5% (National Quality Forum, 2016).

The Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) reported that in 2011 there were around 3.3 million adult all-cause hospital readmissions in the United States (National Quality Forum, 2016). The HCUP project group estimated that in 2011, 30-day adult all-cause readmissions resulted in approximately $41.3 billion in hospital costs (National Quality Forum, 2016). Financial incentives have caused hospitals to focus on how to prevent readmissions (Dattalo, Nothelle, & Chapman, 2016).

Reasons and Risk Factors for Hospital Readmissions

Ma, Shang, Miner, Lennox, and Squires (2018) found in a systematic review of 18 studies that the main reasons for hospital readmissions are heart failure, other heart disease, cardiac dysrhythmia, respiratory infection, and other types of respiratory difficulties. Risk factors for readmissions can be divided into six categories. These are

patient demographics, health-related factors, interpersonal patient factors, socioeconomic status, care- or intervention-related factors, and organizational factors (Ma et al., 2018).

Patient demographics that contribute to higher readmission rates include age (being older), gender (male), and race (being black or white) (Ma et al., 2018). Health-related factors include complexity of medication regimen and adherence to the regimen, weight gain, frailty, lower functional status, poor general health status, severity of primary diagnosis, comorbidities, pain level, skin condition, psychotic diagnoses, cognitive abilities, dyspnea, cancer, and length of heart failure history. Interpersonal risk factors were related to social support, such as living alone or with others, past use of hospital care, and need for caregivers. Socioeconomic status as a risk factor was related to the type of insurance patients have. Care- or intervention-related risk factors are inadequate care, lack of education on self-care, no home health visits by an aide or few visits by an aide, and higher visit intensity. Organizational risk factors include decreased quality in acute-care setting and non-hospital-based home care agency (Ma et al., 2018).

Research on Interventions to Decrease Hospital Readmissions

Many studies have been conducted aimed at decreasing hospital readmissions. Naylor et al. (1994) showed a reduction in hospital readmissions by employing an advanced practice nurse to meet with patients and their primary caregiver in the hospital to perform a needs assessment and provide thorough discharge planning. Education and coordination of post-discharge health services, such as follow-up appointments and referrals to specialized services were included in the discharge planning. Follow-up phone calls centered around reinforcement of education, symptom monitoring, and

evaluation of the plan of care as needed. During the first six weeks after discharge, readmissions were reduced for medical patients. For high-risk elderly patients, the above interventions, along with home visits, reduced readmissions (Naylor et al., 1994).

Another study described an initiative entitled the Care Transitions Intervention (CTI) (Coleman et al., 2006). A nurse "transition coach" assisted patients with care navigation. This model focused on four key aspects of care: medication management, primary care/specialist follow-up, patient-owned health record, and awareness of conditions that could lead to readmission. This bundled intervention decreased both 30-day and 90-day readmissions (Coleman et al., 2006).

Jack et al. (2009) demonstrated that by providing a multifaceted approach, hospital readmissions were also reduced. Patients received care from a discharge nurse who met with patients during their stay in the hospital, performed discharge planning, and coordinated post-discharge services. A pharmacist provided a follow-up phone call. Other aspects of the intervention included patient education, medication reconciliation, written discharge instructions, telephone reinforcement, and a discharge summary for the provider who would be following up with the patient. Both emergency department visits and readmissions were decreased for this group (Jack et al., 2009).

Hansen, Young, and Hinami (2011) performed a systematic review examining 43 different interventions aimed at reducing 30-day hospital readmissions. The overall quality of most of the studies was low; 16 of the 43 were randomized controlled trials. Over half of the studies examined single-component interventions. The other studies analyzed bundle approaches to reducing readmissions. The most frequent types of

interventions included patient education, discharge planning, telephone follow-up calls, discharge advocates, such as nurses who engaged with the patients pre- and post-discharge, and patient-centered discharge instructions. Single-component interventions did not typically reduce readmissions. Of the 16 randomized controlled trials, only five of the studies showed a significant decrease in hospital readmissions. One of these studies described an early discharge planning intervention, which was a single-component intervention. Four studies described multifaceted interventions which showed a decrease in hospital readmissions of 3.6 to 28 percentage points. Three of the studies that utilized multifaceted approaches to reduce readmissions are described below (Hansen, Young, & Hinami, 2011).

Kripalani, Theobald, Anctil, and Vasilevskis (2014) reported that future work in reducing hospital readmissions should focus on home health services, information technology, mental health care, support of caregivers, partnerships with communities, and care transitions professionals. There is little evidence to support that home health services alone reduce readmissions; they are typically accompanied by other services. Information technology can be used in telehealth monitoring for management of diseases. Mental health comorbidities increase the risk of hospital readmissions. More focus on mental health interventions as part of the readmission reduction bundle approaches is critical. Involving caregivers in the discharge process has been shown to be a part of successful bundle approaches in reducing readmissions. Caring for caregivers is also part of a successful readmission reduction bundle, as caregivers are at higher risk for depression and heart disease and often need education on self-care. Partnerships between hospitals

and community organizations is an emerging trend that is showing promise in reducing readmissions. It is now widely recognized that care transitions are a critical point in a patient's trajectory. Many roles are emerging to help bridge this often-overlooked period of time when patients are most vulnerable. Health coaches, nurse navigators, and care coordinators are a few of the roles that are contributing to readmission reduction bundle interventions (Kripalani et al., 2014).

Emergency Department Visits

Emergency department visits are an expensive and sometimes preventable use of valuable health care resources (Galarraga & Pines, 2016). Outpatient emergency department visits and admissions through the ED comprise approximately 12.5% of health expenditures in the United States. Outpatient ED visits, those visits during which patients are not admitted, account for 87% of all ED visits and constitute 4% of health care expenditures in the United States (Galarraga & Pines, 2016).

Strategies that have been implemented to reduce ED visits include streamlining physician-level admission and discharge processes in emergency departments, community-based strategies intended to increase outpatient resources, expansions in primary care capacity, and urgent care offerings (Galarraga & Pines, 2016). In a systematic review, Moe et al. (2017) found that interprofessional case management, diversion tactics for nonurgent issues, and social work home visits were all strategies that had been implemented to decrease ED visits. All of these interventions were shown to decrease ED visits. Moe et al. (2017) also noted that costs of interventions are complex, yet each of these interventions resulted in some cost savings.

Interprofessional Education

Studies conducted about IPE have centered on three areas: outcomes on the practice of licensed health care professionals, student outcomes, and patient outcomes. Because this dissertation study's outcome variable is hospital readmissions, the "patient outcomes" literature will be summarized here. In the Cumulative Index to Nursing and Allied Health Literature (CINAHL) database, search terms "interprofessional education" and "patient outcomes" were entered. PubMed was searched using the terms "interprofessional education" and "research", along with "health professions students," "outcomes" and "patients." An inclusion criterion was that the study had to include an IPE intervention with described results, not an assessment of readiness for IPE, or a description of facilitators and barriers with implementation of IPE. The publication date range was not limited. Seven studies are synthesized below.

Study designs varied among these seven studies. One was qualitative (Anderson & Thorpe, 2009); four were quantitative (Hutchison, 2014; Parker et al., 2016; Shiyanbola et al., 2014; Virtue et al., 2018); and two were mixed methods (Nagelkerk et al., 2018; Umland et al., 2016). Sample sizes varied; some studies collected data on students and patients, while some collected data on patients only. Of the studies that collected only patient data, those sample sizes ranged from 25-250 (Hutchison, 2014; Nagelkerk et al., 2018; Parker et al., 2016; Umland et al., 2016; Virtue et al., 2018). Psychometric data were provided for some measures (Shiyanbola et al., 2014; Nagelkerk et al., 2018) and not others (Shiyanbola et al., 2014; Umland et al., 2016). Five of the studies provided clinical patient outcome data that showed improvement after patients

received an IPE intervention (Hutchison, 2014; Nagelkerk et al., 2018; Parker et al., 2016; Shiyanbola et al., 2014; Virtue et al., 2018). Other patient outcome data were qualitative and related more to their experience of care (Anderson & Thorpe, 2014; Umland et al., 2016).

IPE and Nursing

While it is difficult to tease out the exact trajectory of specifically nursing and IPE, a recent systematic review captured the state of IPE research in the nursing profession (Rutherford-Hemming & Lioce, 2018). This review synthesized the research in 49 articles. Thirty-one of the studies were quantitative, 13 were qualitative, and 4 were reviews (Rutherford-Hemming & Lioce, 2018). Six of the studies utilized robust study designs, including one randomized controlled trial (Czamecki, Kloostra, Boynton, & Inglehart, 2014; McCaffrey, Tappen, Lichstein, & Friedland, 2013; Scherer, Myers, O'Connor, & Haskins, 2013; Wang, Shi, Bai, Zheng, & Zhao, 2015; Watters et al., 2015; Williams, Lewis, Boyle, & Brown, 2011). Pre-licensure and graduate nursing students, as well as students from other professions were included in the samples. IPE teaching methods, or interventions, included simulation, use of standardized patients, role-play, lecture, and case study with group discussion (Rutherford-Hemming & Lioce, 2018). Outcomes focused on the students' reactions and student knowledge acquisition related to the IPE interventions. None of the students examined outcomes related to patients (Rutherford-Hemming & Lioce, 2018).

Innovative Interprofessional Approaches to Reduce Readmissions and ED Visits

While "hotspotting" is an emerging term in the current health care climate, strategies that follow the same model as hotspotting have been in existence for years. This even includes models utilizing IPE as a vehicle to implement hotspotting strategies. Seymour and Cannon (2010) examined patient outcomes after health professions students (n=7) visited patients at risk for high-utilization of the health care system. The project was entitled the Healthy Elder Living Program (HELP). The assumption behind the project was that focused, individual visits with the at-risk older adults would improve their health outcomes, while providing students with an opportunity for interprofessional collaboration and experiential service learning. The students, referred to as student health advocates (SHA), used a tool called the Health Promotions Inventory (HPI) at each home visit, which occurred bimonthly for six months. The tool allowed data collection about current health status, including social support, nutrition, physical function, and depression. Goals would then be established based on the data obtained from the HPI (Seymour & Cannon, 2010).

In this same study, qualitative data about the student perspective were obtained and analyzed (Seymour & Cannon, 2010). Themes that emerged included increased interpersonal communication skills with older adults, enhanced understanding of the health care delivery system and ability to problem-solve, and a greater appreciation of the impact of the social determinants of health on the ability of patients to navigate the health care system and on patient outcomes. Patient outcomes were also impacted by the student home visits. Tools used to assess outcomes included the Physical Performance Test

(PPT), the Geriatric Depression Scale (GDS), the Lubben Social Network Scale, and the Mini Nutritional Assessment. Scores were improved significantly on the PPT and the GDS scales ($p < 0.000$; $p < 0.010$). There was a positive trend in scores on the other two scales, but no significant change noted. Readmission rates were also examined for these patients. These rates were related to comorbidities. For example, patients with chronic obstructive pulmonary disease and depression had the most readmissions. The authors did not report readmission rates before the home visits intervention, thus the impact of the home visits on readmission rates was not clear. The authors reported there was not a significant reduction in readmissions but actual percentages were not reported (Seymour & Cannon, 2010).

Rock et al. (2014) conducted a prospective evaluation of 330 homes that were randomly assigned to a control group or an intervention group. The intervention group received four home visits in one year from an interprofessional (medicine, nursing, and social work) student team. During the home visits, the student teams provided health education based on a needs assessment. Families were assessed for social, environmental, and physical needs. Referrals were made as needed. Each home was surveyed at the onset of the study and again at one year. The purpose of this study was to ascertain whether the home visits improved utilization of preventative health services by the participating homes. These services were defined in accordance with the Centers for Disease Control and Prevention guidelines (physicals, monitoring of blood pressure, and various health screenings). Secondary outcomes examined included use of the emergency department for routine health care and improved health literacy. Results showed an increased

likelihood in the intervention group for adherence to preventative health services. Emergency department visits had decreased in frequency for both the intervention and the control group, but with a trend of even fewer visits for the intervention group. The same results were true for health literacy—it improved in both groups, but without statistical significance (Rock et al., 2014).

Wros, Mathews, and Voss (2015) examined the impact of student team (pharmacy, medicine, nursing, and dentistry) home visits on the Institute for Healthcare Improvement's Triple Aim goal of improving individual and population health outcomes and reduce health care costs. The home visits were a part of the Interprofessional Care Access Network (I-CAN), which is an academic-practice partnership that incorporates service learning into health professions students' curriculum. Under the supervision of nursing faculty, student teams performed home visits on patients to assess the impact of the patients' social determinants of health on their ability to access health care and meet their personal goals for health. Partner organizations identified patients who met criteria for home visits. Criteria included unstable housing, lack of health insurance, chronic disease, multiple medications, overuse of the ED and emergency medical services (EMS), missed appointments, and lack of access to health resources. Nursing faculty contacted the patients for consent. Patient visits occur in the patients' homes about half the time; visits also occur at public community centers. The students performed assessments and set goals with the patients, as well as linked them with community resources. The visits averaged 80 minutes in length; after twelve visits, the patients were reassessed to determine if the visits need to continue (Wros, Mathews, & Voss, 2015).

