AN EVIDENCE-BASED INTERVENTION TO ENHANCE PROVIDER AWARENESS AND CONFIDENCE IN ADDRESSING POLYPHARMACY

A Scholarly Project

Submitted to the

Faculty of Liberty University

In partial fulfillment of

The requirements for the degree

Of Doctor of Nursing Practice

By

Catherine Marie Steiner

Liberty University

Lynchburg, VA

March, 2020

AN EVIDENCE-BASED INTERVENTION TO ENHANCE PROVIDER AWARENESS AND CONFIDENCE IN ADDRESSING POLYPHARMACY

A Scholarly Project

Submitted to the

Faculty of Liberty University

In partial fulfillment of

The requirements for the degree

Of Doctor of Nursing Practice

By

Catherine Marie Steiner

Liberty University

Lynchburg, VA

March, 2020

Scholarly Project Committee Approval:

[redacted] March 14, 2020

ABSTRACT

Polypharmacy is a healthcare problem of epidemic proportions in the United States. It is frequently associated with negative health outcomes in the lives of both elderly and chronically ill persons at excessive costs to the United States healthcare system. Appropriate medication management incorporating evidence-based guidelines is essential to addressing polypharmacy. Prescribing clinicians in all disciplines have expressed a lack of confidence and perceived gaps in knowledge to address polypharmacy through deprescribing. This scholarly project aimed to determine if a polypharmacy protocol intervention, based on the most current evidence-based guidelines in prescribing and deprescribing, would improve clinician confidence in the decision making to reduce polypharmacy and increase ability to recognize potentially inappropriate medications and potentially inappropriate prescribing omissions. The scholarly project utilized a quasi-experimental study design with pre-intervention and post-intervention data collection using the Clinician Polypharmacy Management Survey. Evaluation of the data demonstrated a clinically significant increase in clinician confidence and ability in the recognition of polypharmacy and capability to prescribe and deprescribe following the implementation of the protocol. Although not as strong statistically, all ten areas of confidence measured, demonstrated improvement. The results of the scholarly project agreed with the literature that implementation of evidence-based guidelines for prescribing and deprescribing increases clinician confidence in addressing polypharmacy.

Keywords: Polypharmacy, deprescribing, evidence-based guidelines, confidence, potentially inappropriate medications, clinician

Table of Contents

List of Tables

List of Abbreviations

Clinician Polypharmacy Management Survey (CPMS)

Collaborative Institutional Training Initiative (CITI)

General practitioner (GP)

[redacted] (HCH)

Independent nurse providers (INPs)

Institutional Review Board (IRB)

Nonsteroidal anti-inflammatory drugs (NSAIDs)

Over-the-counter (OTC)

Potentially inappropriate medications (PIMs)

Potentially inappropriate prescribing omissions (PPOs)

Random controlled trial (RCT)

Screening Tool of Older Persons' Potentially Inappropriate Prescriptions/Screening Tool to Alert Doctors to Right Treatment (STOPP/START)

United States (US)

Introduction: Polypharmacy

Polypharmacy is defined as the regular use of multiple medications, either prescribed, over-the-counter (OTC), or a combination. The incidence of polypharmacy most often occurs in persons receiving treatment for one or more chronic disease (Masnoon, Shakib, Kalisch-Ellett, and Caughey, 2017). Because of the correlation between polypharmacy and chronic diseases, older adults, by a significant percentage, have the highest prevalence of polypharmacy compared to other age groups. A number of concerning outcomes for elderly persons have been associated with polypharmacy, even after adjusting for chronic conditions. Research has shown these negative outcomes to include falls, adverse drug reactions, morbidity, increased length of hospital stays, and frequent readmissions to the hospital (Masnoon et al., 2017). Appropriate medication management is essential to decreasing polypharmacy, beginning with the education of all prescribing healthcare providers and continuing with up-to-date evidence-based guidelines usage by prescribing clinicians in the practice setting (Djerbib, 2018; Kostas et al., 2014; Martin, Tamblyn, Benedetti, Ahmed, and Tannenbaum, 2018). The general discomfort with reducing polypharmacy through deprescribing, by healthcare providers at all levels of experience, validates the need for evidence-based methods to address the situation (Djerbib, 2018; Farrell et al., 2018; Mecca et al., 2019). The incorporation of prescribing and deprescribing solutions into practice is crucial for proper medication management by clinicians.

Background

Although there was inconsistency in the literature on the characterization of polypharmacy, research by Masnoon, et al. (2017), determined the most commonly used definition for polypharmacy as regular use of five or more medications. The definition of older adults or elderly persons also varied in the literature. While the age of 65 or older was the most common,

it should be noted the youngest age included in the research is 50. For the purpose of the scholarly project, older adults/elderly was defined as 65 years of age or older.

Related to the high prevalence of chronic disease in the elderly, polypharmacy has been a rapidly increasing problem the last several years. In the United States (US), the prevalence of co-morbidities of two or more chronic diseases was 61% in the elderly population (Quinn & Shah, 2017). This frequency of chronic disease and the associated medical treatment resulted in 30% of elderly persons in the US with medication regimes reflecting polypharmacy (Quinn & Shah, 2017). The US is not alone in the high rate of polypharmacy, as similar incidence has been reported in many European countries, Australia, Japan, China, Brazil, Canada, and India. The problem of polypharmacy has been seen in primary care, in-home healthcare settings, adult long-term care facilities, and acute care hospitals.

An equally concerning situation and related cause for polypharmacy, has been the number of inappropriate drugs prescribed for the elderly, known as potentially inappropriate medications (PIMs) and potentially inappropriate prescribing omissions (PPOs). The occurrence of PIMs has been estimated to be as high as 50% in the elderly population (Kua, Mak, & Huey Lee, 2019). According to Kimura et al. (2016), PIMs are prescribed medications that involve an incorrect dose, frequency, or mode of administration; the duration of treatment is incorrect; high risk of clinically significant drug-drug or drug-disease interactions; or without a clear evidence-based clinical indication. PPOs are medications that are clinically indicated for the treatment of a certain condition or disease, or used to prevent disease in persons at risk. The incidence of polypharmacy increases the risk for both PIMs and PPOs in the elderly population. The elderly in the US were found to use 33% of all prescription medications and account for 40% of the OTC drugs, supplements, and herbals. The percent of adults 65 or older was estimated to be

15% of the US' population in 2014, with an estimated growth to 21% by 2030 (Mather, Jacobsen, & Pollard, 2015). Related to these projections, healthcare concerns for polypharmacy, PIMs, and PPOs will continue to be a growing problem in the US.

According to Quinn and Shah (2017) the prevalence of polypharmacy related drug reactions have been responsible for the acute care hospitalization of 4 of every1000 people each year, was among the ten most common causes of death, and was estimated to cost the healthcare system in the US upwards of $180 billion dollars annually. For the elderly population, the burden of adverse drug effects and interactions were highest with 10-15% of all hospital admissions in this age group related to an adverse drug effect (Löffler, et al., 2014). In addition to increased hospitalization, it's estimated 23% of nursing home admissions in the US were related to problems the elderly patient experience because of polypharmacy (Pasina et al., 2014). The data suggests polypharmacy increased the risk of falls, frailty, physical and cognitive dysfunction, which has lead to loss of autonomy and decreased quality of life for the elderly population (Muth et al., 2018). The far-reaching effects of polypharmacy with the immense negative impact on the lives of elderly persons and the exorbitant costs to the healthcare system is an issue that needs to be addressed at all levels of patient care.

The need for enhanced awareness to address polypharmacy and medical management within primary care in the US is recognized in the research, but implementation of evidence-based solutions has been limited and inconsistent (Campins et al., 2017; Djerbib, 2018; Mecca et al., 2019). Clinicians in multiple disciplines, including physicians, nurse practitioners, and physician assistants, have expressed discomfort with their ability to address polypharmacy through deprescribing. There are perceived gaps in their training, knowledge, and resources to effectively prioritize care when patients have multiple comorbidities coupled with polypharmacy

(Djerbib, 2018; Farrell et al., 2018; Mecca et al., 2019). Numerous reasons for clinicians' lack of confidence in addressing polypharmacy were identified, including: concerns for withdrawal, ability to monitor, stopping or changing a medications prescribed by another provider, lack of clarity related to tapering, failure in disease management, and other adverse side effects (Farrell et al., 2018).

Polypharmacy can be appropriate and justified when treating patients with multiple comorbidities. The challenge for the prescriber is achieving a balance between minimizing the risks and adverse effects of polypharmacy, while maintaining optimal control of chronic disease symptoms and progression. The situation is further complicated when patient or families are resistant to changes or there is poor adherence to current medication regimen.

An evidence-based reduction in the number of long-term medications has shown to decrease acute hospital length of stays and admissions, improve mortality, and reduce the healthcare costs to individuals and the healthcare system (Löffler, et al., 2014). Several criteria have been successfully used for reducing the burden of polypharmacy and detecting PIMs and PPOs. The most common methods included the Beers Criteria, Improved Prescribing in the Elderly Tool, and the Screening Tool of Older Persons' Potentially Inappropriate Prescriptions/Screening Tool to Alert Doctors to Right Treatment (STOPP/START) criteria (Campins et al., 2017). Other research has confirmed the simplification of medication regimens improved adherence and resulted in higher levels of patient satisfaction (Löffler, et al., 2014).

Implementing an evidence-base intervention aimed to improve competency of primary care providers in medication management and polypharmacy has demonstrated success in the research (Campins et al., 2017; Djerbib, 2018; Farrell et al., 2018; Kostas et al., 2014). Studies by Cossette et al. (2016) and Kostas et al. (2014) revealed deprescribing tools that improved

clinical judgment and guided decision-making, enhanced the learning experiences. Other preferred methods included concise presentations that emphasized the relevance of a focused educational topic, such as deprescribing, and applying the specific information to patient care (Cossette et al., 2016). Proper training and resources increased prescribing clinicians' confidence for developing and implementing changes to patient's medication regimen addressing polypharmacy, PIMs, and PPOs. An intervention to improve deprescribing and medication management in the primary care setting will provide clinicians with an evidence-based methodology and medication analysis tool that will increase competence in addressing polypharmacy. A short learning session providing education on the deprescribing tool must be focused, with clear information on usage and implementation in the practice setting. It is important the intervention is user-friendly, efficient, and effective at addressing polypharmacy through the reduction of PIMs, evaluation of PPOs, and takes into consideration patient preferences.