To present findings from their work, the authors of this same study utilized a qualitative, case-study approach (Wros, Mathews, & Voss, 2015). Two case studies were presented in the article. The first case study was about a patient who had a history of frequently calling EMS, missed primary care appointments, ED visits for anxiety, polypharmacy, diagnosis of insulin-dependent diabetes and heart failure, and was dependent on oxygen. The student teams visited this man weekly for two 10-week school terms. They posted signs in his home reminding him to wear his oxygen, developed a calendar for better medication management, and facilitated the patient receiving a non-rebreather mask that he could use for exacerbation of anxiety related to shortness of breath. For one of the patients, there was a marked decrease in EMS calls and fewer missed appointments with his primary care provider. The patient also expressed increased satisfaction with his health care in general (Wros, Mathews, & Voss, 2015).

Continuing with this same study, the second case study presented was about a 60-year-old homeless man who did not have a primary care provider and slept outside most nights (Wros, Mathews, & Voss, 2015). Health-wise, he had blurred vision, peripheral edema, and had not been able to brush his teeth in three months. The students met weekly with this patient at a local community service agency. The students assisted the patient in getting temporary housing and applying for an identification card to eventually obtain permanent housing. It took six months for the permanent housing to be established, and then the patient was eligible for much-needed cataract surgery. While waiting for permanent housing, the nursing students educated the patient and his neighbor about how to administer eye drops in the meantime. Other patient outcomes were not specifically

described in the article; however, the impact of the student visits is easy to determine from the qualitative data included in both case studies. The primary foci of the student home visits were housing, access to care and food, transportation, health insurance, medication management, and health literacy (Wros, Mathews, & Voss, 2015).

O'Neal, Frame, and Triplett (2016) conducted a study examining the impact of pharmacy students' involvement in home visits with members of an established health care team, including practicing nurses. This collaboration was considered an academic-practice partnership. Pharmacy students began their work by conducting an analysis of prospective patients' medication lists. This analysis occurred at the home health agency prior to the home visit. The pharmacy students look at the patients' past medical history and any current medical conditions. Patient-level criteria for the pharmacy student to perform a home visit include being on more than ten medications, having a new diagnosis or chronic condition such as diabetes, heart failure, COPD, and being prescribed a medication that is not familiar to the home health agency health care team. The home visit is performed by the pharmacy student in conjunction with oversight from a home health care agency staff member, usually a nurse. The student reviews all of the patients' medications, determining if the patient is taking all of the medications listed in his or her profile, inquiries about any adverse drug events, assesses any barriers to the patients' taking the medications, and provides patient education about the medication regimen. The student provides the preceptor with documentation about the visit, and any recommendations based on visit findings. From 2012-2015, 600 patients had in-home medication reviews by pharmacy students. An electronic database captured data over an

8-month period and calculated a monthly savings of $7800 due to the students' visits. Although pharmacy was the only health profession represented in the student capacity, interprofessional collaboration occurred between the pharmacy student and other members of the home health agency's health care team, including nurses and physical therapists. Another patient outcome related to the student pharmacists' home visits was increased satisfaction with understanding their medication regimen. The patients noted that they are more receptive to the medication review once at home and not being rushed to be discharged from the hospital. No quantitative data were provided to support the increase in patient satisfaction (O'Neal, Frame, & Triplett, 2016).

Schuttner, Zhang, and Kuo (2017) implemented a pilot program in which super-utilizers of the health care system received interprofessional care at an ambulatory care clinic. Patients who had at least two emergency department (ED) visits within the previous twelve months and at least one chronic medical condition met inclusion criteria. Patients who consented to participate in the pilot received a comprehensive assessment from multiple health care professionals. Nutrition, pharmacy, behavioral health, and care coordination were represented professions, in addition to the patients' regular health care providers. Patients (n=66) received care from their health care team over a period of nearly two years. Results showed a monthly decrease of all-cause ED visits by 12%. A statistically significant decrease was noted in hospital readmissions as well (Schutter, Zhang, & Kuo, 2017).

Bronsky et al. (2017) evaluated a community program entitled CARES (Community Assistance Referral and Education Services). This program was created to

identify super-utilizers of the health care system through community partnerships with local organizations. Over a 90-day time frame, super-utilizers are assisted by fire department personnel, behavioral health professionals, registered nurses, social workers, and medical assistants. Referring partners include the local fire department, an acute care hospital, a behavioral health care facility, and a collaborative care organization. Once a referral is received, a team of two of the previously mentioned professionals contact the patient to set up the home visit. The initial visit includes a safety assessment, medication history, identification of any barriers to accessing health care, and goal setting. There is follow up from a nurse navigator after the initial intake of information from the patient. There is also collaboration across agencies where the patient may receive health care services. If the intake team or navigators think a patient needs additional behavioral health or substance use services, a behavioral health navigator will follow up with the patient. Results from the model were promising. There were statistically significant ($p<0.001$) decreases in the number of 9-1-1 calls, ED visits, and readmission rates for the super-utilizers. The authors projected that this model prevented 331 9-1-1 calls per month, 144 ED visits per month, and 52 hospital readmissions per month (Bronsky et al., 2017).

Conceptual Framework

Use of the Interprofessional Learning Continuum Framework in Current Research

Noting that the inception of the IPLC framework was 2015, two studies referencing this model have been published. Ploeg et al. (2017) conducted a qualitative descriptive study examining the perceptions of IPE experts about the current state of IPE

in home health and community care of older adults. The authors used the IPLC framework as an "interpretive lens" in their qualitative study (p. 639). The sample size was 32 experts (educators, administrators, practitioners, and researchers). Semi-structured interviews were used. The interview guide contained questions about the definition of IPE, IPE models, current gaps in IPE research, IPE facilitators for health care professionals caring for older adults in their homes and communities, and suggestions to enhance IPE in home and community settings. Data were analyzed for common themes (Ploeg et al., 2017).

Six themes were identified through data analysis (Ploeg et al., 2017). The first theme discussed was "client and family-centered care at the core of IPE" (p. 641). The participants reported that a key gap in IPE is the lack of engagement with families and patients. Particularly with older adults, families are integral to care. Health care professionals can be educated by the older adults and their families—these experiences provide rich learning opportunities about different perspectives. Some participants noted that the term "interprofessional education" should potentially be changed because it does not denote patient and family-centered care. "Collaborative education" was a suggested replacement term (Ploeg et al., 2017).

The second theme uncovered by the study was "the community as a unique learning setting across the learning continuum" (Ploeg et al., 2017, p. 641). Participants strongly expressed concerns that IPE is currently heavily focused on acute care settings. They recommended IPE to occur across the continuum of learning, from students to practicing health care professionals (Ploeg et al., 2017).

The third theme was entitled “aging-relevant IPE curriculum” (Ploeg et al., 2017, p. 642). Many participants identified a lack of information in health professions’ education about older adults. More content related to multiple chronic conditions and the complexity these bring to older adults in their home and communities. Care transitions stood out as part of this theme. Health care professionals need much more education about how to make these transitions smoother for the older adult in particular. The need to also address social determinants of health in the context of what older adults face was a key point made by participants (Ploeg et al., 2017).

The fourth theme identified was “faculty commitment and resources for IPE” (Ploeg et al., 2017, p. 643). Faculty development in the care of older adults in their homes and communities is needed. Resources must be allocated so that leading expert providers in geriatrics will be able to serve as faculty or preceptors in community-based IPE learning experiences (Ploeg et al., 2017).

The fifth theme was “technological innovation to support IPE” and the sixth theme was “comprehensive IPE programme evaluation and research” (Ploeg et al., 2017, p. 643). Participants noted that robust information technology platforms are critical to caring for patients in community settings, as providers are often at different locations. Comprehensive IPE program evaluation and research are needed in the care of older adults and community-based care (Ploeg et al., 2017).

In the discussion of findings, the authors used the IPLC as a framework. The authors noted that the IPLC does not explicitly address the context of community care, or that patients and their families are critical members of the health care team (Ploeg et al.,

2017). The report from the National Academy of Sciences (2015) recognizes the critical role played by patients and families, although it is not obviously depicted in the framework.

The study findings support the learning continuum concept of the IPLC and offer ways in which the concept can be further enhanced (Ploeg et al., 2017). The authors recommend including the community as a unique learning environment across the continuum from formal to informal education. The report from the National Academy of Sciences references community-based learning in a very limited manner (2015).

Also supported by the study findings is that IPE must be more inclusive of other workers. In home care and community settings, there is a range of caregivers, from health care professionals to community and social support personnel. The National Academy of Sciences' report points out that the IPLC framework has room for adaptation to include personnel beyond just health care professionals (Ploeg et al., 2017)

The IPLC framework depicts population health outcomes as part of the framework (National Academy of Sciences, 2015). This aligns with the Ploeg et al. (2017) study. Participants identified older adults as a target population for increased and enhanced IPE interventions. Finally, two enabling factors of IPE were identified in the study. Commitment of faculty and resources, as well as increased utilization of information technology in the care of community-based older adults are the two factors (Ploeg et al., 2017). In the IPLC framework, enabling or interfering factors are shown as one of the four major concepts. Professional culture, workplace culture, workforce policy, and financing policy are included under this concept. Ploeg et al. (2017) felt that

commitment of faculty and resources are addressed, but that information technology is not adequately addressed in the IPLC framework. The authors concluded that, overall, the IPLC framework is useful and can be used for future work in IPE, particularly in the home and community care settings (Ploeg et al., 2017).

Zierler, Blakeney, O'Brien, and IPCP Heart Failure Teams (2018) published a paper that describes a recently funded grant aimed at incorporating IPE into the work of a heart failure readmission prevention team. The paper provides an overview of upcoming work related to the grant. Because heart failure is the leading cause of hospital readmissions, the research team will target this outcome with their interventions (Avery et al., 2012; Zierler et al., 2018).

The Interprofessional Learning Continuum is one of several guiding conceptual frameworks for this team's work (Zierler et al., 2018). The team plans to use the 'learning continuum' concept and the 'enabling and interfering factors' concept in their work. They aim to identify the level of learners taking part in their interventions, as well as determining whether formal or informal learning is occurring. The IPLC model depicts learners at all levels, from foundational to continuing education. This project includes health care professionals at the graduate and continuing educational levels. For the 'enabling and interfering factors' concept, they plan to discern factors that enable or interfere with their planned interventions to improve interprofessional communication and collaboration on acute-care heart failure units (Zierler et la., 2018).

Summary

Hotspotting has been implemented in health care organization-community partnerships (Cutts et al., 2014; Holzer et al., 2014), as well as academic-practice partnerships (Jones et al., 2018; Zomorodi et al., 2018). There is an impetus for change for all health care professionals to be required to understand how SDOH affect the health outcomes of patients (National Academies of Science, 2016). Health professions schools have been charged with including both IPE and education about SDOH in their respective curricula (National Academy of Sciences, 2016). Outcomes of hotspotting have shown some positive results, such as improved knowledge, skills, and attitudes of health professions' students, as well as some improved patient outcomes, such as decreased hospital readmission rates (Jones et al., 2018).

Super-utilizers of the health care system are medically complicated, psychologically fragile, and are at high risk for negative health outcomes (Mercer et al., 2015). These patients contribute disproportionate to health care costs and have many hospital admissions and readmissions (Dattalo, Nothelle, & Chapman, 2016). Interventions to improve outcomes and decrease costs for this group have centered around incorporating an interprofessional team approach to care, activated community partners, and engaged the super-utilizers in their individualized plans of care. Interventions have produced primarily positive results. Due to the complex nature of the health care needs of this group, it has been difficult to generalize successful interventions across all groups. Interprofessional education is a useful vehicle through which the care of super-utilizers can be delivered. It is an educational strategy that is now on the

forefront of health professions education. There have been many interprofessional approaches to reducing hospital readmissions and decreasing costs. Research has found that single-component interventions are less effective at reducing hospital readmissions than multifaceted approaches (Kripalani et al., 2014). The IPLC theoretical framework is new and as such has not been used very much in research. Utilizing this framework for this study will contribute to the knowledge base about its usefulness and applicability to IPE research.

Gaps in the Literature

A review of the hotspotting literature reveals a lack of formal research in general, including lack of robust study designs and small sample sizes. Published papers about hotspotting have tended to be more at the program evaluation level, or a review of how a hotspotting model was implemented. There is some evidence of improved patient outcomes due to hotspotting, but more research is needed to provide support for the effectiveness of hotspotting (Dattalo, Nothelle, & Chapman, 2016). Research has shown that super-utilizers have multiple, complex health issues that cannot be addressed by any one health profession (Kripalani et al., 2014). There is room to build upon interventions that have been successful in reducing hospital readmissions, and explore new care delivery methods to improve care for this patient population.

There is limited research that demonstrates a clear impact of IPE on health care outcomes (Reeves et al., 2017; Rutherford-Hemming & Lioce, 2018). National IPE experts are calling for more robust studies involving IPE, including more rigorous study designs with accompanying research questions (Lutfiyya, et al., 2015). Incorporating how

IPE addresses the Triple Aim into research studies is another recommendation brought forth by the experts (Brandt et al., 2014). Another gap in IPE research is that a consistent theoretical framework has not been used (National Academy of Science, 2015). This study aimed to address these identified gaps.

CHAPTER III

METHODS

Introduction

Interprofessional education is not a new concept. In 1972, the Institute of Medicine (IOM), at its first conference, recommended that interdisciplinary education should be required at administrative and teaching levels (Brandt, 2015). In 1975, the phrase "interprofessional teamwork" was first used in the United States in a report with the same title, issued by the University of Syracuse's School of Social Work. The Center for the Advancement of Interprofessional Education (CAIPE) was created in 1987 in the United Kingdom. This group first defined interprofessional education. The World Health Organization adapted this definition in 2010. The WHO definition is the one most commonly referenced today (Brandt, 2015).

By 2010, the state of health care was being evaluated in terms of how far it had come in light of previous IOM reports (Brandt, 2015). Improvements were still not taking hold as they should, with health care errors, communication, and quality issues still lingering. The Interprofessional Education Collaborative (IPEC), consisting of experts from multiple health care professions, issued a report outlining four core interprofessional competencies, which are values/ethics, roles/responsibilities, teams/teamwork, and interprofessional communication (IPEC, 2016). This report was most recently updated in 2016. The work of IPEC spurred many health professions schools to include IPE as part

of their accreditation standards. Now, there are increased funding opportunities for IPE work, as well as a national repository for IPE resources, called the National Center for Interprofessional Practice and Education, referred to at the Nexus (Brandt, 2015).

The current climate in academia is now more favorable for implementing IPE initiatives. As previously described, IPE has been linked to improved knowledge, skills, and attitudes of health professions students (Reeves et al., 2016).

Hospital readmissions remain a serious quality and cost concern in health care. In 2011, the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project estimated that there were 3.3 million adult 30-day all hospital readmissions in the United States, resulting in $41.3 billion in hospital costs (Hines, Barrett, Jiang, & Steiner, 2014). Causes of hospital readmissions are complex. Some are related to a lack of care coordination and inadequate discharge planning. Readmission risk is also impacted by environmental, community, and patient-related factors, including social determinants of health (National Quality Forum, 2017). Like hospital readmissions, ED visits are a concern for super-utilizers of the health care system (Moe et al., 2017). Emergency departments cost the United States health care system approximately $328 billion annually (Galarraga & Pines, 2016). Reducing readmissions and ED visits would have an impact on health care cost savings (Galarraga & Pines, 2016; Moe et al., 2017).

A gap in the literature points to increasing the knowledge base about the impact of IPE on patient outcomes. Hospital readmissions and emergency department visits are important patient outcomes to address. Given this, the study described below aims to address this gap.

Purpose

The purpose of this quasi-experimental retrospective study was to gain a better understanding of the relationship between interprofessional student-team home visits and 30-day hospital readmission rates and emergency department visits of selected super-utilizers. This chapter describes the methodology of the research and includes the study design, setting, and the sample description.

Research Questions/Hypothesis

For this retrospective, quasi-experimental study, the research questions and hypotheses were:

1. **Research Question:** What are the first-time 30-day hospital readmission rates for super-utilizers receiving interprofessional student teams' home visits in one home health agency?
2. **Research Question**: What is the number of emergency department visits for super-utilizers receiving interprofessional student teams' home visits in one home health agency?
3. **Research Question:** Is there a relationship between the number of home visits performed by interprofessional student teams and 30-day hospital readmission rates?
4. **Research Question:** Is there a relationship between the number of home visits performed by interprofessional student teams and the number of emergency department visits?

5. **Hypothesis:** Super-utilizers who receive home visits by interprofessional student teams will have fewer hospital readmissions than super-utilizers who do not receive home visits by interprofessional student teams.
6. **Hypothesis:** Super-utilizers who receive home visits by interprofessional student teams will have fewer emergency department visits than super-utilizers who do not receive home visits by interprofessional student teams.

Parent Study

This study was part of a larger study being conducted at the University of North Carolina at Chapel Hill. The purpose of the parent study is to test a model of hotspotting in home health care. The principal investigator on the parent study is Dr. Meg Zomorodi, Assistant Provost of Interprofessional Education and Practice at UNC-Chapel Hill. This study began in 2017 and is funded through both the Rural Interprofessional Health Initiative (RIPHI) program at UNC-Chapel Hill and an Area Health Education Center (AHEC) Campus Innovation Grant. The AHEC funding ended in summer 2018 and the RIPHI funding has been secured through 2020. The primary goal of the RIPHI is to infuse IPE into rural care settings. There are multiple rural, clinical sites involved in the RIPHI work, one of which is the home health care agency included in this study.

There have been different iterations of hotspotting during the course of the parent study. The first iteration was to tweak the hotspotting process to maximize its impact on patient outcomes. In this initial process development in fall 2017, interprofessional student teams participated in “ride-alongs” with the home health agency’s personnel. At those home visits, the students traveled with the agency’s personnel to patient homes and

observed the interactions between the patients and the agency's staff. Follow up appointments were made with patients who consented to be visited by the interprofessional student teams. Patient outcomes were not yet addressed with this iteration. The key outcome at the stage was the refinement of the hotspotting process (Zomorodi et al., 2018).

A second iteration of hotspotting in home health occurred in spring of 2018. Interprofessional (nursing, occupational therapy, and pharmacy) students conducted home visits to super-utilizers. During this semester, students worked on improving a tool designed by the home health agency aimed at gathering more information from patients about their social determinants of health (SDOH). Members of the leadership team at the agency wanted to determine if the newly designed tool served as a better predictor of readmissions than the Care Transitions Measure (CTM)-15 tool. Three students (one nursing, one pharmacy, and one occupational therapy) participated in the home visits. The conclusion of this work was that neither tool accurately captured patient risk factors (Miller, Robinson, Eyster, & Kahlid, 2018).

The third iteration of hotspotting in home health is the current piece of the study being conducted and is the focus of this dissertation. This iteration is described below.

Setting and Sample

The setting for this study was part of the home health agency's catchment area in central North Carolina. The home care agency serves numerous counties in North Carolina, providing home health and personal care services to patients. The average daily census for the agency is 1600 patients (D. Thompson, personal communication, April 17,

2018). In this retrospective quasi-experimental study, participants were patients in the care of this home health agency during a seven-month period of time. Length of stay in the care of the home health agency varied among the participants. Participants in the intervention group were selected based on their score of "L4" on the LACE readmission risk scoring tool (Walraven et al., 2010). They were contacted via phone by the parent study's project coordinator to obtain permission for teams of interprofessional students to come to the patients' homes for home visits. Once receiving permission, the project coordinator scheduled the visits. Participants in the control group were selected based on matching as closely as possible to the characteristics of the intervention group, particularly matching on age and gender when possible. All participants in the control group also received a score of "L4" on the LACE readmission risk scoring tool. The sample size of the group receiving the intervention was 20. The sample size of the control group was also 20, equaling a total of 40 participants.

Study Population

Convenience sampling was used in this study. Participants met the criteria of super-utilizers and were assigned a score of L4 on the LACE readmission risk assessment tool (described below) to be considered for a hotspotting home visit. Inclusion criteria include patients who were:

1. Age 18 years of age or older
2. English-speaking
3. Living in Wake, Durham, Orange, or Chatham counties
4. Classified as super-utilizers (Harris et al., 2016)

a. Three or more hospitalizations or two or more hospitalizations and

b. Two or more emergency department visits in a 6-month period

5. Diagnosed with a chronic condition, such as Type II diabetes, congestive heart failure, coronary artery disease, or chronic obstructive pulmonary disease (COPD)
6. Scored on LACE tool of L4
7. Able to provide informed consent to participation in hotspotting visits

Exclusion criterion include patients who:

1. Did not speak English
2. Lived outside Wake, Durham, Orange, and Chatham counties
3. Had not had an admission, or intake, visit from the study health agency personnel

Power Analysis and Sample Size

A priori power analysis showed that to achieve a power of 0.80 with a level of significance of $p<0.05$ (α), and a medium effect size, a sample size of 21 for the group receiving the hotspotting intervention was required. The same sample size was needed for the control group.

The Intervention

Patient Recruitment

An agency liaison identified the patients who met criteria for being super-utilizers through examination of the electronic health record. During part of the usual care of patients (described below), a readmission risk tool, called the LACE, was used. The data were scored and the patients then fell into levels of risk for readmission—Levels 1-4,

with 4 being the highest risk for readmission. Patients who met criteria for hotspotting (Levels 3 and 4) were contacted by the graduate nursing student, referred to as the project coordinator (PC), and assigned to patient recruitment. This PC has been working with the PI (Dr. Zomorodi) through all iterations of the parent study. This PC received a list of patients through secure email. This PC was familiar with the patient recruitment process, as she recruited patients during spring semester, 2018. The PC was trained by the Principal Investigator of the parent study, along with agency staff. The PC completed clinical compliance requirements for the agency. The PC-contacted patients by phone and obtained consent from the patient to receive home visits from student teams. Once a patient consented to the visit, the patient was contacted by a member of the interprofessional team to schedule the visit. In some instances, the PC scheduled the home visit on the same phone call that patient consent was obtained to decrease the number of phone calls going to the patients.

Usual Care from Home Health Agency

Patients who met criteria for hotspotting received usual care from agency personnel. Usual care for patients at “high” and “highest” risk for readmissions for the home health agency included the following: Patients at “high” risk received 7-9 visits from the nurse navigator and 5-6 visits from the transitional care specialist. These visits occurred over variable periods of time. For Medicare patients, each home health admission was certified for 60 days. Patients may be discharged prior to the 60-day window. Patients at “highest” risk receive 10-12 visits by the nurse navigator and 5-6 visits by the transitional care specialist. All patients receive a phone call at start of care

(SOC) from the nurse navigator, one routine call during care from the nurse navigator, and one discharge (DC) call from the nurse navigator (R. Kipple, personal communication, April 17, 2018). Patients receiving usual care may also receive other services based on patient needs. These services include social work, skilled nursing, occupational therapy, and physical therapy. In addition to usual care, the patients who consented to hotspotting received at least one hotspotting visit during the time they were in the care of the agency. Patients who received hotspotting visits were followed for at least 30-days, beginning with date of hospital discharge, to determine if a 30-day readmission had occurred. The average length of stay for all patients of the home health agency is 43.9 days (R. Kipple, personal communication, July 15, 2018).

LACE instrument. The LACE instrument was developed by Walraven et al. (2010) because the researchers recognized the need for a practical tool that could be used to assess readmission risk. They wanted to provide patients who were at higher risk for readmission with more comprehensive post-discharge care. The "L" represents length of stay; "A" represents acuity of the admission, "C" represents comorbidities, and "E" represents emergency department use (Walraven et al., 2010). Refer to Appendix A.

Walraven et al. (2010) designed a prospective cohort study when they developed the LACE tool. They collected 48 patient-level and admission-level data for 4,812 medical and surgical patients who were discharged from eleven hospitals in Ontario, Canada. For this group of patients, further data were collected if any of the patients were readmitted to the hospital within 30 days of discharge. Variables that were determined to be predictors of readmission included length of stay, acuity, comorbidities, and ED

utilization, hence the acronym LACE. They found the LACE to be discriminative and accurate at predicting readmission risk (Walraven et al., 2010).

The LACE tool has been primarily used in hospital settings. Most reviewed studies used a retrospective cohort design to examine hospital readmission data to determine if the LACE was predictive of 30-day readmissions (Damery & Combes, 2017; Robinson & Hudali, 2017; Spiva, Hand, VanBrackle, & McVay, 2015). The LACE performance was mixed. Some studies found that the LACE had good discriminatory power, but failed to outperform other tools, such as the HOSPITAL readmission risk scoring tool, at predicting readmissions (Damery & Combes, 2017; Robinson & Hudali, 2017). Spiva, Hand, VanBrackle, and McVay (2015) found the LACE to be more effective as a tool for identifying patients at risk for readmission.

Student Training/Intervention Fidelity

Interprofessional teams (in groups of at least two differing professions) composed of either medical, nursing, pharmacy, public health, and occupational therapy students made home visits to patients classified as super-utilizers receiving care from the agency. The students were recruited through emails and flyers distributed by the Office for Interprofessional Education and Practice (OIPEP) at UNC-Chapel Hill. Students were instructed to contact this office indicating their interest. This was a voluntary endeavor by the students. The students were at the undergraduate and graduate levels. Once self-selected, the students were informed about an orientation date and time. The orientation was recorded for students who were not able to appear in person.

Orientation was two-fold. Students were enrolled in a Sakai® site related to this hotspotting project and students either attended a face-to-face orientation session, or listened to the recorded session. Sakai® is the password-protected educational software platform at the university where this study is being conducted. In the Sakai® site, the students had access to and completed an online training module about hotspotting and expectations for their home visits. The students were oriented to the Sakai® site by the principal investigator, nurse researcher, and other support staff from the OIPEP during this face-to-face orientation session. The students also participated in role play and practiced conducting home visits using the structured interview guide provided by the OIPEP office. Orientation also included practice logging into laptops provided by the agency for read-only student use.

Prior to participating in the actual home visits, students completed the online training module and attended the face-to-face orientation or listened to the recorded version. Proof of training was obtained from the Sakai® site, as students submitted a post-module questionnaire upon completion. Using a standardized orientation for all students involved supported intervention fidelity for this study.