Problem Statement

Polypharmacy affects 30% of elderly persons in the US. The burden of polypharmacy on the elderly population in the US is reflected in increased hospitalizations and nursing home admissions, decreased quality of life related to falls, cognitive and physical impairment, and increased mortality. The additional cost to the US healthcare system for acute care hospital admissions alone was estimated at $180 billion dollars in 2014. With the percentage of adults 65 or older expected to increase 50% by the year 2030, the costs of polypharmacy to individuals and the society is a healthcare crisis in the US. Primary care providers of all disciplines are in need of effective, easy to implement methods and tools to address polypharmacy management and

deprescribing. To successfully address polypharmacy and reverse this worsening healthcare crisis in the US, the use of evidence-based protocols in primary care settings are crucial.

Purpose of the Project

The purpose of the scholarly project was to implement and evaluate the effects an evidence-based pocket-sized deprescribing tool had on primary care providers' awareness and confidence in addressing polypharmacy, PIMs, and PPOs during outpatient visits. The significance of the project was the clinician's increased understanding and ability to identify and address polypharmacy during patient primary care visits. The primary outcome was the affect a tool developed from evidence-based guidelines had on prescriber confidence in the deprescribing decision making process. The secondary outcomes were a self-evaluation of skills in recognizing PIMs and PPOs, and increased confidence to deprescribe when specific, common barriers were encountered in the presence of polypharmacy.

Clinical Question

The clinical question was "Would primary care providers in an outpatient setting (P) with the utilization of an evidence-based deprescribing protocol to reduce polypharmacy (I), experience an increase in perceived awareness and confidence to initiate medication changes (O) compared to standard practice before the introduction of the protocol (C)?"

Literature Review

Search Strategy

The search for literature began with the Jerry Falwell Library "Search Anything" box on the main page, delimited by the option of "Articles". Although separate searches were also performed using multiple databases (CINAHL Plus with Full, National Guideline Clearinghouse, Cochran Database of Systematic Reviews, ProQuest Nursing and Allied Health Database,

EBSCO, and PubMed), the results of the "Search Anything" function provided the best comprehensive search for the topic. The general delimiters were English language, published in the last 5 years, journal articles only, and scholarly and peer-reviewed articles. The search string terms of polypharmacy, elderly, research, clinical trial, intervention, PIMs, STOPP, education, learning preference, primary care, nurse practitioner, US, and deprescribing were used in various combinations resulting in 287 articles. After reviewing the first 100 articles, with some chosen for the literature review and proposal, further refinement to the list was made by limiting articles to those published in the past 3 years with a resulting 127 journal articles. Next, pilot studies, study protocols, poorly executed or reported studies, and studies that were not pertinent to the project were eliminated. Because the project was based in the US with a Western cultural view of healthcare, the studies were limited to European countries, Australia, the US, Canada, and Japan. Nineteen articles were chosen for the literature review.

Critical Appraisal

Review of the studies found seven articles with a 1 or 2 level of evidence using the Melnyk Framework, which were selected for inclusion (Melnyk & Fineout-Overholt, 2015). An additional nine studies with a Melnyk level of evidence of 3 or 4, including a systemic review of cohort/case-control studies, were chosen for the strength of the studies as well as the contribution to the evidence and knowledge of the scholarly project subject (Melnyk & Fineout-Overholt, 2015). Finally, three more research studies with a level of evidence of 5 or 6 according to the Melnyk Framework (Melnyk & Fineout-Overholt, 2015) were chosen for their contribution to better understanding the importance of the patient in deprescribing and an analysis of the dynamics influencing the decision making process of primary care providers.

Reduction of polypharmacy, PIMs, and PPOs.

A systemic review and meta-analysis by Kua et al. (2019) evaluated research studies related to polypharmacy and deprescribing, performed among elderly residents in nursing homes. A total of 41 randomized clinical studies were appraised for the research study, all matching the criteria of execution in a country with a Western culture. Overall, deprescribing interventions reduced the number of PIMs by 59% (Kua et al., 2019). Limitations in the Kua et al. (2019) study included: dissimilarities in reporting measures for the same patient outcomes, variation in outcomes measured among the studies, and some studies had a short study period. This study provided strong evidence for deprescribing as an effective method to reduce PIMs. Also, while there are a variety of methods used to accomplish deprescribing, a medication review intervention was the most successful in improving patient outcomes.

In a random controlled trial (RCT) study by Campins et al. (2017), the STOPP/START criteria was used effectively to reduce the cost and burden of polypharmacy through deprescribing medications of recruited community dwelling older adults. Evaluation of the intervention group revealed 26.5% of the prescription medications as PIMs, and a total 21.5% of the prescription medications were either discontinued, substituted, or dose adjusted (Campins et al., 2017). Also, 95.6% of the intervention group had at least one recommended change to medications (Campins et al., 2017). Continued assessments at three, six, and twelve months showed the number of prescriptions per intervention patient was significantly lower compared to the control group (Campins et al., 2017). Limitations in the Campins et al. (2017) research included potential contagion of groups, with physicians having patients in each arm of the study.

The study by Clyne et al. (2016) was a mixed method study involving an RCT and a qualitative semi-structured interview. A three-phase intervention was conducted in general

practitioner (GP) practices to reduce PIMs for older adults, and evaluated the execution and effectiveness of each of the three phases (Clyne et al., 2016). Results found just over 70% of the practices completed the medication review with the patient present (Clyne et al., 2016). Even so, the research demonstrated the effectiveness of the interventions to reduce PIMs in the elderly. Limitation involved the inability to capture a meaningful volume of qualitative data.

Next, the RCT study by Martin et al. (2018) was a pharmacist-led intervention, with recommendations for deprescribing using the Beers Criteria sent to the physician and educational deprescribing brochure to the patient. The study involved community pharmacies and recruited elderly patients each prescribed one or more Beers Criteria medications. Evaluation at six months revealed 43% of the intervention group no longer received prescriptions for the PIMs, compared to 12% of the control group. Two noted limitations, included the confounding change in guidelines calling for the discontinuation of glyburide, and the small recruitment of patients using nonsteroidal anti-inflammatory drugs (NSAIDs) or first generation antihistamines. The association and reliability of using the Beers Criteria for deprescribing with positive patient outcomes, is strengthened.

By trialing a computer decision support system in general practices, the RCT study by Muth et al. (2018), investigated if the intervention would show improvement in number of PIMs utilized by elderly with multiple co-morbidities. While results of this study showed no significant changes in patient prescriptions, quality of life, or functional status, it should be noted both the control and intervention groups had few medications identified as PIMs, and high functional status and quality of life indicators at the beginning of the study. Limitations included the Hawthorne effect with intense data collection at every visit, the lower age limit of 60 for participants, and an arbitrary definition of polypharmacy. The study still provided important

outcomes to consider in the overall scope of the proposed project, especially involving the importance of limiting the prescribing of PIMs.

The research study by Potter, Flicker, Page, and Etherton-Beer (2016) was a RCT aimed to reduce polypharmacy and PIMs usage by elderly in residential aged care facilities through medication reviews by a pharmacist and GP. In the intervention group, 348 medications were identified for deprescribing, with a total of 207 (59%) medications successfully discontinued (Potter et al., 2016). The primary limitations of the study were the small number of participants and an open design, which can lead to treatment bias. Successfully deprescribing without adverse health outcomes evidenced the importance of this study.

In the RCT study by Schäfer et al. (2018), the intervention involved three 30-minute consolations by the GP, expected to demonstrate a reduction in polypharmacy, without a negative affect on quality of life. During the 12-month study, there was no statistically significant difference, between the intervention and control groups related to change in number of medications used or quality of life indicators (Schäfer et al., 2018). The intervention group was twice as likely to receive a new prescription for an analgesic compared to the control group. Major study limitations were unobserved consults, study volunteers may have been more cooperative, and higher satisfaction with their GP compared to the population. In the instance of this study, a high intensity intervention demonstrated a neutral impact on the degree of polypharmacy.

Research by Van der Linden et al. (2017), was a quasi-experimental design study that assessed the effect of a pharmacist medications review with the application of the STOPP criteria to elderly patients' home medications. The patients were admitted to an acute geriatric ward in a university hospital. The results of the study demonstrated the intervention group had more

medications discontinued at discharge, including a higher number of PIMs, compared to the control group. Re-evaluation of both groups, 3 months after discharge, revealed patients in the intervention group continued to have less PIMs prescribed without adverse health events. Limitations of the study were lack of randomization and a follow-up period of only three months. The safe reduction of polypharmacy and PIMs in elderly patients with the use of the STOPP protocol demonstrated a positive effect on the quality of life.

A cohort study completed by Kimura et al. (2017), evaluated the efficacy of a medication review by hospital pharmacists using the STOPP criteria to deprescribe PIMs in elderly patients. Of the participants in the study, 346 were identified as having one or more PIMs. The intervention identified 310 PIMs to be discontinued, resulting in a total of 292 PIMs either discontinued or modified (Kimura et al. (2017). Limitations of the study included generalizability, initial reasons for prescribing of PIMs were not considered for deprescribing, and no evaluation of patient outcomes with discontinuation of PIMs. The research demonstrated prescribing of PIMs to be a significant problem in the elderly and can be effectively addressed using tools that are currently available.

The next study was a correlational design cohort study by Komagamine and Hagane (2017) that evaluated the effectiveness of an internal medicine physician medication assessment, for patients admitted with hip fractures. The intervention considered evidence-based use for the medication, valid indication related to age and disability level, harm versus benefits, and availability of a superior medication or non-pharmacological treatment (Komagamine & Hagane, 2017). The total prescribed PIMs was statistically lower at discharge in the intervention group. No significant differences were observed in clinical outcomes at the six-month follow-up comparing the intervention and control group. Limitations were related to the study's

retrospective observational design, no follow-up for adverse reactions, and long-term outcomes. Including only a special subset of patients may dilute the real effects of the interventions. Even with the limitations, the study showed deprescribing an effective approach to reducing PIMs.

The quasi-experimental cohort study by Urfer, Elzi, Dell-Kuster, and Bassetti (2016), assessed the safety and efficacy of a prescriber checklist using the STOPP/START criteria for reducing polypharmacy and PIMs and addressing PPOs. The study involved elderly patients hospitalized in the internal medicine wards. At admission and evaluation of both control and intervention groups, 59% had medication regimens reflecting polypharmacy, 37% had one, or more PIMs and 25% had one or more PPOs (Urfer et al., 2016). The intervention arm of the study demonstrated a 22% reduction in PIMs at discharge. In addition, there was an overall decrease in the number of total prescription medications at discharge, but less than the 20% theorized, and the reduction of PPOs at discharge was lower than expected (Urfer et al., 2016). The primary limitations experienced by the study are reduced strength of evidence compared to an RCT, and decreased generalizability related to a single site study. The strength of this study is an easy to use intervention producing a significant reduction in PIMs at discharge.

Association of polypharmacy and adverse outcomes.

Fried et al. (2014) conducted a systematic review of fifty observational studies, with four case-control studies and the rest identified as cross-sectional or longitudinal cohort studies. The purpose of the research was to summarize the health outcomes associated with polypharmacy in elderly community-dwelling persons. Results revealed the majority of the studies receiving a good rating, in terms of adjustment for comorbidities, demonstrated a significant relationship between polypharmacy and adverse outcomes. The adverse outcomes patients experienced were comprised of increased fall risk factors, falls, negative fall outcomes, patient decreased function

and cognition, and adverse drug events resulting in drug interactions, hospitalizations, and mortality (Fried et al., 2014). The strongest relationship was falls associated with polypharmacy in the better-rated studies. A few inconsistent results occurred with some studies rated as good that did not reveal a relationship between polypharmacy and adverse effects. Also, some studies rated as fair or poor, in terms of adjustments for comorbidities, did indicate an association between adverse effects and polypharmacy. Limitations identified were heterogeneity in the study populations and differing definitions of polypharmacy that made direct comparisons between studies very challenging (Fried et al., 2014). Relevant studies were likely missed considering many were found through reference lists, rather than database searches. A wide-variety in types of medications included or excluded was identified among the studies. Overall, a definitive association could not be made between polypharmacy and the adverse events listed above, but there were good associations and when considered along with other research, this study does support the relationship.

Patient secondary outcomes.

In the systemic review by Kua et al. (2019), the results showed that even with variety in reporting, deprescribing had significant impact on patient outcomes. Further analysis of the data comparing the different type of deprescribing interventions, a medication review-directed intervention was shown to reduce the number of residents experiencing falls by 24% and all-cause mortality reduced by 26% (Kua et al., 2019). The Martin et al., (2018) RCT was significant for no adverse events requiring hospitalization within the intervention group at the six-month evaluation after deprescribing. In the Potter et al. (2016) study the intervention group showed improved mortality at the 12-month evaluation. Other secondary outcomes studied: fractures, falls, hospital admissions, sleep, bowel function, physical function, cognition, quality

of life; had no significant differences between the intervention and control groups, possibly influenced by the number of study participants (Potter et al., 2016). The Schäfer et al. (2018) RCT displayed the number of hospital days was reduced in the intervention group but did not effect the degree of polypharmacy in the intervention group. At three months post-discharge in the Van der Linden et al. (2017) study, the safe reduction of polypharmacy and PIMs in elderly patients in the intervention arm showed a positive effect on quality of life, including a downward trend in emergency department visits and hospital readmission, compared to the control group.

Not all studies had the sample size necessary to properly assess secondary outcomes. In the RCT by Campins et al. (2017), the sample size was small with limited statistical power for the evaluation of secondary outcomes for emergency department visits, hospitalizations, and deaths. Another study producing no significant results was the Muth et al. (2018) RCT, where the patient population in both arms had a small occurrence of polypharmacy and PIMs. Furthermore, studies by Clyne et al. (2016), Kimura et al. (2017), Komagamine and Hagane (2017), and Urfer et al. (2016) did not perform measurements on secondary outcomes.

Patient participation.

Many studies identified the importance of patient participation in the deprescribing process. The study by Clyne et al. (2016) demonstrated changes to current medication regimens were more successful when the patient was present, reinforcing the importance of patient participation. Research by the Martin et al. (2018) also strengthened the concept when patient education was proven to be critical for deprescribing PIMs. The study by Komagamine and Hagane (2017), employed a protocol where the physician involved the patient or caregiver in the decision making process for deprescribing.

The next two research studies although qualitative studies, add significant knowledge to the subject of polypharmacy and patient point of view. The study by Pasina et al. (2014) aimed to describe adherence to medication regimen in elderly patients identified with polypharmacy after hospital discharge. Participants were contacted for telephone interviews at 2-4 weeks and three months after discharge. Results of the first follow-up call reflected patient non-adherence to medication regimens at 55.1% and at the second follow-up call, the non-adherence rate rose to 69.9% (Pasina et al., 2014). Furthermore, only 28.1% of patients reported understanding the reasons for their medications during the first call, and decreased to 25.3% during the second call at three month (Pasina et al., 2014). Limitations include small sample size, overestimation of adherence from self-reporting, and no information collected for clinical outcomes associated with non-adherence. The information revealed by the study provided a strong rational to reduce polypharmacy and simplify elderly patients' medication regimens. Also, the need for patient friendly education, better communication related to medication importance, and the need for improved understanding of medical diagnoses associated with the drug.

The qualitative study by Snell, Langran, and Donyai (2017) investigated elderly patients' perspective utilizing a questionnaire, for a pharmacist initiated, medication review addressing polypharmacy at the GP clinics. The medication reviews prompted a total of 901 medications-related changes (Snell et al., 2017). The review and educational intervention was found helpful by 83% of respondents, with 80% expressing a better understanding of their medications, and 94% stating medication-related concerns were addressed during the intervention (Snell et al., 2017). Limitations were only 51% of the eligible patients attended a medication review with only 40% of attendees completing a feedback questionnaire. Also, the longevity of the intervention was not evaluated. Patients overwhelmingly perceived the medication reviews

positively. The study reinforced the concept that patients' understanding their medication is an important and crucial step in deprescribing and addressing polypharmacy among the elderly.

Clinician competency and evidence-based deprescribing protocols.

As exampled in the Martin et al. (2018) RCT, the importance of evidence-based deprescribing protocols for the prescriber was a consistent theme in the literature. Primary care prescribers in the US have a vital role in the reduction of polypharmacy and PIMs, as well as the appropriate prescribing of PPOs. Medication management and pharmacology are vital competences for medical trainees of multiple disciplines. Learning to manage polypharmacy is a growing phenomenon in healthcare, which needs to first be addressed during the education of future prescribers (Kostas et al., 2014). Early and regular exposure to the topic of polypharmacy and methods utilized to address the issue, are important to increasing confidence and competency of all clinicians during their journey to independent practitioner and beyond.

A qualitative systemic review by Djerbib (2018) evaluated research studies related to the dynamics that influence the prescribing decision making process by primary care independent nurse providers (INPs) in the United Kingdom. A total of 10 qualitative research studies were appraised for the systemic review, all meeting the inclusion criteria: INPs, primary care practice setting, prescribing decision-making, peer-reviewed, and studies performed in the United Kingdom. The INPs identified three major themes that influence prescribing decisions: perception of competence, perception of risk, and impact on the patient. Related to the perception of competence, there was a preference for use of evidence-based guidelines and formularies to facilitate decision-making. The INPs identified patients with complex problems and polypharmacy to increase the risks of prescribing. Impact on the patient was the third concern expressed by the INPs, involving adherence, clinical need for the prescription, and

patient costs. In comparison to similar research on GPs, it was found that GPs also identified the same three major themes as influencing the prescribing process. The research provides important insight to clinicians' concerns related to competence, concerns for polypharmacy, and patient participation when prescribing, as well as a preference for the use of evidence-based guidelines. The major limitation of the study was a single reviewer of the systematic review with a potential for bias and decreased transparency.

In a quasi-experimental design study performed by Cossette et al. (2016), the aim was to evaluate the effects of a strategy using multiple interventions on the prescribing behaviors of physicians in the acute hospital setting. The outcome of the research was an absolute decrease in PIMs usage of 3.5%, which showed significant decrease in physician prescribing of new PIMs (Cossette et al., 2016). Interventions in the multi-strategy protocol included evidence-based educational material on PIMs targeted for non-introduction during hospitalization and educational presentation targeted to specific clinician groups. Barriers identified to deprescribing were pre-hospital use of PIMs and lack of information for alternative non-pharmacological or preferred/safer pharmacological options.

The research study by Farrell et al. (2018) investigated whether the implementation of evidence-based deprescribing guidelines would increase the confidence of clinicians to actively reduce and stop medications that identified as PIMs. The quasi-experimental design participants were physicians, nurse practitioners, and pharmacists both in long-term care facilities and family health practices. Over the eighteen month study, the final analysis showed a significant, overall increase in clinicians' confidence in deprescribing across multiple drug classes, when the guidelines were routinely utilized (Farrell et al., 2018). Setting did affect outcomes with the clinicians in the long-term care facilities having the highest increases in confidence and action

related to deprescribing. The most notable limitations in the Farrell et al. (2018) research, were the lack of psychometric testing of the instrument and low number of survey respondents.