IPE curriculum during orientation. Interprofessional education occurs when students from at least two professions learn from, with, and about each other (WHO, 2010). During the orientation process, interprofessional students introduced themselves and participated in icebreaker activities. Students described their professions and the role their profession plays in patient care. After watching a case study example of a home

visit, students were asked to react to the scenario in terms of how their profession could contribute to the patient depicted in the case study. Other components of the orientation curriculum including watching an online module about hotspotting, its history, goals of hotspotting, social determinants of health, patient engagement, motivational interviewing, how to conduct an interprofessional home visit, writing SBAR notes, and other safety procedures to be aware of while home visits are being conducted.

IPE during visits and debriefings. IPE occurred while home visits were conducted and during the debriefing sessions. Prior to the home visit, the student team huddled and collaborated about priorities related to information noted in patients' health records. Some patients had goals that were set with home health personnel, while others set goals with the assistance of the student teams. Post-visit, the students collaborated on the completion of an SBAR (Situation-Background-Assessment-Recommendation) note about their visit. If the patient received a subsequent visit, the same students would again work together to update goal tracking information and add any new goals determined by the patient.

Faculty from the students' respective schools facilitated debriefings about the patient visits. Students collaborated on their own time prior to debriefings to formulate a team report of the home visits. This report was shared during debriefing sessions. Faculty assisted students in troubleshooting any concerns about patients and offered suggestions about how to connect patients with additional resources. Personnel from the home health agency were called in to the debriefing sessions when possible.

Student visits/intervention. Once the patient consented to receiving a home visit, the PC notified the interprofessional team who conducted the visit. The students had previously provided the PC with their availability and contact information during the orientation process. The coordinator sent patient information through a secure message from the password-protected Sakai® site. The coordinator obtained patient initials, medical record number, diagnoses, and reason for home health care with patient goals if available. The interprofessional team reviewed the patient's chart through use of laptops provided by the agency. Students were given log-ins with passwords to access (read-only) the agency's electronic health record (EHR).

During the patient visit, the students utilized a structured interview guide and a decision-making framework with the patient to assist with goal-setting. The structured interview guide is provided in Appendix B. This interview guide has been used nationally in hotspotting endeavors (Association of American Medical Colleges, n. d.). The intent of the guide is to establish rapport with the patient. The decision-making framework is an evidence-based tool (Appendix C) designed by researchers at the University of Ottawa (Jacobsen & O'Connor, 2006). Students assisted in setting short-term and long-term goals with the patient, or followed up on goals previously set with agency personnel. Upon completion of the initial visit, the patients were asked if they would be open to future visits. The students set up some visits at that time, or proceeded with a follow up phone call within approximately one week of the first visit.

Subsequent visits followed a similar format. The students utilized the structured interview guide as needed to further establish rapport with the patient. Goals set at the

first visit were revisited through a patient-centered discussion about any barriers patients had encountered in working on or reaching their goals. Goals were sometimes met, or modified, according to the patient's needs or desires. After each visit, students documented their visit in Situation, Background, Assessment, Recommendation (SBAR) format and submit in a folder on the password-protected Sakai® site. The coordinator reviewed all documentation and communicated with the agency about any urgent patient needs, as well as patient progress with goal achievement.

Debriefing. Students participated in bi-weekly debriefings about hotspotting. Debriefings were scheduled at mutually agreed upon times. Students presented their patient cases in the debriefing. The debriefings were led by the faculty. Personnel from the agency attended the debriefing by conference call when possible. The students reflected on their learning experience in an interprofessional team. The research team and faculty facilitated the debriefing and provided constructive feedback about any patient-related issues. Refer to Appendix D for an overview of the steps in the hotspotting process.

Data Collection

The PC of the hotspotting initiative collected data about the intervention and control groups from the agency's EHR. The PC is a graduate nursing student who has been working with the PI (Dr. Zomorodi) through the different iterations of the parent study. The PC also participated in the majority of the student-team home visits, as the one of the members of the interprofessional student team. Data were entered into an Excel® spreadsheet. All data were deidentified and provided to this nurse researcher for analysis.

These data included age, gender, ethnicity, diagnoses and/or comorbidities, date of discharge from the hospital, number of hotspotting visits, which professions completed the home visits, number of 30-day readmissions, reasons for readmissions, number of emergency department visits, and patient goals. To address the study's hypotheses, the same data were collected for a group of patients in the agency's database who also met study criteria but did not receive the interprofessional student home visits. These patients were a convenience sample selected from the patient list generated by the agency's liaison. This list typically contained information about many patients who have the L4 scores. Patient demographic information, such as age and gender, and health histories were matched as closely as possible to those patients receiving the hotspotting intervention.

Protection of Study Participants

This study was part of a larger grant-funded study (RIPHI) to infuse the work of interprofessional students into rural areas to improve patient outcomes. The oversight of the larger study is the responsibility of the Assistant Provost for Interprofessional Education and Practice at UNC-Chapel Hill. This work has been approved by the Institutional Review Board (IRB) at this facility. This nurse researcher obtained IRB approval from her home university (University of North Carolina at Greensboro), ensuring the protection of study participants. This nurse researcher has completed the Collaborative Institutional Training Initiative (CITI). A business associate contract between the study home health agency and the university conducting the parent study is current and on file with the nursing school at this university. This contract allows for

authorized persons to have access to patient information, including protected health information in conjunction with authorized activities being completed by the business associate, who in this case is UNC-Chapel Hill School of Nursing. The study agency has authorized the hotspotting work and was aware of the nature of the patient data being collected for the parent study, as well as this dissertation study.

The study agency supplied students with password-protected laptops. These laptops gave students read-only access to the agency's EHR. SBAR notes were stored on the password-protected UNC-Chapel Hill Sakai® site for the hotspotting initiative. Only patient initials were used in the SBAR notes stored on Sakai. No identifying information (patient names, phone numbers, or addresses) was stored with the SBAR notes. The purpose of the SBAR notes is for the research team to have a point of reference when conducting debriefings with students about their home visits during the scheduled debriefings. The de-identified data were stored on a password-protected laptop, which has been stored in a locked office. Students who participated in the study received reimbursement for mileage from the OIEP. Students provided their mileage to the administrative assistant of the OIEP in order to receive reimbursement. To protect information related to patient addresses, students submitted mileage information by providing an address that is geographically close to the patient's home.

Summary

As shown in the literature review, a gap in research that exists for IPE is that its impact on patient outcomes has not clearly been shown (Lutfiyya et al., 2015; Ploeg et al., 2017; Reeves et al., 2016). Researchers have recognized that IPE is difficult to

evaluate rigorously due to the complex nature of health care, from the varied environments to the multiple professions who intersect in these environments, whether at the student or licensed practitioner level (National Academy of Sciences, 2015; Reeves et al., 2016). Further focusing on the outcomes of older adults in home and community settings is also an area in IPE that needs more research focus (Ploeg et al., 2017).

Students in interprofessional teams completed home visits of patients who are super-utilizers of the health care system. The students utilized one structured interview guide to build rapport with patients and then assisted patients in setting goals according to their preferences. Information obtained through the home visits was shared with home health agency personnel for follow up as needed. The readmission rates and number of emergency department visits of the patients visited by student teams were examined to determine any relationship between IPE home visits, readmission rates, and emergency department visits.

CHAPTER IV

RESULTS

The purpose of this retrospective quasi-experimental study was to examine the impact of interprofessional students' home visits on readmissions and emergency department visits of super utilizers of the health care system. Data were collected for a parent study at the University of North Carolina at Chapel Hill by the project coordinator of that study. After the University of North Carolina at Greensboro's Institutional Review Board (IRB) approval for this study, the de-identified data were sent to the doctoral student researcher. Data collected included age, gender, ethnicity, diagnoses and/or comorbidities, date of discharge from the hospital, number of hotspotting visits, which professions completed the home visits, number of 30-day readmissions, reasons for readmissions, number of emergency department visits, and patient goals. The data were entered into the Statistical Package for the Social Sciences (SPSS), version 25, (IBM Corporation, Armonk, NY) and analyzed based on the study's research questions and the study design.

Management of the Data

Preliminary Examination of the Data

A post-hoc analysis to determine statistical power was conducted. Power was determined to be 0.7, based on a final sample size of 40, $\alpha = 0.05$, and a medium effect size. Descriptive statistics were obtained for all variables. Independent variables included

in the analysis were age, gender, ethnicity, number of student visits, and which professions performed the visits. Dependent variables included in the analysis were 30-Day readmissions and number of ED visits. Independent variables related to demographics were collected to characterize the participants. Frequencies and percentages were calculated for categorical variables. Measures of central tendency were computed for continuous variables. Because the one of the outcome variables, 30-day readmissions, was a categorical, dichotomous variable, nonparametric tests were warranted. Checking for normality was not appropriate given this type of dependent variable (Polit, 2010; Vogt, Vogt, Gardner, & Haeffele, 2014).

Sample Demographics

The results of the sample demographics are displayed in Table 1. The overall sample was 55% male and 45% female. The mean age for the entire sample was 73.15 years (SD=9.963; range 56-91 years). The intervention group was 55% male and 45% female and had a mean age of 73.25 years (SD=10.17; range 56-91 years). The control group was 55% male and 45% female, with a mean age of 73.05 years (SD=10.02; range 56-89 years). The ethnicities of the overall sample were 57.5% white, 37.5% African American, 2.5% Native American, and 2.5% Hispanic. Analysis of the intervention group's ethnicities revealed 55% white, 40% African American, 5% Native American. Ethnicities of the control group were 60% white, 35% African American, and 5% Hispanic.

Diagnoses and comorbidities of the participants included diagnoses of congestive heart failure (CHF), coronary artery disease (CAD), Type 2 diabetes, anxiety, asthma,

chronic obstructive pulmonary disease (COPD), atrial fibrillation, peripheral vascular disease, anemia, benign prostatic hypertrophy (BPH), deep vein thrombosis (DVT), hypertension, anemia, gastritis, liver disease, cardiomyopathy, and others. Reasons for readmissions for the intervention group included CHF exacerbation, abdominal pain, and shortness of breath. Reasons for readmission for the control group included CHF exacerbation, sepsis, acute respiratory failure, COPD exacerbation, shortness of breath, GI bleed, foot ulcer, hyperglycemia, and cellulitis. Reasons for emergency department visits were urinary retention and the other reason was not documented. Examples of patient goals for the intervention group were to improve strength, increase family involvement in their care, increase mobility, and increase ability to better perform activities of daily living such as vacuuming, cooking, and cleaning.

Table 1

Sample Demographics (N=40)

Demographics	**Intervention Group (*N*=20)**	**Control Group (*N*=20)**	**Total (*N*=40)**
Age (years)			
50-59	1 (5)	1 (5)	2 (5)
60-69	8 (40)	8 (40)	16 (40)
70-79	5 (25)	4 (20)	9 (22.5)
80-89	5 (25)	7 (35)	12 (30)
90-99	1 (5)	0	1(2.5)
Gender			
Male	11 (55)	11 (55)	22 (55)
Female	9 (45)	9 (45)	18 (45)
Ethnicity			
White	11 (55)	12 (60)	23 (57.5)
African American	8 (40)	7 (35)	15 (37.5)
Native American	1 (5)	0	1 (2.5)
Hispanic	0	1 (5)	1 (2.5)

Note: All numbers are presented as *N* (%).

Demographics of Interprofessional Student Teams

Twelve student participants who conducted the home visits included two pharmacy students, three public health students, three occupational therapy students, three nursing students (one graduate; two undergraduate), and one medical student. Student teams performed 32 visits total over approximately a seven-month period, during summer and fall semesters. Eight patients were visited by student teams during the summer semester and 12 patients were seen by students during the fall semester. Different groups of students participated during the summer and during the fall. The only student who performed home visits across both semesters was the graduate nursing student project coordinator of the study. On each visit, there were two to three students participating. Combinations of two professions making visits were nursing and pharmacy, nursing and medicine, nursing and occupational therapy, nursing and public health, pharmacy and public health, medicine and public health. Some visits were conducted by three professions-nursing, medicine, and public health and nursing, medicine, and occupational therapy. Out of the 20 patients in the intervention group, 10 of them received one home visit, eight received two home visits, and two received three home visits. Table 2 depicts the make-up of the student teams and number of visits performed by each team combination.

Table 2

Student Team Composition and Number of Visits (N=32)

Student Professions	**Number of Visits (Percent of Total Visits)**
Nursing and Public Health	13 (40.6)
Pharmacy and Public Health	4 (12.5)
Nursing and Medicine	3 (9.4)
Medicine and Public Health	1 (3.1)
Nursing, Medicine, and Public Health	4 (12.5)
Nursing, Medicine, and Occupational Therapy	4 (12.5)
Nursing and Pharmacy	2 (6.25)
Nursing and Occupational Therapy	1 (3.1)

Note: All numbers are presented as *N* (%).

Findings Related to Research Questions and Hypotheses

Results related to the study's research questions and hypotheses are described below.

Research Question 1

What are the first-time 30-Day hospital readmission rates for super-utilizers receiving interprofessional student teams' home visits in one home health agency?

To be consistent with the method the home health agency uses to calculate 30-day readmission rates, the number of 30-day readmissions were counted from the date of hospital discharge. The student home visits began within that first 30-days from the patients' hospital discharge dates. The total number of 30-Day readmissions for the intervention group was three. The total number of 30-Day readmissions for the control

group was nine. Using proportions, these rates were calculated by dividing the number of 30-day readmission by the number of patients in the respective group, intervention or control, and then multiplying by 100. For the intervention group, the 30-day readmission rate was 15%. The 30-Day readmission rate for the control group was 45%. Table 3 depicts these data.