In the next study, the Beers Criteria was the basis for the implementation of a workshop with the goal to improve medical trainees confidence and ability to perform accurate medication reviews (Kostas et al., 2014). The participants were internal medicine residents, physician assistant students, and geriatric fellows. Participants first completed a needs assessment, which identified medications management and polypharmacy, as one of the five most important learning topics (Kostas et al., 2014). Three months after attending the workshop 71% of participants reported making changes to patient medication regimens as a result of the information learned in the workshop (Kostas et al., 2014). The major limitations were a pre-post survey quasi-experimental design, without a control group, conducted at a single site, and low participation rate in the follow-up survey (Kostas et al., 2014). Even with these limitations, the improvement in the participants ability to identify appropriate medications for deprescribing, followed by taking action and making changes in the clinical setting, shows the strength of evidence-based deprescribing protocols in addressing polypharmacy.

Research by Mecca et al. (2019) assessed the impact an educational intervention had on the knowledge and perceptions of internal medicine and nurse practitioner residents related to polypharmacy, complex medication management, and deprescribing PIMs. The study was conducted at a veterans' primary care clinic with an intervention and control group in a quasi-experimental design study. The intervention centered on a complete medication review with analysis using evidence-based tools, guidelines, and calculators to develop a deprescribing strategy. Six months after the original intervention, both groups were given a post-test to evaluate polypharmacy knowledge. The intervention group's test scores averaged 14% higher

when compared to their pre-educational program test versus the control group's 1.3% average post-test increase. In addition, the intervention group perceived an improvement in knowledge and skills, and showed positive changes in the clinical setting demonstrated by an average of two discontinued medications for each veteran. Study limitations were the small number of residents and no long-term evaluation of discontinued medications. The research validates the consistent theme of clinician use of evidence-based deprescribing methods as an effective intervention to reduce polypharmacy, while building confidence and ability for improved care.

The articles selected for the literature review provided a strong basis for reducing polypharmacy through appropriate prescribing of PIMs and PPOs. The research reviewed included similar interventions implemented in both inpatient and outpatient settings, with positive outcomes independent of setting. Involvement of all prescribing medical disciplines is vital to managing polypharmacy. The studies demonstrated the initiation of evidence-based interventions with the specific aim to manage polypharmacy, have successfully raised clinicians' awareness, competence, and confidence in implementing protocols for deprescribing. Finally, encouraging patient involvement in the deprescribing process is an important component that needs to be considered by the prescriber for the successful of reduction of polypharmacy.

Synthesis of Evidence

The use of deprescribing is endorsed in the literature review as the key to addressing the problem of polypharmacy in elderly persons. Deprescribing is described as the reduction, substitution or discontinuation of unnecessary or inappropriate medications (Kua et al., 2019). This theme was validated in other research. Further delving into methods of deprescribing focused on medications identified as PIMs. In addition, several of the research articles gave

equal importance to evaluating and correcting medications identified as PPOs, based on patient diagnoses.

It was found deprescribing commonly followed a specific framework among the studies, starting with a comprehensive medication review and medical history including prescription and OTC drugs, supplements, and herbals. Next, was the identification of PIMs, PPOs, and other medications to consider for discontinuation or modification of current dosage. The questions asked to evaluate medications in this step included: did the patient have a medical indication for the drug; was the patient experiencing adverse effects; did potential harm outweigh benefits; did the medication provide therapeutic efficacy; and what were patient preferences. Finally, the determination of medications to discontinue or change was made based on the previous criteria, the plan for stopping/changing medications was initiated, and monitoring support was provided in follow-up. This deprescribing framework was generally employed in the research, to varying degrees, initiated by a prescribing provider, a multidisciplinary team of health care professionals, or a pharmacist medication review with recommendations to prescribers. Consultation with the patient or a family member for input and preferences was also performed in some of the studies.

There were several methods or interventions used to identify the PIMs, PPOs and other medications to discontinue or modify. Included in these methods were the STOPP/START criteria, the American Geriatrics Society Beers Criteria, targeting specific drug classes (e.g. NSAIDs, benzodiazepines, diuretics, antidepressants, and neuroleptics), educational programs for prescribers and/or patients, and computer decision support systems. The studies demonstrated these diverse methods to have various degrees of success in reducing polypharmacy through deprescribing. But, not all methods studied were equally sensitive for the identification of PIMs and PPOs.

The majority of the literature indicates the reduction of polypharmacy and PIMs can decrease the risk of adverse events in elderly persons. Among the negative consequences of polypharmacy are reduced ability to perform daily tasks, increased risk for cognitive impairment, delirium, falls, and urinary incontinence. The research suggested the more medications a person uses regularly, corresponded with increased risk of drug interactions, emergency department visits, hospital readmissions, and a rise in mortality. When measured, the studies imply an improved quality of life experienced with the reduction of polypharmacy and PIMs. There was a wide variation in the measurement of adverse effects and positive outcomes, with multiple methods utilized to measure outcomes among the studies. Evaluating the body of literature, multiple study outcomes were found positively affected by interventions used to deprescribe.

Successful managing polypharmacy, realizes patient and family participation is an important component. Patients may pressure providers to continue prescribing certain medications or a specific dosage, without a clear communication of medication changes. Often patients don't understand why they are on certain mediations, the reasons for a medication have resolved, or recognize a medication as the cause of an undesired side effect. When patients or family were educated and actively involved in the deprescribing process, the results reflect improved understanding of medication changes and a significant decrease in polypharmacy.

Acknowledging that physicians, nurse practitioners, and physician assistants are the primary care prescribers in the US, it follows the use of evidence-based deprescribing interventions in the primary care settings is crucial to addressing polypharmacy, PIMs, and PPOs. Prescribing clinicians in all disciplines perceive medication management and the ability to address polypharmacy as vital skills for current and future practice. The literature demonstrated that evidence-based deprescribing protocols incorporated into the primary care

setting is an effective method for continuing development of clinical judgment and clinician confidence necessary for appropriate prescribing and deprescribing of patient medications. Several methods for deprescribing were represented in the research and preferences by clinicians were shown to be relevant, focused and concise, user-friendly, evidence-based clinical tools.

Conceptual Framework

The conceptual framework used to guide the scholarly project was the Iowa Model of Evidence Based Care (Iowa Model Collaborative [IMC], 2017). Permission was obtained from the University of Iowa Hospitals and Clinics as evidenced by materials contained in Appendix A. Adherence to the elements of the Iowa Model of Evidence Based Care ensured the successful implementation of the scholarly project. The components addressed using the Iowa Model (IMC, 2017) were the identification of problems and triggers; the purpose of the intervention in addressing the phenomenon of interest; ensuring the topic was a priority to the organization; assembling a project team; the literature search and research critique supported the project; the development and implementation of the project; facilitated integration into practice change as appropriate; and dissemination of results.

Triggers.

Research showed polypharmacy contributed to frequent readmissions to the hospital, increased length of stay, adverse drug effects, risk of falls, physical and cognitive dysfunction, and mortality (Masnoon et al., 2017; Muth et al., 2018). Evidence depicted clinicians at all levels of practice in need of methods to improve management of polypharmacy and competency in deprescribing (Djerbib, 2018; Farrell et al., 2018; Kostas et al., 2014; Mecca et al., 2019). The research for the project has demonstrated the need for evidence-based guidelines in primary care clinics to improve polypharmacy management.

Purpose.

The purpose of the project was to evaluate the effects the an evidence-based deprescribing tool had on prescribing clinicians' confidence to address polypharmacy, PIMs, and PPOs in the primary care setting. The intervention supported the decision-making process to perform appropriate prescribing and deprescribing activities. The project increased skills and competency in the clinicians' abilities to address polypharmacy and deprescribing.

Organizational priority.

The mission statement for [redacted] (HCH) is "to provide quality, compassionate healthcare throughout the communities we serve" ([redacted] [HH], 2019). The organizational values statement of HCH is "our commitment to you is *Service Excellence*... where the patient always comes first" (HH, 2019). The scholarly project aligns with the mission and values of the organization with continued improvement in primary care through research-based methods, resulting in increased quality of care with a patient-centered experience.

Formation of the team.

The next step in the Iowa Model of Evidence Based Care (IMC, 2017) is the formation of a project team. The team for the project is the project leader, the outpatient clinical coordinator for the hospital, clinical administrators, and the medical directors of the outpatient clinics. This is the core group who made initial and ongoing decisions related to the project.

Evaluation process and pilot.

The Iowa Model of Evidence Based Care (IMC, 2017) next stage is the assembly, appraisal and synthesize of the body of evidence. The evaluation of literature, found in Appendix B, provided evidence to support the scholarly project. The literature review acknowledges the

problem of polypharmacy, use of clinical guidelines for reduction of polypharmacy, the need for medical management to address polypharmacy and deprescribing in the primary care setting, and the value of evidence-based deprescribing protocol in improving skills and confidence of prescribing clinicians. The scholarly project was a pilot program to analyze the effectiveness of an evidence-based deprescribing tool on the clinicians' perceived awareness and confidence to initiate medications changes. The evaluation tool utilized was a pre-post survey of the prescribing providers that measured confidence levels in recognition of polypharmacy and decision-making in deprescribing.

Summary

The literature supported the use of deprescribing to address the problem of polypharmacy in the elderly population. Although not consistent throughout, the majority of the literature found an association between deprescribing and decreased risk of drug interactions, adverse events, emergency department visits, hospital readmissions, and patient mortality. When measured, most of the research validated deprescribing resulted in better patient outcomes. Methods that focused on reduction of PIMs demonstrated the most effective approaches to deprescribing and addressing issues related to polypharmacy.