Table 3

Crosstabs (Contingency) Table for Group/30-Day Readmission Status

30-Day Readmission Status	*Group* **Intervention**	**Control**	**Total**
Readmitted (30-Day)	3 (15)	9 (45)	12 (30)
Not Readmitted (30-Day)	17 (85)	11 (55)	28 (70)
Total	20 (100)	20 (100)	40 (100)

Note: All numbers are presented as *N* (%).

Research Question 2

What is the number of emergency department (ED) visits for super-utilizers receiving interprofessional student teams' home visits in one home health agency? There were no ED visits by the patients in the control group. There were two ED visits by two patients in the intervention group. Due to the small numbers for this outcome variable, no further analysis could be performed.

Research Question 3

Is there a relationship between the number of home visits performed by interprofessional student teams and first-time 30-Day hospital readmission rates?

Descriptively, the two participants who each received three home visits from student teams did not have any 30-Day readmissions. Eight patients received two home visits from student teams. Of these, two participants each had one 30-day readmission. Ten patients received one home visit from student teams. Of these, one participant had one 30-day readmission. The nonparametric chi-square distribution test of association was used to determine if there were group differences in first-time 30-day hospital readmission rates between the intervention group and control group. The chi-square test it often utilized to test the impact of an intervention, comparing two groups (Gliner, Morgan, & Leech, 2017). Assumptions for the chi-square test were met, as the observations were independent, and expected frequencies in each cell of the contingency table were greater than 5 (Polit, 2010). Significance was determined using a two-tailed test and α=0.05 was assumed. Results showed that there was a significant difference between the 30-day hospital readmission rate for the intervention group and the 30-day hospital readmission rate for the control group (χ^2=4.286, *df*=1, *p*=0.038).

Research Question 4

Is there a relationship between the number of home visits performed by interprofessional student teams and the number of emergency department visits?

As described above for RQ #2, the results for this outcome variable are not sufficient to perform analysis. Two patients in the intervention group visited the ED. One

of these patients had one student-team home visit. The other patient who visited the ED received two student-team home visits.

Hypothesis 1

Super-utilizers who receive home visits by interprofessional student teams will have fewer hospital readmissions than super-utilizers who do not receive home visits by interprofessional student teams.

Logistic regression was used for analysis related to this hypothesis. The Hosmer and Lemeshow goodness-of-fit test was not significant (p=0.587). Thus, there was no evidence of lack of fit in the logistic regression model. The adjusted odds ratio (AOR) for group (intervention or control) was 0.163, therefore the odds of 30-day readmission were 83.7% lower for the intervention group when controlling for the number of student home visits. The AOR for number of student home visits was 1.19. Thus, for each additional student home visit, the odds of a patient having a 30-day hospital readmission increased by 19%, adjusting for group (intervention or control). Neither of these results were significant. Table 4 depicts the binary logistic regression analysis.

Table 4

Binary Logistic Regression for 30-Day Readmissions (N=40)

Covariate	AOR	95% CI	*p*-value
Number of IPE home visits	1.190	(0.195, 7.263)	0.850
Groups			
Control (RC)*			
Intervention	0.163	(0.006, 4.642)	0.288

*RC=reference category

Hypothesis 2

Super-utilizers who receive home visits by interprofessional student teams will have fewer emergency department visits than super-utilizers who do not receive home visits by interprofessional student teams.

Again, with only two ED visits by two patients in the intervention group, it was not appropriate to perform analysis related to this hypothesis.

Summary

This study's purpose was to examine the impact of interprofessional student team home visits on 30-Day hospital readmission rates and ED visits of patients who are super-utilizers of the health care system. There were 20 participants in the intervention group and 20 in the control group. The intervention group had three 30-day readmissions and the control group had nine 30-day readmissions. There were only two ED visits by members of the intervention group. Chi-square analysis revealed a significant difference

in 30-day readmissions between the two groups (p=0.038). Due to the small number of ED visits, no analysis could be performed.

Hypothesis 1 proposed that participants who experienced more interprofessional student home visits would have fewer 30-day readmissions. Logistic regression analysis showed that participants in the intervention group had an 83.7% lower risk of readmission than those in the control group. Logistic regression analysis also showed that for every increase of one student-team home visit, there was a 19% increase in the chance for 30-day readmission. Results of the logistic regression were not significant and were heavily influenced by sample size (Polit, 2010).

CHAPTER V

DISCUSSION

Introduction

This chapter provides a synopsis of the problem, a review of the study purpose, a short summary of the findings, and interpretation and discussion of the findings in terms of the outcomes measured. Implications for education, research, policy, and practice will also be discussed.

Overview of the Problem

The overarching problem guiding this study is the cost of health care, particularly hospital readmissions and emergency department visits. In 2016, national health care spending increased by 4.3%, to over $3 trillion, or over $10,000 per capita (CMS, 2016). Hospital readmissions account for over $17 million in annual Medicare spending (Kripalani, Theobald, Anctil, & Vasilevskis, 2014). Emergency department visits serve as a substantial part of medical care in the United States (AHRQ, 2014). In 2011, there were over 131 million total ED visits. Use of the ED has increased over the last decade. Almost half of all hospital inpatient readmissions began in the ED. Emergency departments are the most common point of entry for hospital admission for both uninsured and publicly insured patients (AHRQ, 2014).

Purpose

The purpose of this retrospective, quasi-experimental study was to explore the effects of interprofessional student home visits on 30-day hospital readmission rates and emergency department visits of patients who are super-utilizers of the health care system. There were too few emergency department visits to warrant analysis. Thus, only readmission rates of patients visited by student teams were compared to readmission rates of a group of patients who were not visited by student teams. The intervention is referred to as hotspotting. Students attended a hotspotting orientation during which they learned about each other's professions, population health, social determinants of health, patient engagement, motivational interviewing, and how to conduct a home visit. The intervention was composed of students working with patients to establish goals related to their care. Students followed up on any patient concerns. Follow-up patient phone calls were also made by the project coordinator.

Interpretation of Findings

This study of the impact of hotspotting on 30-day hospital readmissions yielded several important findings. The most noteworthy finding was the statistical significance between the two groups with regard to 30-day readmissions. No previous studies have shown statistical significance with regard to patients receiving student-team home visits and the impact of those visits on readmission rates. Some papers have indicated a decrease in readmissions for patients who were "hotspotted," but small sample sizes did not allow for a showing of statistical significance (Capp et al., 2017; Jones et al., 2018; Kaufman et al., 2014). In this study, sample size was also a limitation, however, statistical

significance between the number of 30-Day readmissions between the intervention and control groups was shown in the chi-square analysis. Each research question and hypothesis will be further discussed below.

Research Question 1

What are the first-time 30-Day hospital readmission rates for super-utilizers receiving interprofessional student teams' home visits in one home health agency?

The intervention group had three 30-day hospital readmissions. The control group had nine 30-Day hospital readmissions. Rates calculated out to be a 15% 30-Day readmission rate for the intervention group and a 45% 30-Day readmission rate for the control group. These rates can be compared to the home health agency's average rate for 30-day hospital readmissions over the same seven-month period of time in this same geographical area. This average was 6.97% (personal communication, R. Kipple, January 9, 2019). The home health care agency has a goal of 8.5% for 30-Day readmissions for their overall population. So, the 15% 30-day readmission rate for the intervention and the 45% 30-day readmission rate for the control group are higher than the seven-month average and the overall goal for the home health agency, however, it is important to consider that the participants in this study are at the highest risk for readmission, as compared to the entire patient population in the care of the agency.

Reasons for hospital readmissions for participants in this study aligned with reasons found in the literature, specifically heart failure exacerbation, other heart disease, and respiratory problems (Ma, et al., 2018). Participants in this study were readmitted for heart failure exacerbation, respiratory problems, such as chronic obstructive pulmonary

disease (COPD), shortness of breath, and acute respiratory failure, abdominal pain, sepsis, and hyperglycemia. Again, these reasons are supported in the literature. The three most prevalent non-cardiac causes of readmission are neuropsychiatric, gastrointestinal, and infections (Kwok et al., 2019). The three most prevalent causes of cardiac-related readmission are angina, arrhythmias, and heart failure (Kwok et al., 2019).

Research Question 2

What is the number of emergency department (ED) visits for super-utilizers receiving interprofessional student teams' home visits in one home health agency?

The total number of ED visits for this sample was two. These two ED visits occurred for two patients in the intervention group. One visit was for urinary retention and the reason for the other participant's ED visit was not documented. As previously noted, these data were not able to be analyzed; however, a couple of situations can be considered given these low numbers. Emergency department visits could have occurred for patients in both the intervention and control group that were either not documented in the electronic health record, or documented in an atypical area of the electronic health record so that the project coordinator did not find a record of it. Another scenario could be that participants presented to the ED with a diagnosis that was deemed admittable or that that patient was considered a "direct admit," and the ED visit was not captured, but the readmission was captured. The Agency for Healthcare Research and Quality (AHRQ) found that nearly half of all inpatient hospital admissions begin in the ED (2014). For adults aged 45-84, which includes the age range of participants in this study, the most common reason for hospital admission after an ED visit is septicemia (AHRQ, 2014).

One of the reasons for readmission for one participant in this study was septicemia. This participant could have begun his or her hospital stay in the ED prior to admission. This was not able to be confirmed in the electronic health care record.

Research Question 3

Is there a relationship between the number of home visits performed by interprofessional student teams and first-time 30-Day hospital readmission rates?

Results showed that there was a significant difference between the 30-day hospital readmission rate for the intervention group and the 30-day hospital readmission rate for the control group (χ^2=4.286, *df*=1, *p*=0.038). There were fewer 30-day readmissions for the intervention group. Specifically isolating the impact of the *number* of home visits on 30-day readmission rates could not be assessed with the chi-square test. This was assessed using logistic regression and is discussed in the section related to Hypothesis 1. Due to the small sample size, it is difficult to unequivocally state that hotspotting made the difference between the groups. Many other factors contribute to the care of the participants in the study. Some literature has noted clinical significance in reducing readmissions due to hotspotting, but not statistical (Capp et al., 2017; Jones et al., 2018; Kaufman et al., 2014). Seymour and Cannon (2010) reported a reduction in readmissions, but not a significant one. Another important consideration regarding this significant difference in 30-day readmissions is the potential cost savings. The average cost per readmission of all-cause readmissions ranges from $13,800-$15,924 (AHRQ, 2015; CMS, 2016). Participants in the intervention group had six fewer 30-day readmissions, as

compared to the control group. Extrapolating this in terms of cost shows a cost savings of $82,800-$95,544. These findings are promising and certainly warrant further study.

Research Question 4

Is there a relationship between the number of home visits performed by interprofessional student teams and the number of emergency department visits?

The low number of ED visits did not allow analysis to occur for this research question. Discussion around reasons for low numbers for ED visits is included under Research Question 2.

Hypothesis 1

Super-utilizers who receive home visits by interprofessional student teams will have fewer hospital readmissions than super-utilizers who do not receive home visits by interprofessional student teams.

Logistic regression analysis showed that participants in the intervention group had an 83.7% lower risk of readmission than participants in the control group. This analysis also showed that for every increase of one student-team home visit, there was a 19% increase in the chance for 30-day readmission. These results seem promising when comparing between groups and controlling for visits, but less so when assessing the impact of the number visits on readmissions; in fact, they are contradictory. Neither of these results were significant, which makes sense because logistic regression is a robust statistical test that is strongly influenced by sample size (Polit, 2010). Taking a closer look at the odds of readmission between groups, this is supportive of the significance found in the chi-square analysis. The literature also supports that increasing patient

engagement, bundling services, and implementing multi-modal delivery approaches during periods of transitional care, as in home health, has shown a decrease in readmissions (Albert, 2016; Naylor et al., 2017).

Analysis in this study also showed that increasing the number of student home visits increased the risk of readmission. Only two patients out of twenty received three student visits, which was the maximum number of student visits. Half of the participants in the intervention group received one student visit and eight of the participants in the intervention group received two student visits. These results are contradictory to what some literature shows. Patients with low social support and decreased access to care tend to have more readmissions that patients who have access to care and increased social support (Dupre et al., 2018). Although one study showed that an intervention targeting super-utilizers increased readmissions, but decreased mortality and length of stay (Durfee et al., 2018). Increasing the amount of patient education and follow up has been shown to decrease readmissions as well (DiPalo, Patel, Assafin, & Pina, 2017). It was the intention of the student home visits to increase social support, and provide additional education and follow up for the participants. Increasing the number of home visits appeared to have the opposite effect. However, the small numbers related to the number of visits are not sufficient to draw substantive conclusions from this regression analysis. Further research related to the effect of "dose" (number of visits) on readmissions needs to be conducted.

Hypothesis 2

Super-utilizers who receive home visits by interprofessional student teams will have fewer emergency department visits than super-utilizers who do not receive home visits by interprofessional student teams.

Due to the paucity of ED visits, no analysis could be performed to address this hypothesis.