The importance of appropriate prescribing and evidence-based interventions that address polypharmacy were both topics shown to be important to prescribing clinicians of all disciplines (Farrell et al., 2018; Kostas et al., 2014; Mecca et al., 2019). The research supported the need in various settings to implement protocols developed for evaluating polypharmacy and PIMs, that build knowledge, skills, competency, and confidence for deprescribing (Farrell et al., 2018; Kostas et al., 2014; Mecca et al., 2019). Preferred methods were clinical tools that focus on user-friendly and relevant material (Djerbib, 2018). The evidence obtained through the literature

review supports the scholarly project, which is the implementation of a deprescribing protocol to improve skills and confidence in recognition of polypharmacy with the ability to make decisions to address deprescribing.

Methodology

Design

The proposed scholarly project was an evidence-based practice, pilot project using the Iowa Model of Evidence Based Care (IMC, 2017). The design of the project was a quasi-experimental approach with an evidence-based polypharmacy protocol designed to assist prescribing clinicians in the identification of PIMs and PPOs, and appropriate prescribing and deprescribing during primary care visits in the outpatient clinic setting. The quasi-experimental design, although with limitations, was the design preferred when it is not ethical or logistically feasible to conduct a randomized control trial (Harris, McGregor, Perencevich, & Furuno, 2006).

All participants received the deprescribing tool to be utilized during clinic visits with patients. The goal of the project was to improve primary care providers' confidence in addressing polypharmacy, PIMs and PPOs in the outpatient clinic setting. The quasi-experimental design planned, even with limitations, was expected to demonstrate a causal association between the intervention and outcomes.

Measurable Outcomes

After the receiving the deprescribing protocol and utilizing it with patients, prescribing clinicians were expected to demonstrate an increase in confidence rating on the Clinician Polypharmacy Management Survey (CPMS), after a 4 week period. When comparing pre-survey and post-survey scores, it was anticipated there would be a 10% increase in the prescriber's confidence for the deprescribing decision-making process to reduce polypharmacy.

The self-evaluation of the clinicians' confidence in recognizing PIMs and PPOs was expected to reflect a 15% increase in the post-test. The confidence ratings for the seven different barriers were anticipated to show variable increases when post-survey scores are compared to pre-survey.

Setting

The project setting was several outpatient clinics located in [redacted] County, [redacted]. The clinics are either owned by or closely associated with HCH. The HCH health system serves the residents of [redacted] and surrounding counties, with a wide range of inpatient and outpatient services. The vision statement of HCH states, "As a leader in health services, HCH encompasses all of your healthcare needs utilizing state-of-the-art technology while embracing a future of organizational growth", and the motto is "Large enough to be of service ... small enough to care" (HH, 2019). The organization is committed to improving patient care and health through the application of evidence-based practices. Providing patient-centered care, HCH serves a diverse patient population, at all levels of the health and wellness spectrum. The letters of support in Appendix C, D, and E confirms organizational support for the scholarly project.

Population

The population for the project was the HCH primary care clinic providers, comprised of physicians, nurse practitioners, and physician assistants. All providers from the four primary care clinics were invited to participate. In order to obtain additional participants, providers from two primary care offices closely affiliated with the HCH were also invited to join the project. There were a total of 15 possible participants. The inclusion criterion was the clinician must have provided primary care at least 20 hours a week. The exclusion criterion was voluntarily choosing not to participate in the project. Completion of the informed consent form and pre-intervention CPMS were required for participation in the project. An example of the informed

consent form can be found in Appendix F. The participants were assigned a random code to ensure confidentiality of information. The name-code key was stored in a locked, fireproof safe, off-site.

Ethical Considerations

The Collaborative Institutional Training Initiative (CITI) training modules for human research ethics and compliance training available on the Liberty University Institutional Review Board (IRB) website have been completed by the project leader. Certificates confirming completion can be found in Appendix G. It is important before conducting any research studies involving human subjects, the researcher has received training to ensure an ethically designed scholarly project and the protection of the human participants involved. The scholarly project was presented and approved by the assigned Liberty University project chair and the organizations invited to participate. The project was submitted to the Liberty University IRB, and the IRB letter confirming project approval can be found in Appendix H. Evaluation of the scholarly project by the IRB is vital to ensure the research is ethically acceptable, protects the rights and privacy of the participants involved, and is in compliance with federal regulations and laws.

Information gathered through the CPMS tool was stored in an Excel spreadsheet coded only by the random number initially assigned to the participant, with no other identifying information. The spreadsheet was password protected in addition to being stored on a laptop with password protection. The surveys and informed consents were stored in a locked, fireproof safe. Only the project leader has access to the spreadsheet and locked safe. The surveys, informed consents, and name-number key will be destroyed three years after completion of the project.

Data Collection and Survey Tool.

Basic demographic data was collected during the initial pre-intervention survey and includes clinic, professional title (physician, nurse practitioner, physician assistant), years in practice and practice setting (primary care or other). The project leader developed the CPMS tool based on the clinical question and barriers to deprescribing identified in the review of literature (Djerbib, 2018; Farrell et al., 2018; Kostas et al., 2014; Mecca et al., 2019). The purpose of the 10-item survey was to capture the participants' perception of confidence when deprescribing to reduce polypharmacy, recognizing PIMs and PPOs, and confidence when faced with seven common barriers to deprescribing. A 0-10 scale was utilized for each question in the CPMS tool to offer the participants a more precise definition of confidence level. The survey was reviewed with other members of the project team to assure clarity of content, improving reliability, and validity.

Participants completed the pre-intervention survey before the initial training on the use of the deprescribing protocol tool and distribution of the tool. The survey took less than 10 minutes to complete by all participants. The post intervention survey was distributed to the participants via email, four weeks after receiving the deprescribing protocol tool and returned to the project leader through return email. The pre-survey and post-survey results were entered into the IBM SPSS Statistics 25 (IBM Corp., 2016) software for statistical analysis.

Intervention

The scholarly project intervention consisted of a polypharmacy protocol booklet and a brief educational session designed to instruct the prescribing clinician on the use of the protocol. The educational presentation took approximately ten minutes. The tool was an adaptation of the STOPP/START toolkit using the following sources for current evidence-based information: the

2019 American Geriatrics Society Beers Criteria®, UpToDate, and current practice guidelines from the American Diabetes Association, the American College of Cardiology, the American Heart Association, the Centers for Disease Control and Prevention, and the American College of Chest Physicians. The final polypharmacy protocol booklet used in the scholarly project was a series of double-sided, laminated cards approximately 5.25 x 4 inches, bound with a loose-leaf ring in the upper left hand corner for ease of flipping to the desired information. Including the reference information, there were a total of 6 flip cards composing the booklet.

Timeline.

The scholarly project action plan for the approval, initiation, implementation, and evaluation of the scholarly project is contained in the following table.

Table 1. Scholarly Project Timeline

Action Item	Anticipated Completion Date
Final scholarly project proposal submitted	10/25/2019
Proposal Defense	11/6/2019
Submitted to Liberty University IRB	11/8/2019
IRB Approval	11/22/2019
Visit clinics providing education, collect pre-intervention survey data and distribute polypharmacy protocol	Week of December 1st
Start of data compilation	12/16/2019
Final survey data collection complete	Week of January 6th
Statistical Analysis	2/15/2020
Draft write up of scholarly project complete	2/17/2020
Final write up of scholarly project complete	2/25/2020
Send scholarly project to editor	2/25/2020
Final defense PowerPoint completed	2/27/2020
Final defense date	3/12/2020
Complete final revisions and submit to Scholars Crossing	3/15/2020
Disseminate information to stakeholders	3/26/2020

Feasibility analysis.

The polypharmacy scholarly project has been successfully implemented at the HCH primary care clinics and associated clinics. The project had the full support of the outpatient clinics' medical director, clinical coordinators and participating clinicians. The population of [redacted] County over the age of 65 is 18% compared to 15.9% for the State of [redacted] (HH, 2019). This larger percent of elderly adults is associated with an increased incidence of chronic disease and polypharmacy, providing the proper patient population for a successful implementation.

The major cost of the project was the printing and materials used to produce the pocket-sized polypharmacy protocol. Materials and printing were less than $100 and provided by the project leader. There were minimal risks in the implementation of the polypharmacy protocol. Use of the intervention did not replace the clinical judgment of the clinician and was initiated as a supplement to the decision making process during patient medication review. There was greater risk associated with not performing a medication review process that can decrease polypharmacy and address the inappropriate prescribing of PIMs and PPOs. The overall analysis of the scholarly project resulted in a neutral use of resources, increased confidence in primary care clinicians with the deprescribing process, and expected improvement in patient outcomes over time. These factors made the scholarly project very feasible for implementation.

Data Analysis

Following IRB approval, project implementation was initiated in the clinics, and also marked the beginning of data collection for analysis. The general characteristics of the project population were presented in a table format comprising the following information: clinic, professional title (physician, nurse practitioner, physician assistant), years in practice and

practice setting (primary care or other). Statistical analysis of the CPMS tool results was produced utilizing IBM SPSS Statistics 25 (IBM Corp., 2019). The dependent variable was the perceived awareness and confidence of the clinician to initiate medication changes to address polypharmacy through deprescribing. The 10-question CPMS tool completed by clinicians, before and after the intervention, measured the dependent variable. The independent variable was the polypharmacy protocol booklet and a brief educational session. Only the participants who completed the pretest and posttest CPMS tool were included in the data analysis.

The paired sample t-test was utilized to determine the effectiveness of the polypharmacy intervention. The analysis examined the differences between pre-survey and post-survey results obtained from the CPMS tool. Descriptive statistics included computed mean and standard deviation to describe the project outcomes and were displayed in table format. Inferential statistics included paired samples correlation and confidence interval. Inferential statistical results for each outcome measure were displayed in table format.

Results

The scholarly project was designed to assess if an evidence-based protocol for deprescribing increased clinician's perceived awareness and confidence to address polypharmacy, PIMs, and PPOs in an outpatient clinic population. Eight primary care providers, from five clinics, accepted the invitation to participate in the polypharmacy project. The eight participants (n=8) completed the pre-intervention survey, received the deprescribing tool, and a brief training on how to use the tool in practice, at each clinic. The post-intervention survey was sent to all eight participants by email four weeks after the office visits. The post-survey was completed by seven participants (n=7), 87.5 % of the original participants, one participant (n=1)

declined to complete the post survey, resulting in a non-completion rate of 12.5%. Table 1 displays the scholarly project participant numbers during the pre-survey and post-survey.