Conceptual Framework

The Interprofessional Learning Continuum (IPLC) was the conceptual framework guiding this study. This framework was developed by the National Academy of Sciences in 2015 in an effort to advocate for a consistent framework to be used in IPE research. This framework was modified to accommodate the concepts being examined in this study. The learning continuum in this adapted model refers to the foundational education the student-teams undergo during their orientation to hotspotting. When students learn from, with, and about each other, IPE is said to have occurred (WHO, 2010). Student participants learn the definition of IPE and participate in team building exercises during the orientation process. Each professional role is described and students are asked to offer examples of how they have exemplified their roles in clinical practice. For the health and system outcomes component of the conceptual model, hospital readmissions and ED visits were measured for the sample. Thirty-day hospital readmissions were compared to the home health agency's average and goal, as means of incorporating system outcomes from the model into the implementation of the study. Learning outcomes in the adapted IPLC model refers to the collaborative behaviors exhibited by the student teams. Before

each visit, student teams would huddle to discuss the best approach to patient interaction. The Ottawa Framework for Shared Decision Making and a structured interview guide were tools the students used to guide their home visits. During the home visits, the students collaborated as they assisted patients with goal setting. After the home visits, the students collaborated over how to document the visit, the patients' progress on their goals, and the plan for a follow up visit, if the patient participant had consented to a future visit. The arrows in the adapted model represent the cyclical interplay among three primary components of the original IPLC model—the learning continuum, health and system outcomes, and learning outcomes. Each of these components affects the other. As student receive education in an interprofessional setting, go out into the community to visit patients, and collaborate with the patient and each other, the cyclical framework is demonstrated. For example, after initial home visits, students come back together as a large group and debrief the home visits. Each student team learned from the next, further collaborating and troubleshooting any patient care situations that need to be addressed. Therefore, this study adds support to the use of the IPLC, although the original IPLC model was adapted for this study, in order to focus on the key components of the model that are applicable to this particular study.

Limitations

As described in Chapter One, limitations of this study were small sample size, lack of intervention fidelity, and difficulty extricating exactly how student-team home visits impact patient outcomes. For instance, the student-team home visits could be viewed as additional social support for the patients. Improvement in patient outcomes

may or may not be a direct result of the student-team home visits. The home health agency also links patients with various supportive service, such as social work, or occupational therapy. The amount of supportive services in relation to the number of interprofessional student team home visits could be a factor in determining patient outcomes. The timing of the student-team home visits in relation to when the 30-day readmissions occurred also needs to be considered when distinguishing the impact of the student-team home visits. Discernment of exactly which grouping of interventions was most effective at improving patient outcomes is difficult. Lastly, another study limitation is that the bearing of the patient's mental health on their other health outcomes is not explicitly addressed. Often super-utilizers have multifaceted medical diagnoses, including a psychiatric component (Harris et al., 2016). This psychiatric component is an area that no doubt warrants further exploration. Other IPE models, mostly underway in primary care clinics, have integrated psychiatric health in their approaches to providing care aimed at improving outcomes for groups very analogous to super-utilizers (Selleck, Fifolt, Burkar, Frank, Curry, & Hites, 2017).

Implications for Education, Research, Policy, and Practice

Education

The main aim of this study was to generate new knowledge about how IPE impacts patient outcomes. This was found to be a gap in the literature in terms of the merits of IPE. Given that IPE is now a requirement for accreditation for health professional schools such as nursing, medicine, and pharmacy, linking IPE to patient outcomes should be easier to accomplish. The requirement aspect of IPE gives faculty in

health professional schools the impetus needed to incorporate IPE into curricula. Universities are trying multiple teaching and learning modalities to meet this requirement. Students who participated in this study were volunteers. This sometimes presented a barrier when scheduling home visits in the face of complex and differing schedules across health professions schools. Offering experiential learning opportunities for course credit will remove some of the barriers for already-busy students to take on an additional volunteer activity. Currently, IPE activities offered in health professional schools are often an assortment of "one and done" undertakings. Receiving course credit will allow IPE to occur in a more formalized way, also allowing for measurement of IPE outcomes in a more intentional way.

To further support the use of interprofessional hotspotting as a way for health professional schools to meet the IPE requirement from accreditors, the National Academy of Sciences (2016) issued a report that strongly recommends the incorporation of social determinants of health (SDOH) education in higher doses than are currently being taught in health professional schools. Depending on the population of patients that is "hotspotted," SDOH could have a large impact on patient outcomes. Patients in this sample overwhelmingly had insurance of some type, as well as receiving "usual care" from the home health agency, although SDOH impacted their health as well. The degree to which SDOH impacted their health is another area for future study. Using hotspotting to target those with fewer resources and access to care could be a valuable undertaking and would definitely warrant research. Health professional students in a service-learning,

hotspotting course would be in a strong position to answer this call by the National Academy of Sciences (2016).

Research

With the increase of IPE being included in health professions education, more research will be needed to link IPE to improved patient outcomes. The findings of this study indicate a potential relationship between interprofessional student-team home visits and 30-day hospital readmission rates. More research is need to determine the impact of all the myriad of contributing factors to readmission rates for those patients who are "hotspotted." Future research could include the examination of what combinations of professions lead to better outcomes, with a closer look at covariates such as age, ethnicity, and gender with a larger sample. Also using mixed methods, such as taking a qualitative look at differences in services between intervention and control groups and including the patient's perspective would shed more light on effective bundles of care for super-utilizers. Further work in IPE research should also include the recommended IPLC theoretical framework to be tested and modified as needed and as supported by the research.

Research examining the "dose" of home visits that is required to impact patient outcomes is critical. This would support best practices in using resources most wisely. This study indicates a possibility that even one interprofessional student-team home visit could make a difference in patient outcomes. Linking the cost savings due to decreased readmissions to the hotspotting intervention would show impact beyond patient outcomes, expanding the results to include the impact on health and system outcomes as

well. A research question related to this could also be: Is there an optimal combination of health professions, such as nursing and social work, that could make a significant difference in readmissions, ED visits, or other patient outcomes, as well as decrease health care costs? The number of student visits could be more intentional and aimed at patients who need more assistance. Increased collaboration with the home health agency would also need to occur to better discern the patient group that would most benefit from hotspotting. This would even further increase the amount of interprofessional collaboration between students and the health care professionals employed by the home health agency. Showing linkages between hotspotting, patient outcomes, and health and system outcomes would also strengthen the IPLC as an effective theoretical model to guide IPE research.

Policy

The United States spends over $10,000 per capita on health care, but does not have the positive patient outcomes to show for it (Organization for Economic Cooperation and Development, 2018). By doing further research linking IPE to improved patient outcomes, perhaps a linkage between the type of health profession that performs home visits and the patients' outcomes could be made. If a particular health profession, such as nursing, for example, is a component of the home visiting team that shows better patient outcomes, then there is potential cause for increased workforce development for nurses. Policies such as Title VIII would be better supported and more funding could potentially become available for nurses to increase their education, from baccalaureate-

prepared to advanced practice, doctorally-prepared nurses, which would increase the number of nurses on health care teams.

Taking a closer look at the critical mental health aspect to the care of super-utilizers is an area for future policy development. Parity in mental care services is an ongoing debate and quality improvement effort. Often readmissions are related to complex comorbidities with a mental health component (Ma et al., 2018). Further studies that include a health professional student who is specialized in mental health participating in home visits would be a vital avenue to take. Having a mental health specialist's input as a member of the interprofessional health care student team would contribute to the other students' increased awareness of the impact of mental health issues on patient outcomes. Any research supporting the use of mental health professionals in decreasing health care costs could lead to further much-needed policy revision around accessibility to mental health services.

Practice

Implications for practice include the support for interprofessional health care teams to provide care for all patients, but particularly for those at highest risk for readmission. Primary care practices are transitioning to become Accountable Care Organizations and Patient Centered Medical Homes. Much research is currently underway to show outcomes of these care delivery models. Undoubtedly, a multi-pronged approach to providing care for complex patients who are at highest risk for readmission will continue to be a critical framework for care delivery (Naylor et al., 2017).

Conclusions

The most intriguing finding from this study was that there was a statistically significant difference between the 30-day readmission rates of patients who received interprofessional student-team visits and the comparison group that did not receive the student home visits. This significance translates into a cost savings per readmission of $13,800-$15,924 (AHRQ, 2015; CMS, 2016). While limited by sample size, this study warrants a closer examination of hotspotting in home health as an effective way to improve patient outcomes. Many adjustments, such as increasing the number of student participants and the number of interprofessional home visits, could be made to determine any further impact of the hotspotting intervention. The findings support expanding IPE initiatives, as well as hotspotting initiatives in particular, to determine the impact of IPE on patient outcomes. Other analytical approaches, such as logistic regression, did not show statistical significance, but did show potential clinical significance, with a decrease in 30-day hospital readmissions when patients receive student home visits. Knowing that there is a myriad of reasons why patients are readmitted, further research is warranted to explore further these contributing factors, which can be better researched with increased sample size of both students and patients. There are plenty of patients who can be included in future research, thus increasing sample size, and compelling health professional schools to offer courses that allow students to participate in hotspotting would increase the number of student participants so that the volunteer component, as in this study, does not hinder student participation.

REFERENCES

Accreditation Council for Graduate Medical Education [ACGME]. (2017). Common program requirements. Retrieved from https://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/CPRs_2017-07-01.pdf

Accreditation Council for Pharmacy Education [ACPE]. (2015). Accreditation standards and key elements for the professional program in pharmacy leading to the doctor of pharmacy degree. Retrieved from https://www.acpeaaccredit.org/pdf/Standards2016FINAL.pdf

Agency for Healthcare Research and Quality [AHRQ]. (2014). Healthcare Cost and Utilization Project: Statistical Brief # 174: Overview of emergency department visits in the United States, 2011. Retrieved from https://www.hcup-us.ahrq.gov/reports/statbriefs/sb174-Emergency-Department-Visits-Overview.pdf

Agency for Healthcare Research and Quality [AHRQ]. (2015). Healthcare Cost and Utilization Project: Statistical Brief # 199: All-cause readmissions by payer and age, 2009-2013. Retrieved from https://www.hcup-us.ahrq.gov/reports/statbriefs/sb199-Readmissions-Payer-Age.pdf

Albert, N. M. (2016). A systematic review of transitional-care strategies to reduce rehospitalization in patients with heart failure. *Heart & Lung, 45,* 100-113. doi: 10.1016/j.hrtlng.2015.12.001

American Association of Colleges of Nursing [AACN]. (2008). *The essentials for Baccalaureate education for professional nursing practice.* Retrieved from https://www.bc.edu/content/dam/files/schools/son/pdf2/BaccEssentials08.pdf

American Association of Medical Colleges. (n. d.). Tips and sample questions for interviewing patients. Retrieved from https://www.aamc.org/initiatives/hotspotter/toolkit/356828/patientinterviewquestions.html

Anderson, E. S., & Thorpe, L. N. (2014). Students improve patient care and prepare for professional practice: An interprofessional community-based study. *Medical Teacher*, *36*(6), 495-504. doi: 10.3109/0142159X.2014.890703

Avery, C. L., Loehr, I. R., Baggett, C., Chang, P. P., Newton, A. M., Matsushita, K., …Heiss, G. (2012). The population burden of heart failure attributable to modifiable risk factors: The atherosclerosis risk in communities study. *Journal of the American College of Cardiology, 60*(17), 1640-1646.

Barr, H., Koppel, I., Reeves, S., Hammick, M., & Freeth, D. (2005). *Effective interprofessional education: Argument, assumption, and evidence.* Oxford and Malden, MA: Blackwell Publishing.

Bedoya, P., Neuhausen, K., Dow, A., Brooks, E. M., Mautner, D., & Etz, R. C. (2017). Student hotspotting: Teaching the interprofessional care of complex patients. *Academic Medicine*, doi: 10.1097/ACM.0000000000001822

Brandt, B. F. (2015). Interprofessional education and collaborative practice: Welcome to the “new” forty-year old field. The Advisor, March 2015, 9-17.

Brandt, B., Lutfiyya, M. N., King, J. A., & Chioreso, C. (2014). A scoping review of interprofessional collaborative practice and education using the lens of the Triple Aim. *Journal of Interprofessional Care, 28*(5), 393-399.

Bronsky, E., McGraw, C., Johnson, R., Giordano, K., Orlando, A., and Bar-Or, D. (2017). CARES: A community-wide collaboration identifies super-utilizers and reduces their 9-1-1 call, emergency department, and hospital visit rates. *Prehospital Emergency Care, 21(*6), 693-699. doi: 10.1080/10903127.2017.1335820

Capp, R., Misky, G., Lindrooth, R., Honigman, B., Logan, H., Hardy, R.,…& Wiler, J. L. (2017). Coordination program reduced acute care use and increased primary care visits among frequent emergency care users. *Health Affairs, 36*(10), 1705-1711. doi: 10.1377/hlthaff.2017.0612

Centers for Medicare and Medicaid Services (n. d.). Hospital Readmissions Reduction Program. Retrieved from https://www.cms.gov/Medicare/Medicare-Fee-for-Service Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html

Centers for Medicare and Medicaid Services. (2013). State innovation models initiative. Retrieved from https://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-Sheets/2013-Fact-Sheets-Items/2013-02-21.html

Centers for Medicare and Medicaid Services. (2016). National health expenditure fact sheet. Retrieved from https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports/nationalhealthexpenddata/nhe-fact-sheet.html

Centers for Medicare and Medicaid Services. (2017). Report to the Congress: Medicare payment policy. Retrieved from http://www.medpac.gov/docs/defaultsource/reports/mar17_entirereport224610adfa9c665e80adff00009edf9c.pdf?sfvrsn=0

Coleman, E. A., Parry, C., Chalmers, S.,…et al. (2006). The Care Transitions Intervention: Results of a randomized controlled trial. *Archives of Internal Medicine, 166,* 1822-1828.

Cutts, T., Rafalski, E., Grant, C., & Marinescu, R. (2014). Utilization of hot spotting to identify community needs and coordinate care for high-cost patients in Memphis, TN. *Journal of Geographic Information System, 6,* 23-29. doi: http://dx.doi.org/10.4236/jgis.2014.61003

Czamecki, G. A. Kloostra, S. J., Boynton, J. R., & Inglehart, M. R. (2014). Nursing and dental students' and pediatric dentistry residents' responses to experiences with interprofessional education. *Journal of Dental Education, 78*(9), 1301-1312.

Damery, S., & Combes, G. (2017). Evaluating the predictive strength of the LACE index in identifying patients at high risk of hospital readmission following an inpatient episode: A retrospective cohort study. *British Medical Journal Open, 7,* e016921. doi: 10.1136/bmjopen-2017-016921

Dattalo, M., Nothelle, S., & Chapman, E. N. (2016). Targeting enhanced services toward high-cost, high-need Medicare patients. In Lindquist, L. A. (ed.).'s *New directions in geriatric_medicine: Concepts, Trends, and Evidence-Based Practice.* (pp. 13-30). Switzerland: Springer International Publishing, Inc.

Di Palo, K. E., Patel, K., Assafin, M., & Pina, I. L. (2017). Implementation of a patient navigator program to reduce 30-day heart failure readmission rate. *Progress in Cardiovascular Diseases, 60,* 259-266. doi: 10.1016/j.pcad.2017.07.004

Dupre, M. E., Xu, H., Granger, B. B., Lynch, S. M., Nelson, A., Churchill, E., …Peterson, E. D. (2018). Access to routine care and risks for 30-day readmission in patients with cardiovascular disease. *American Heart Journal, 196,* 9-17. doi: 10.1016/j.ahj.2017.10.001

Durfee, J., Johnson, T., Batal, H., Long, J., Rinehart, D., Everhart, R., …& Atherly, A. (2017). The impact of tailored intervention services on charges and mortality for adult super-utilizers. *Healthcare,* Retrieved from http://dx.doi.org/10.1016/j.hjdsi.2017.08.004

Fader, J., Goldstein, D., & Vause-Earland, T. (2016). Hotspotting collaborative: Student efforts to identify and intervene with emergency service "super-utilizers." *Occupational Therapy Practice, 21*(20), 13-16.

Finkelstein, A., & Brenner, J. (2018). Health care hotspotting: A randomized controlled trial. Retrieved from https://clinicaltrials.gov/ct2/show/NCT02090426?term=hotspotting&rank=1

Galarraga, J. E., & Pines, J. M. (2016). Costs of ED episodes of care in the United States. *American Journal of Emergency Medicine, 34*, 357-365. doi: 10.1016/j.ajem.2015.06.001

Hansen, L. O., Young, R. S., Hinami K., (2011). Interventions to reduce 30-day rehospitalization: A systematic review. *Annals of Internal Medicine, 155,* 520-528.

Harris, L. J., Graetz, I., Podila, P., Wan, J., Waters, T., & Bailey, J. (2016). Characteristics of hospital and emergency care super-utilizers with multiple chronic conditions. *The Journal of Emergency Medicine, 50*(4), e203-e214. doi: 10.1016/j/jemermed.2015.09.002

Hines, A. L., Barrett, M. L., Jiang, J., and Steiner, C. A. (2014). Conditions with the largest number of adult hospital readmissions by payer. Healthcare Cost and Utilization Project, Statistical Brief #172, April 2014. Agency for Healthcare Research and Quality, Rockville, MD.

Holzer, J., Canavan, M., Cherlin, E., & Bradley, E. (2014). Health hot spots: Mapping hospital costs and social determinants of health. *Open Journal of Preventative Medicine, 4,* 717-722. doi: http://dx.doi.org/10.4236/ojpm.2014.49081

Hutchison, R. W. (2014). Treating diabetes in underserved populations using an interprofessional care team. *Journal of Interprofessional Care, 28*(6), 568-569.

Interprofessional Education Collaborative (IPEC). (2016). Core competencies for interprofessional collaborative practice: 2016 update. Washington, D. C.: Interprofessional Education Collaborative.

Jack, B. W., Chetty, V. K., Anthony, D.,…et al. (2009). A reengineered hospital discharge program to decrease hospital readmissions: A randomized trial. *Annals of Internal Medicine, 150,* 178-187.

Jacobsen, M. J., & O'Connor, A. (2006). *Population needs assessment: A workbook for assessing patients' and practitioners' decision-making needs.* Ottawa, Canada: University of Ottawa.

Jones, A. C., Li, T., Zomorodi, M., Broadhurst, R., & Weil, A. (2018). Straddling care and education. Developing interprofessional collaboration through a hotspotting service learning project. *Healthcare.* In press. Retrieved from https://doi.org/10.1916/j.hjdsi.2018.02.001

Kaufman, S., Ali, N., DeFiglio, V., Craig, K., & Brenner, J. (2014). Early efforts to target and enroll high-risk diabetic patients into urban community-based programs. *Health Promotion Practice, 15,* Supplement 2, 62S-70S. doi: 10.1177/1524839914535776

Kilgore, M., Patel, H. K., Kielhorn, A., Maya, J. F., & Sharma, P. (2017). Economic burden of hospitalizations of Medicare beneficiaries with heart failure. *Risk Management and Healthcare Policy, 10,* 63-70.

Kripalani, S., Theobald, C., Anctil, B., & Vasilevskis, E. E. (2014). Reducing hospital readmission rates: Current strategies and future directions. *Annual Review of Medicine, 65,* 471-485.

Kwok, C. S., Parwani, P. J., Fischman, D. L., Thamman, R., al Suwaidi, J., Mohamed, M., …Mamas, M. (in press). (2019). Nonspecific chest pain and 30-day unplanned readmissions in the United States (from the Nationwide Readmission Database). *American Journal of Cardiology*. Retrieved from https://doi.org/10.1016/j.amjcard.2019.01.012

Lutfiyya, M. N., Brandt, B., Delaney, C., Pechacek, J., & Cerra, F. (2015). Setting a research agenda for interprofessional education and collaborative practice in the context of United States health system reform. *Journal of Interprofessional Care*. Retrieved from http://informahealthcare.com/jic. doi: 10.3109/13561820.2015.1040875

Ma, C., Shang, J., Miner, S., Lennox, L., and Squires, A. (2018). The prevalence, reasons, and risk factors for hospital readmissions among home health care patients: A systematic review. *Home Health Care Management & Practice, 30*(2), 83-92. doi: 10.1177/1084822317741622

Mautner, D. B., Pang, H., Brenner, J. C., Shea, J. A., Gross, K., Frasso, R., & Cannuscio, C. C. (2013). Generation hypotheses about care needs of high utilizers: Lessons from patient interviews. *Population Health Management, 16*(1), s-26-s-33. doi: 10.1089/pop.2-13.0033

McCaffrey, R., Tappen, R. M., Lichtstein, D. M., & Friedland, M. (2013). Interprofessional education in community-based Alzheimer's disease diagnosis and treatment. *Journal of Interprofessional Care, 27*(6), 534-536.

Mercer, T., Bae, J., Kipnes, J., Velazquez, M., Thomas, S., & Setji, N. (2015). The highest utilizers of care: Individualized care plans to coordinate care, improve healthcare service utilization, and reduce costs at an academic tertiary care center. *Journal of Hospital Medicine, 10*(7), 419-424.

Miller, B., Robinson, B., Eyster, J., & Khalid, S. (2018, May). *Identifying patients at risk for hospital readmission.* Poster session presented at the Rural Interprofessional Health Initiative Spring Presentations, Chapel Hill, NC.

Moe, J., Kirkland, S. W., Rawe, E., Ospina, M. B., Vandermeer, B., Campbell, S. & Rowe, B. (2017). Effectiveness of interventions to decrease emergency department visits by adult frequent users: A systematic review. *Academic Emergency Medicine, 24*, 40-52. doi: 10.1111/acem.13060

Nagelkerk, J., Thompson, M. E., Bouthillier, M., Tompkins, A., Baer, L. J., Trytko, J., Booth, A., Stevens, A., & Groeneveld, K. (2018). Improving outcomes in adults with diabetes through an interprofessional collaborative practice program. *Journal of Interprofessional Care, 32*(1), 4-13. doi: 10.1080/13561820.2017.1372395

National Academy of Sciences. (2015). Measuring the impact of interprofessional education on collaborative practice and patient outcomes. Retrieved from http://nationalacademies.org/hmd/reports/2015/impact-of-ipe.aspx. doi: 10.17226/21726

National Academy of Sciences. (2016). A framework for educating health professionals to address the social determinants of health. Retrieved from http://www.nationalacademies.org/hmd/Reports/2016/Framework-for-Educating-Health-Professionals-to-Address-the-Social-Determinants-of-Health.aspx

National Quality Forum. (2017). All-cause admissions and readmissions 2015-2017. Retrieved from http://www.qualityforum.org/Project_Pages/All-Cause_Admissions_and_Readmissions_2015-2017.aspx

Naylor, M., Brooten, D., Jones, R., et al. (1994). Comprehensive discharge planning for the hospitalized elderly. A randomized controlled trial. *Annals of Internal Medicine, 120,* 999-1006.

Naylor, M. D., Shaid, E. C., Carpenter, D., Gass, B., Levine, C., Li, J., Malley, A., …Williams, M. V. (2017). Components of comprehensive and effective transitional care. *Journal of the American Geriatric Society, 65*, 1119-1125. doi: 10.1111/jgs.14782

O'Neal, F., Frame, T. R., and Triplett, J. (2016). Integrating a student pharmacist into the home healthcare setting. *Home Healthcare Now, 34*(6), 308-315.

Parker, R. A., Hook, L. D., & Jones, M. E. (2016). Glycemic control: Can nurse practitioners on interprofessional collaborative practice teams enhance clinical outcomes? *Journal of the American Association of Nurse Practitioners, 28*, 652-658.

Ploeg, J., Markle-Reid, M., Fisher, A., Bookey-Bassett, S., Chambers, T., Kennedy, L., Morsy, M., and Dufour, S. (2017). An exploration of experts' perceptions on the use of interprofessional education to support collaborative practice in the care of community-living older adults. *Journal of Interprofessional Care, 31*(5), 638-647. doi: 10.1080/13561820.2017.1347610

Reeves, S., Fletcher, S., Barr, H., Birch, I., Boet, S., Davies, N., McFayden, A., Rivera, J., & Kitto, S. (2016). A BEME systematic review of the effects of interprofessional education: BEME Guide No. 39. *Medical Teacher, 38(*7), 656-668. doi: 10.3109/0142159X.2016.1173663

Reeves, S., Pelone, F., Harrison, R., Goldman, J., & Zwarenstein, M. (2017). Interprofessional collaboration to improve professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews*, Issue 6. Article no.: CD000072. doi: 10.1002/14651858.CD000072.pub3.

Robinson, R., and Hudali, T. (2017). The HOSPITAL score and LACE index as predictors of 30 day readmission in a retrospective study at a university-affiliated community hospital. *Peer J* (5), e1-7. doi: 10.7717/peerj.3137

Rock, J. A., Acuna, J. M., Lozano, J. M., Martinez, I. L., Greer, P. J., Brown, D. R., Brewster, L., and Simpson, J. L. (2014). Impact of an academic-community partnership in medical education on community health: Evaluation of a novel student-based home visitation program. *Southern Medical Journal, 107*(4), 203-211.

Rutherford-Hemming, T, and Lioce, L. (2018). State of interprofessional education in nursing: A systematic review. *Nurse Educator, 43*(1), 9-13. doi: 10.1097/NNE.0000000000000405

Scherer, Y. K., Myers, J., O'Connor, T. D., & Haskins, M. (2013). Interprofessional simulation to foster collaboration between nursing and medical students. *Clinical Simulation in Nursing, 9*(11), e497-e505.

Seymour, C. J., and Cannon, S. (2010). Student-facilitated health promotion intervention for chronic disease self-management in at-risk elders. *Journal of Allied Health, 39*(2), 120-127.

Schuttner, L., Zhang, Z., and Kuo, A. (2017). Reducing ER use through a trainee-designed, interprofessional care group for high-utilizing, chronically ill patients: A pilot program. *Journal of Interprofessional Education and Practice, 9*, 86-90. doi: http://dx.doi.org/10/1016/j.xjep.2017.08.010

Shang, J., Larson, E., Liu, J., and Stone, P. (2015). Infection in home health care: Results from national Outcome and Assessment Information Set data. *American Journal of Infection Control, 43*(5), 454-459. doi: 10.1016/j.ajic.2014.12.017

Shiyanbola, O., Randall, B., Lammers, C., Hegge, K., & Anderson, M. (2014). Impact of an interprofessional diabetes education model on patient health outcomes: A longitudinal study. *Journal of Research in Interprofessional Education and Practice*, *4*(2), 1-21.