Table 2. Polypharmacy Intervention Participation by Pre-survey and Post-survey

Project Phase	Completion	Non-completion
Pre-Survey and Intervention	8	0
Post-Survey	7	1
Response Rate Post-Survey (%)	87.5	12.5

Descriptive Statistics

Only the seven participants who completed both the pre-intervention and post-intervention surveys will be included in further data analysis. Originally, the demographic information of the participants was to include clinic information. Due to the reassignment of some participants to other clinics during the four weeks between the pre-survey and post-survey data collection, clinic of practice became irrelevant as a demographic. The general characteristics of the project population are displayed in Table 2.

Table 3. General Characteristics of Project Participants

Variable	Frequency	Percentage (%) *
Professional Title		
Physician	1	14.3
Nurse Practitioner	4	57.1
Physician Assistant	2	28.6
Years in Practice		
< 5 years	3	42.9
5-15 years	2	28.6
> 15 years	2	28.6
Practice Setting		
Primary Care	6	85.7
Primary Care and Walk-in Clinic	1	14.3

*Response totals do not equal 100% due to rounding.

In order to better understand clinician's perceptions of polypharmacy and the deprescribing tool, there were three standalone questions asked of each project participant. One question was on the pre-intervention survey, asking if the clinicians perceived polypharmacy to be a major health care issue in their practice setting. The other two questions were asked on the post-intervention survey. The first question inquired if the clinician used the deprescribing tool, and the second question, if the tool was helpful in the medication prescribing/deprescribing decision-making process. The majority of the clinicians, 85.7%, did perceive polypharmacy as a major health care issue in the practice. One hundred percent of clinicians involved in the project did use the deprescribing tool and all found it to be useful in the decision making process of prescribing and deprescribing medications. Table 3 presents the results of clinicians' responses.

Table 4. General Perception of Polypharmacy Prevalence and Use of Deprescribing Tool

Question	Yes	Percentage (%)	No	Percentage (%)
Pre-intervention				
Perceive polypharmacy to be a major health care issue?	6	85.7	1	14.3
Post-intervention				
Did you use the deprescribing tool?	7	100	0	0
Was the tool helpful in the prescribing process?	7	100	0	0

The statistical analysis of the CPMS was performed utilizing IBM SPSS Statistics 25 (IBM Corp., 2019). The paired samples t-test was applied to compare the differences in the pre-survey and post-survey scores for each of the ten questions answered by the participants. The results presented in Table 4 are the statistical values for mean, standard deviation, and standard error means.

Table 5. Paired Samples Statistics Analysis Organized by CPMS Question

CPMS Question No.		N	Mean	Mean Std. Error	Standard Deviation
1	Pre-survey	7	7.43	.649	1.718
	Post-survey	7	8.00	.577	1.528
2	Pre-survey	7	8.14	.634	1.676
	Post-survey	7	8.43	.528	1.397
3	Pre-survey	7	7.29	.680	1.799
	Post-survey	7	7.71	.778	2.059
4	Pre-survey	7	5.43	.528	1.397
	Post-survey	7	6.00	.617	1.633
5	Pre-survey	7	5.00	.535	1.414
	Post-survey	7	5.14	.553	1.464
6	Pre-survey	7	6.43	1.043	2.760
	Post-survey	7	7.14	1.100	2.911
7	Pre-survey	7	7.29	.680	1.799
	Post-survey	7	7.43	.719	1.902
8	Pre-survey	7	6.43	.751	1.988
	Post-survey	7	6.57	.685	1.813
9	Pre-survey	7	5.29	1.017	2.690
	Post-survey	7	5.57	.997	2.637
10	Pre-survey	7	6.71	.918	2.430
	Post-survey	7	7.14	.911	2.410

Measurable Outcomes

The paired sample correlations are displayed in Table 5. There is an individual analysis for each of the ten questions in the CPMS. The strength of association between the pre-survey and post-survey variables, in all ten questions, was shown to have a strong positive correlation, with r values ranging from .886 to .984 and significance levels of .000 to .008.

Table 6. Paired Samples Correlations by CPMS Question

CPMS Question No.		N	Correlation (r)	Sig.
1	Pre-survey & Post-survey	7	.889	.007
2	Pre-survey & Post-survey	7	.966	.000
3	Pre-survey & Post-survey	7	.971	.000
4	Pre-survey & Post-survey	7	.950	.001
5	Pre-survey & Post-survey	7	.886	.008
6	Pre-survey & Post-survey	7	.924	.003
7	Pre-survey & Post-survey	7	.981	.000
8	Pre-survey & Post-survey	7	.984	.000
9	Pre-survey & Post-survey	7	.983	.000
10	Pre-survey & Post-survey	7	.976	.000

The main outcome expected from the intervention was an increase in the clinicians' perceived confidence in the deprescribing decision making process. This outcome was measured by question 1 on the CPMS, with a predicted increase of 10% from the pre-survey mean to the post-survey mean. The pre-post mean difference for question 1 is -.571 (see Table 6). This mean difference calculates to an increase of 7.7% using the pre-survey mean of 7.43 (see Table 2). Although there is an increase in confidence in the decision making process to deprescribe, it is less than the 10% predicted. Further analysis of the Table 6 results for question 1 ($t[7] = -1.922$ with a $df = 6$, $p = .103$ and 95% CI [-1.299, .156]), demonstrates the mean difference of -.571 is not statistically significant.

Two secondary outcomes expected of the project were an increase in clinicians' confidence in the identification of PIMs and PPOs. It was predicted the post-survey mean would demonstrate a 15% increase compared to the pre-survey results. These outcomes were measured by questions 2 and 3 on the CPMS respectively. Evaluating the identification of PIMs, a mean difference of -.286 is found for question 2 (see Table 6). This mean difference reflects an

increase of 3.5% using the pre-survey mean of 8.14 (see Table 2). The increase in ability to identify PIMs is less than the 15% predicted. Additional analysis of Table 6 results for question 2 ($t[7] = -1.549$ with a $df = 6$, $p = .172$ and 95% CI [-.737, .166]), show the mean difference of -.286 is not statistically significant. The identification of PPOs utilizes the mean difference of -.429 from question 3 (see Table 6). The mean difference calculates as an increase of 5.9% when using the pre-survey mean of 7.29 (see Table 2). This result, although demonstrating an increased ability to identify PPOs is less than the 15% predicted. Further evaluation of Table 6 results for question 3 ($t[7] = -2.121$ with a $df = 6$, $p = .078$ and 95% CI [-.923, .066]), show the mean difference of -.429 is not statistically significant.

The remaining questions on the CPMS measure the confidence level of clinicians when encountering seven commonly identified barriers to deprescribing. It was anticipated these secondary outcomes would reflect increased post-survey scores, but the results were expected to be variable and no percentage of increase was predicted. The fourth question measured confidence in ability to deprescribe when the clinician was not the original prescriber of a medication. The analysis of question 4 (Table 6) shows a significant average difference comparing pre-survey and post-survey scores ($t[7] = -2.828$ with a $df = 6$, and $p = .030$), and on average a post-survey scores were .571 higher pre-survey scores (95% CI[-1.006, -0.77]). Question 4 was the only measure on the CPMS tool to demonstrate statistical significance.

Survey questions 5-10 measured confidence level of deprescribing for clinicians in the following situations, respectively: a specialist prescribed the medications, unsure why a medications was started originally, medication is used to treat adverse effect of another medication, the patient/patient's family are resistant to change, medication is coupled to performance indicators, and concern for adverse drug effects or withdrawal. The statistical

analysis of these six questions did demonstrate increases in post-survey scores compared to pre-survey scores. But as shown in Table 6 the increases are not statistically significant.

Table 7. Paired Differences by CPMS Question

CPMS Question No. Pre-Post	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval		t	df	Sig. (2-tailed)
				Lower	Upper			
1	-.571	.787	.297	-1.299	.156	-1.922	6	.103
2	-.286	.488	.184	-.737	.166	-1.549	6	.172
3	-.429	.535	.202	-.923	.066	-2.121	6	.078
4	-.571	.535	.202	-1.066	-.077	-2.828	6	.030
5	-.143	.690	.261	-.781	.495	-.548	6	.604
6	-.714	1.113	.421	-1.743	.315	-1.698	6	.140
7	-.143	.378	.143	-.492	.207	-1.000	6	.356
8	-.143	.378	.143	-.492	.207	-1.000	6	.356
9	-.286	.488	.184	-.737	.166	-1.549	6	.172
10	-.429	.535	.202	-.923	.066	-2.121	6	.078

Discussion

Implication for Practice

The prevalence of polypharmacy within the healthcare system harms patient outcomes and costs patients and healthcare institutions tens of millions of dollars yearly (Masnoon et al., 2017; Quinn & Shah, 2017). Polypharmacy, PIMs, and PPOs effect up to 50% of the elderly population and patients with two or more chronic diseases (Kua, 2019). The clinicians involved in the project confirmed that polypharmacy was a major healthcare issue within the multiple practice settings. The need for solutions to address polypharmacy through increased awareness and confidence of clinicians is an important subject for improvement of healthcare. The findings of this project are consistent with the research indicating the need to address polypharmacy in everyday practice with the individual patient.