Spiva, L., Hand, M., VanBrackle, L., & McVay, F. (2016). Validation of a predictive model to identify patients at high risk for hospital readmission. *Journal for Healthcare Quality, 38*(1), 34-41.

Thompson, M. P., Podila, P., Clay, C., Sharp, J., Bailey-DeLeeuq, S., … & Waters, T. M. (2018). Community navigators reduce hospital utilization in super-utilizers. *American Journal of Managed Care, 24*(2), 70-76.

Umland, E., Collins, L., Baronner, A., Lim, E., & Girodano, C. (2016). Health mentor-reported outcomes and perceptions of student team performance in a longitudinal interprofessional education program. *Journal of Allied Health*, 45(3), 219-224c.

Virtue, S. M., Rotz, M. E., Boyd, M., Lykon, J. L., Waldron, E. M., & Theodorou, J. (2018). Impact of a novel interprofessional dental and pharmacy student tobacco cessation education programme on dental patient outcomes. *Journal of Interprofessional Care*, *32*(1), 52-62. doi: 10.1080/13561820./2017.1378171

Vogt, W. P., Vogt, E. R., Gardner, D. C., & Haeffele, L. M. (2014). *Selecting the right analysis for your data: Quantitative, qualitative, and mixed methods.* New York: Guilford Publications, Inc.

Walraven, C., Dhalla, I. A., Bell, C., Etchells, E., Steill, I., Zarnke, K., Austin, P. C., and Forster, J. (2010). Derivation and validation of an index to predict early death or unplanned readmission after discharge from hospital to the community. *Canadian Medical Association Journal*, 182(6), 551-557.

Wang, R., Shi, N., Bai, J., Zheng, Y., & Zhao, Y. (2015). Implementation and evaluation of an interprofessional simulation-based education program for undergraduate nursing students in operating room nursing education: A randomized controlled trial. *BMC Medical Education, 15,* 1-7.

Watters, C., Reedy, G., Ross, A., Morgan, N. J., Handslip, R., & Jaye, P. (2015). Does interprofessional education increase self-efficacy: A comparative study. *British Medical Journal Open*, 5(1), e005472. doi: 10.1136/ bmjopen-2014-005472

Williams, B., Lewis, B., Boyle, M., & Brown, T., (2011). The impact of wireless keypads in an interprofessional education context with health science students. *British Journal of Education and Technology, 42*(2), 337-350.

World Health Organization. (2010). Framework for action on interprofessional education & collaborative practice. Geneva: World Health Organization.

World Health Organization. (2016). Social determinants of health. Retrieved from http://www.who.int/social_determinants/sdh_definition/en/

Wros, P., Mathews, L., and Voss, H. (2015). An academic-practice model to improve the health of underserved neighborhoods. *Family and Community Health, 38*(2), 195-203.

Zierler, B. K., Blakeney, E., O'Brien, K., and IPCP Heart Failure Teams. (2018). An interprofessional collaborative practice approach to transform heart failure care: An overview. *Journal of Interprofessional Care, 32*(3), 378-381. doi: 10.1080/13561820.2018.1426560

Zomorodi, M., Odom, T., Askew, N., Leonard, C., Sanders, K., and Thompson, D. (2018). Hotspotting: Development of an interprofessional education and service learning programfor care management in home care patients. *Nurse Educator* Published Ahead of Print. doi: 10.1097/NNE.0000000000000523

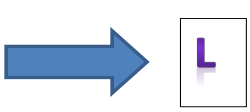
APPENDIX A

LACE INDEX SCORING TOOL

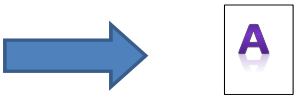
LACE Index Scoring Tool for Risk Assessment of Hospital Readmission

Step 1. Length of Stay
Length of stay (including day of admission and discharge): _____ days (*Enter associated score in step 1.)*

Length of stay (days)	Score (circle as appropriate)
Community	0
1	1
2	2
3	3
4-6	4
7-13	5
14 or more	7



Step 2. Acuity of Admission
Was the referral from the hospital or community?
If hospital, enter "3" in step 2, otherwise enter "0" in step 2



Step 3. Comorbidities

Condition (definitions and notes on reverse)	Score (circle as appropriate)
Previous myocardial infarction	1
Cerebrovascular disease	1
Peripheral vascular disease	1
Diabetes without complications	1
Congestive heart failure	2
Diabetes with end organ damage	2
Chronic pulmonary disease	2
Mild liver or renal disease	2
Any tumor (including lymphoma or leukemia)	2
Dementia	3
Connective tissue disease	3
AIDS	4
Moderate or severe liver or renal disease	4
Metastatic solid tumor	6
TOTAL	

If the TOTAL score is between 0 and 3 enter the score into Step 3. If the score is 4 or higher, enter 5 into Step 3

Step 4. Emergency department visits
How many times has the patient visited an emergency department in the six months prior to admission? _____
Enter this number or 4 (whichever is smaller) in Step 4

Add all score from Steps 1-4 to determine Acuity

Step	Score
Step 1	
Step 2	
Step 3	
Step 4	
TOTAL SCORE	

Acuity Scale

Low- 1-4

Moderate 5-9

High 10-12

Highest 13-19

Appendix A. LACE Index Scoring Tool. Adapted from "Derivation and validation of an index to predict early death or unplanned readmission after discharge from hospital to the community," by C. V. Walraven, et al., 2010, *Canadian Medical Association Journal, 182*(6), 551-557. Reprinted with permission.

APPENDIX B

STRUCTURED INTERVIEW GUIDE

Tips and Sample Questions for Interviewing Patients Who Have Been Hospitalized Three or More Times in the Last Six to Nine Months

Sit next to the patient at the bedside, and make eye contact. You may consider removing your white coat beforehand in order to help the patient feel comfortable opening up to you. Briefly introduce yourself and explain that you are interested in helping patients get better care. Ask the patient if he or she would mind if you ask a few questions to get to know him or her better.

If the patient does not want to talk to you, respect his or her decision. Ask if the patient would like you to come back if he or she is admitted to the hospital again. It may take some time for the patient to want to open up, and this step shows that you are committed to helping the patient on his or her own terms.

If the patient is willing to talk, here are some sample questions to help you get started. Be prepared with follow-up questions if you initially get short responses. It may take time to draw out the patient. Work more on forming a connection with the patient and getting to know him or her, rather than following a rigid script.

1. What's your name? 2. Do you live nearby?

3. Where did you grow up? (Possible follow-ups: What did you like about growing up there? What did you dislike? Why? Are you still close with friends from those days?)

4. What are some of the things you enjoy doing? (Possible follow-ups: How often do you get to do that these days? What would make it easier for you to do this more often? What is your best memory of doing that? What do you usually do on weekends?)

5. Can you tell me a little about how you ended up in the hospital? (Let the patient tell his or her story. Allow the patient to talk for as long as he or she wishes.) (Possible follow-ups: What time of day was it? Were you alone or was someone there with you? Who took you here or called the ambulance? Was there anything different about this trip from other trips to the hospital?)

6. I noticed you've been in the hospital a lot lately. Would you like to talk about what else is going on with your health? (Possible follow-ups: Who do you currently talk to about your health? How do you get there? Do you feel like they understand you? Do they listen to you?)

7. Can you tell me about some of your good and bad experiences with the health care system? (Possible follow-up: What could have made that experience (even) better?)

8. Do you have any problems getting the care you need? Can you share with me some of these problems? (Possible prompts: What was it like getting to the appointment? Did you have to wait long? Reschedule? Do you have any co-pays? Not sure who you should see? Difficulty getting the medicines you need?)

9. Do you have a primary care physician? In other words, do you have a regular doctor who you can call or see when you are having less urgent health problems but don't know what to do? (Possible follow-ups: Does what he/she prescribes to you make sense or seem like something you can do? Why or why not? What would you like the doctor to know or think about that you haven't already discussed with him/her? Do you feel like that is something you could tell your doctor?)

10. Are there other members of your family or the community who check in on you, or to whom you can turn when you aren't feeling well? What about social workers, case managers, or other members of your health care team? Would you mind if I contacted some of them to talk about ways to help you together?

If family members are present, you may want to include them in the conversation as well. They can provide additional clues about the patient's experience, background, and barriers to care.

Appendix B. Structured interview guide. From **"Tips and Sample Questions for Interviewing Patients Who Have Been Hospitalized Three or More Times in the Last Six to Nine Months" by The Association of American Medical Colleges, n. d. Retrieved from https://www.aamc.org/download/359776/data/patientinterview.pdf. Reprinted with permission.**

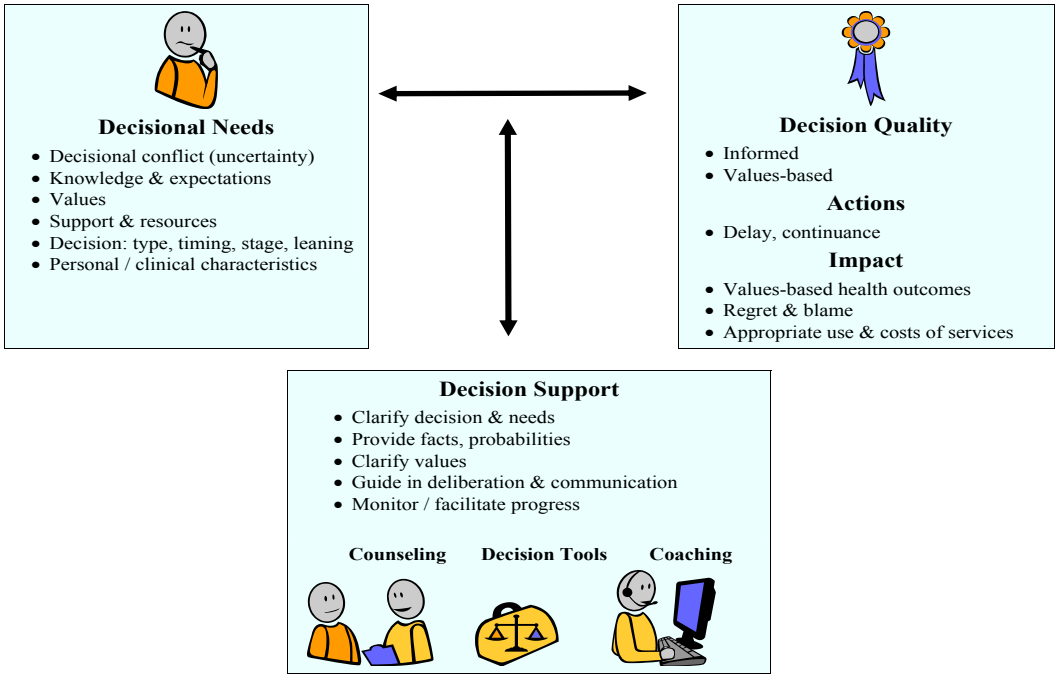
APPENDIX C

OTTAWA DECISION SUPPORT FRAMEWORK

Ottawa Decision Support Framework to Address Decisional Conflict

The Ottawa Decision Support Framework (Fig 1) uses concepts and theories from general psychology (Tversky & Kahneman, 1981), social psychology (Ajzen & Fishbein, 1980), decision analysis (Keeney, 1982), decisional conflict (Janis & Mann, 1977), values (Fischoff, Slovic & Lichtenstein), social support (Norbeck, 1988; Orem, 1995), and self efficacy (Bandura, 1982).

Figure 1. Ottawa Decision Support Framework



The framework applies to all participants involved in decision making, including the individual, couple, or family, and their health practitioner. The framework asserts that participants' decisional needs will affect decision quality (informed, values-based choices), which in turn affects actions or behaviour (e.g. delay), health outcomes, emotions (regret, blame), and appropriate use of health services. (See **Glossary of Terms for Ottawa Decision Support Framework**)

Decision support in the form of clinical counselling, decision aids and coaching can improve decision quality, by addressing unresolved decisional needs.

Appendix C. Ottawa Decision Support Framework. From "Population Needs Assessment: A Workbook for Assessing Patients' and Practitioners' Decision-Making Needs" by M. J. Jacobsen and A. O'Connor, 2006. Reprinted with permission.

APPENDIX D

STEPS IN THE HOTSPOTTING PROCESS

1. The home health agency's liaison provides the project coordinator (PC) with a list of patients who are super-utilizers (score of L4 on the LACE tool).
2. The (PC) checks the list for appropriate geographic location and then contacts the patients to obtain consent for the student home visits and determine a convenient time for the home visit to occur.
3. The PC then communicates with the student volunteers about the patient appointments and gives the student pertinent patient information.
4. A member of the student team contacts the patient 24 hours ahead of the appointment to confirm.
5. The student team arrives at the patient's home to conduct the home visit, using the structured interview guide and goal-setting framework.
6. At the conclusion of the visit, the student schedules the next home visit, as appropriate.
7. The student team collaborates and documents an SBAR note, which is uploaded to the secure Sakai® site.
8. The student team communicates with the PC about any future visits scheduled and any patient concerns that need follow up by the home health agency. The PC sends the documentation to the home health agency's liaison for proper placement in the patient's electronic health record.
9. The student team participates in a weekly or biweekly debriefing, during which they present their patient information and the events of the home visit.
10. The debrief is led by the PI and other interprofessional faculty. The students are provided with feedback.