Decreasing polypharmacy through appropriate medication management involving clinician education and up-to-date evidence-based practice guidelines for prescribing and deprescribing in the practice setting, is supported by the literature (Djerbib, 2018; Kostas et al., 2014; Martin et al., 2018). In the research, guidelines addressing polypharmacy frequently followed a specific framework and utilized a deprescribing protocol that was based on one or more of the many evidence-based prescribing guidelines (Campins et al., 2017; Clyne et al., 2016; Kua et al., 2019; Martin et al., 2018; Urfer et al., 2016; Van der Linden et al., 2017). The polypharmacy protocol developed and used in the scholarly project was based on the proven framework and incorporated the most up-to-date evidence-based prescribing and deprescribing guidelines. The protocol tool was designed with the intention for ease of use in the outpatient clinical environment. All of the clinicians involved in the project used the polypharmacy protocol for prescribing and deprescribing in their practice. In addition, all of the clinicians found the tool was helpful in the decision-making process of prescribing and deprescribing medications. The project findings reinforced the importance of well designed, polypharmacy protocols based on evidence-based guidelines that is found in literature.

Clinician education and evidence-based practice guidelines that focus on proper prescribing and deprescribing, have been shown in the research to improve awareness of polypharmacy and increase confidence in clinicians at all levels of experience (Djerbib, 2018; Farrell et al., 2018; Mecca et al., 2019). The qualities of awareness and confidence are important to the process of addressing polypharmacy, including both inappropriately prescribed or omitted medications. The 10-question CPMS tool was used to evaluate clinicians' awareness and confidence by comparing the results of the pre-post surveys. The analysis of the CPMS tool scores demonstrated an increased overall awareness and confidence in all ten measures, although only

one measure was found to be statistically significant. Even though not statistically signification and two of the predicted outcome measures were not reached, it is clinically significant that survey results revealed an increased confidence to reduce polypharmacy and ability to recognize both PIMs and PPOs prescribed to patients. In addition, there was an increase in confidence level to deprescribe in each of the following situations: not the original prescriber of the medication, a specialist prescribed the medications, unsure why a medication was started originally, medication is used to treat adverse effect of another medication, the patient/patient's family are resistant to change, medication is coupled to performance indicators, and concern for adverse drug effects or withdrawal. The scholarly project demonstrated the effectiveness of the evidence-based polypharmacy protocol for increasing the awareness and confidence of the clinician in deprescribing.

The most notable limitation of the scholarly project was four of the seven participants had the EPIC electronic health record in their practices. The alerts, performance indicators linked to diagnoses, and clinical decision-making interfaces, all could have contributed to elevated self-evaluation scores on the CPMS, especially on the pre-survey, taken before the introduction of the polypharmacy protocol tool. The possible cause of an elevation of the pre-survey scores would have been related to the clinician's confidence in EPIC's ability to identify PPOs and contraindicated mediations. Falsely elevated confidence scores on the pre-survey could potentially lead to post-survey confidence scores not representing the true increase. Further studies could address this problem by introducing the polypharmacy protocol before the pre-survey.

A second limitation is the small sample size of the scholarly project. The small sample size, n=7, can decrease the power of the statistical analysis, reducing the confidence level of the

project results. A small sample size can affect the generalizability to another population or the repeatability in the same setting. The third limitation is the four weeks between the pre-survey and the post-survey. If the clinicians were given a longer period of time to use the protocol, three or six months, the results may have shown statistical significance (Farrell et al., 2018; Mecca et al., 2019).

The limitations discussed are important. Although only one of the ten measures was statistically significant and two of the three outcome measures were not met, the consistency of clinically significant positive results demonstrated in all ten measures, shows an increase in clinician confidence. This increase in confidence experienced by the clinicians may create positive changes in practice with the potential to benefit both patients and the organizations through an improved level of care in the outpatient clinics. The results of the project agree with the literature that confidence to address polypharmacy can be increased through use of the evidence-based guidelines (Djerbib, 2018; Farrell et al., 2018; Mecca et al., 2019).

Sustainability

The five clinics that participated in the project are owned my three different entities that are either a part of, or associated with, HCH healthcare system. The medical directors, clinic administrators, and participating clinicians have all expressed enthusiasm for the polypharmacy protocol. The clinicians have also confirmed polypharmacy as a major healthcare issue within the practices and community. Before the scholarly project proposal, addressing the substantial problem of polypharmacy within the healthcare system and clinics was not a focal point for improving patient care. The initiation of the polypharmacy intervention into the practices has introduced an evidence-based solution for addressing polypharmacy beyond the scope of the electronic health records.

Evaluation of the scholarly project outcomes has provided information on the statistical and clinical significance of the polypharmacy protocol. This information will be shared with the medical directors, clinic administrators, and participating clinicians. This group will need to determine if the protocol is appropriate for integration across the clinics, or the current participating clinicians will continue using the tools. The adoption of the intervention can be implemented with very limited resources. These costs would include a yearly update to the tool utilizing the latest evidence-based guidelines and associated reprinting cost.

Dissemination Plan

The use of evidence-based guidelines for development of interventions to address polypharmacy, PIMs, and PPOs is supported by the critical appraisal of the literature. The evaluation of the scholarly project by the medical directors, clinic administrators, and participating clinicians will determine the sustainability of the interventions and moving forward with the proposed execution of the dissemination plan. If the decision is to move forward with further introduction and integration into the clinics, the project leader will partner with the clinic administrators to complete this task. The project leader will present the polypharmacy protocol booklet with a brief educational session designed to instruct the prescribing clinicians on use of the protocol. This introductory session will be completed at any additional clinics where the intervention is implemented. If the clinic administrators wish to continue collecting data, the CPMS tool and Excel spreadsheet templates will be provided with documentation on usage. The word document containing the polypharmacy protocol will be shared with the organization and training will be offered for maintaining the protocol with future evidence-based guidelines. The completed, final scholarly project write-up will be published electronically in Liberty University's Scholars Crossing.

The challenges encountered by this project leader while working on the scholarly project have been numerous. Looking to our Father in Heaven, has sustained this project leader through this process. Two Bible verses have helped with perseverance and served as a reminder of why this student is a nurse and importance of pursuing a DNP. Philippians 2:4 (New International Version), "Do not merely look out for your own person interests, but also for the interests of other" and Galatians 6:2 (New International Version), "Bear one another's burdens, and thereby fulfill the law of Christ".

References

Campins, L., Serra-Prat, M., Gózalo, I., López, D., Palomera, E., Agustí, C., . . . on behalf of the REMEI Group. (2017). Randomized controlled trial of an intervention to improve drug appropriateness in community-dwelling polymedicated elderly people. *Family Practice, 34*(1), 36-42. doi:10.1093/fampra/cmw073

Clyne, B., Cooper, J. A., Hughes, C. M., Fahey, T., Smith, S. M., OPTI-SCRIPT study team, & on behalf of the OPTI-SCRIPT study team. (2016). A process evaluation of a cluster randomised trial to reduce potentially inappropriate prescribing in older people in primary care (OPTI-SCRIPT study). *Trials, 17*(1), 386. doi:10.1186/s13063-016-1513-z

Cossette, B., Bergeron, J., Ricard, G., Éthier, J., Joly-Mischlich, T., Levine, M., . . . Brazeau, S. (2016). Knowledge translation strategy to reduce the use of potentially inappropriate medications in hospitalized elderly adults. *Journal of the American Geriatrics Society, 64*(12), 2487-2494. doi:10.1111/jgs.14322

Djerbib, A. (2018). A qualitative systematic review of the factors that influence prescribing decisions by nurse independent prescribers in primary care. *Primary Health Care, 28*(3), 25-34. doi:10.7748/phc.2018.e1355

Farrell, B., Richardson, L., Raman-Wilms, L., de Launay, D., Alsabbagh, M. W., & Conklin, J. (2018). Self-efficacy for deprescribing: A survey for health care professionals using evidence-based deprescribing guidelines. *Research in Social and Administrative Pharmacy, 14*(1), 18-25. doi:10.1016/j.sapharm.2017.01.003

Fried, T. R., O'Leary, J., Towle, V., Goldstein, M. K., Trentalange, M., & Martin, D. K. (2014). Health outcomes associated with polypharmacy in community-dwelling older adults: A

systematic review. *Journal of the American Geriatrics Society, 62*(12), 2261-2272. doi:10.1111/jgs.13153

Harris, A. D., McGregor, J. C., Perencevich, E. N., & Furuno, J. P. (2006). The use and interpretation of quasi-experimental studies in medical informatics. *Journal of the American Medical Informatics Association, 13*(1), 16-23. doi:10.1197/jamia.M1749

[redacted]. (2019). *History.* Retrieved from [redacted]

IBM Corp. Released 2019. *IBM SPSS Statistics for Windows,* Version 25.0. Armonk, NY: IBM Corp.

Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation: Iowa model-revised. *Worldviews on Evidence-Based Nursing, 14*(3), 175-182. doi:10.1111/wvn.12223

Kimura, T., Ogura, F., Yamamoto, K., Uda, A., Nishioka, T., Kume, M., . . . Hirai, M. (2017). Potentially inappropriate medications in elderly Japanese patients: Effects of pharmacists' assessment and intervention based on screening tool of older persons' potentially inappropriate prescriptions criteria ver.2. *Journal of Clinical Pharmacy and Therapeutics, 42*(2), 209-214. doi:10.1111/jcpt.12496

Komagamine, J., & Hagane, K. (2017). Intervention to improve the appropriate use of polypharmacy for older patients with hip fractures: An observational study. *BMC Geriatrics, 17*(1), 288-9. doi:10.1186/s12877-017-0681-3

Kostas, T., Zimmerman, K., Salow, M., Simone, M., Whitmire, N., Rudolph, J. L., & McMahon, G. T. (2014). Improving medication management competency of clinical trainees in geriatrics. *Journal of the American Geriatrics Society, 62*(8), 1568-1574. doi:10.1111/jgs.12933

Kua, C., Mak, V. S. L., & Huey Lee, S. W. (2019). Health outcomes of deprescribing interventions among older residents in nursing homes: A systematic review and meta-analysis. *Journal of the American Medical Directors Association, 20*(3), 362-372.e11. doi:10.1016/j.jamda.2018.10.026

Löffler, C., Drewelow, E., Paschka, S. D., Frankenstein, M., Eger, J., Jatsch, L., . . . Altiner, A. (2014). Optimizing polypharmacy among elderly hospital patients with chronic diseases--study protocol of the cluster randomized controlled POLITE-RCT trial. *Implementation Science : IS, 9*(1), 151-151. doi:10.1186/s13012-014-0151-7

Martin, P., Tamblyn, R., Benedetti, A., Ahmed, S., & Tannenbaum, C. (2018). Effect of a pharmacist-led educational intervention on inappropriate medication prescriptions in older adults: The D-PRESCRIBE randomized clinical trial. *JAMA, 320*(18), 1889. doi:10.1001/jama.2018.16131

Masnoon, N., Shakib, S., Kalisch-Ellett, L., & Caughey, G. E. (2017). What is polypharmacy? A systematic review of definitions. *BMC Geriatrics, 17*(1), 230-10. doi:10.1186/s12877-017-0621-2

Mather, M., Jacobsen, L. A., & Pollard, K. M. (2015). *Aging in the United States: Population Bulletin 70, no. 2*. Retrieved from https://www.prb.org/wp-content/uploads/2016/01/aging-us-population-bulletin-1.pdf

Mecca, M. C., Thomas, J. M., Niehoff, K. M., Hyson, A., Jeffery, S. M., Sellinger, J., . . . Brienza, R. (2019). Assessing an interprofessional polypharmacy and deprescribing educational intervention for primary care post-graduate trainees: A quantitative and qualitative evaluation. *Journal of General Internal Medicine, 34*(4) , 1-8. doi:10.1007/s11606-019-04932-9

Melnyk, B. M., & Fineout-Overholt E. (2015). *Evidence-based practice in nursing & healthcare: A guide to best practice* (3rd ed.). Philadelphia, PA: Wolters Kluwer Health.

Muth, C., Uhlmann, L., Haefeli, W. E., Rochon, J., van den Akker, M., Perera, R., . . . Harder, S. (2018). Effectiveness of a complex intervention on prioritising multimedication in multimorbidity (PRIMUM) in primary care: Results of a pragmatic cluster randomised controlled trial. *BMJ Open, 8*(2), e017740. doi:10.1136/bmjopen-2017-017740

Pasina, L., Brucato, A. L., Falcone, C., Cucchi, E., Bresciani, A., Sottocorno, M., . . . Nobili, A. (2014). Medication non-adherence among elderly patients newly discharged and receiving polypharmacy. *Drugs & Aging, 31*(4), 283-289. doi:10.1007/s40266-014-0163-7

Potter, K., Flicker, L., Page, A., & Etherton-Beer, C. (2016). Deprescribing in frail older people: A randomised controlled trial. *PLoS One, 11*(3), e0149984. doi:10.1371/journal.pone.0149984

Quinn, K. J., & Shah, N. H. (2017). A dataset quantifying polypharmacy in the United States.*Scientific Data, 4*, 170167. doi:10.1038/sdata.2017.167

Schäfer, I., Kaduszkiewicz, H., Mellert, C., Löffler, C., Mortsiefer, A., Ernst, A., . . . Altiner, A. (2018). Narrative medicine-based intervention in primary care to reduce polypharmacy: Results from the cluster-randomised controlled trial MultiCare AGENDA. *BMJ Open, 8*(1), e017653. doi:10.1136/bmjopen-2017-017653

Snell, R., Langran, T., & Donyai, P. (2017). Patient views about polypharmacy medication review clinics run by clinical pharmacists in GP practices. *International Journal of Clinical Pharmacy, 39*(6), 1162-1165. doi:10.1007/s11096-017-0538-z

Urfer, M., Elzi, L., Dell-Kuster, S., & Bassetti, S. (2016). Intervention to improve appropriate prescribing and reduce polypharmacy in elderly patients admitted to an internal medicine unit. *PLoS One, 11*(11), e0166359. doi:10.1371/journal.pone.0166359

Van der Linden, L., Decoutere, L., Walgraeve, K., Milisen, K., Flamaing, J., Spriet, I., & Tournoy, J. (2017). Combined use of the rationalization of home medication by an adjusted STOPP in older patients (RASP) list and a pharmacist-led medication review in very old inpatients: Impact on quality of prescribing and clinical outcome. *Drugs & Aging, 34*(2), 123-133. doi:10.1007/s40266-016-0424-8

Appendix A

Permission to Use The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

[redacted] - University of Iowa Hospitals and Clinics <noreply@qualtrics-survey.com>

Tue 4/23/2019 10:41 AM

To: Steiner, Catherine <[redacted]>

You have permission, as requested today, to review and/or reproduce *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care.* Click the link below to open.

The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

Copyright is retained by University of Iowa Hospitals and Clinics. **Permission is not granted for placing on the internet.**

Citation: Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing, 14(3), 175-182. doi:10.1111/wvn.12223*

> In written material, please add the following statement:
> *Used/reprinted with permission from the University of Iowa Hospitals and Clinics, copyright 2015. For permission to use or reproduce, please contact the University of Iowa Hospitals and Clinics at 319-384-9098.*

Please contact UIHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.

Appendix B

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Campins, L., Serra-Prat, M., Gózalo, I., López, D., Palomera, E., Agustí, C., . . . on behalf of the REMEI Group. (2017). Randomized controlled trial of an intervention to improve drug appropriateness in community-dwelling polymedicated elderly people.	To assess the effectiveness and safety of implementing a medications evaluation using the STOPP/ START tools. The study is for elderly persons living in the community, with polypharmacy of 8 or more medications.	A convenience sample of 503 recruited elderly patients within the community, 70 years of age or older taking 8 or more medications.	Randomized, open-label, multicenter, parallel-arm clinical trial with follow-up.	Findings indicate 26.5% of prescriptions were potentially inappropriate and 21.5% were changed. There was at least one change in 95.6% of the intervention group. The mean number of prescription per patient was significantly lower at 3, 6, and 12 months when compared to	Level 2: randomized controlled trial	Results were not evaluated blind. Possible intervention-to-control contagion, as the same physicians had patients in each arm of the study. Sample size has limited statistical power for the secondary outcomes.	Yes, evaluation of polypharmacy using an effective tool can successfully and safely reduce the burden and cost of polypharmacy to the patient.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
				the control group. No differences in number of emergency room visits, hospitalizations, and deaths were observed.			
Clyne, B., Cooper, J. A., Hughes, C. M., Fahey, T., Smith, S. M., OPTI-SCRIPT study team, & on behalf of the OPTI-SCRIPT study team. (2016). A process evaluation of a cluster randomized	To explore intervention execution, effectiveness, and preference of a three-phase intervention to reduce inappropriate prescribing for the elderly in a primary care setting.	A purposive sampling to ensure coverage of 21 GP practices and heterogeneity of the 196 elderly patient participants.	A cluster randomized control trial employing mixed method analysis with quantitative data as well as semi-structure interviews.	Intervention delivery varied among the GP practices with just over 70% of practices completing the medication review as recommended with patient present. Changes to medication regimen were	Level 2: randomized controlled trial	Study limitations focused on qualitative data: which was limited by availability of participants as well as restrictive time allocated to the interviews.	Yes, the research shows interventions aimed to decrease the number of inappropriate prescribed medications in the elderly is effective and achievable; it also

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
trial to reduce potentially inappropriate prescribing in older people in primary care (OPTI-SCRIPT study).				more successful with patients present. Patient information leaflets were not used employed by any GP practice. Both GPs and patients viewed the OPTI-SCRIPT intervention positively.			reinforces the importance of patient participation.
Cossette, B., Bergeron, J., Ricard, G., Éthier, J., Joly-Mischlich, T., Levine, M., . . . Brazeau, S.	Evaluate the effects of a multiple interventions strategy on the prescribing behavior of	A convenience sample of 8622 patients, aged 75 and older discharged from the hospital in	A longitudinal pre-intervention and post-intervention experimental	An absolute decrease of PIMs usage of 3.5%. Interventions included: distribution of	Level 3: quasi-experimental design	Implementation of multiple interventions at different time points did not allow effects to be tracked	Yes, this research identifies successful interventions used for the decreasing

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
(2016). Knowledge translation strategy to reduce the use of potentially inappropriate medications in hospitalized elderly adults.	health professional. Each individual intervention has been shown to be effective in research literature.	2013-2014.	design.	educational material, presentation to targeted clinician groups, pharmacist presentations, computerized alerts, and comprehensive geriatric assessment.		separately. Lack of home medication lists. Effect on clinical outcomes not measured. Study was 8 months and limits the evaluation of long-term effects.	PIMs in the elderly patient in the hospital.
Djerbib, A. (2018). A qualitative systematic review of the factors that influence prescribing decisions by nurse independent	Establish and understand the dynamics that influence the prescribing decision-making process of primary care nurse independent	The sample is 10 qualitative research studies of independent nurse providers in the primary care setting, who regularly prescribe as part of patient	A systemic review of qualitative research studies matching the inclusion criteria of nurse independent prescribers,	Three major themes emerged. The first two themes are perception of competence and perception of risk. Needs identified to increase	Level 5: qualitative systemic review	There was not a second reviewer to reduce the risk of bias and improve transparency.	Yes, this research identifies the areas of perceived competence and risk as influential in the prescribing of independent

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
prescribers in primary care.	providers.	care.	primary care, prescribing decision-making, peer-reviewed and studies performed in the United Kingdom.	competence and comfort level include: knowledge, skills, education and training, experience, and evidence-based guidelines and protocols. The third theme is impact on patient, involving patient adherence, medical need, and costs.			nurse providers. It recognizes knowledge, education, and evidence-based guidelines as methods used to improve competence. Finally, it considers the impact of prescribing on patients.
Farrell, B., Richardson, L., Raman-Wilms, L., de Launay, D., Alsabbagh,	Determine whether the implementation of deprescribing	A convenience sample, participants were physicians,	A longitudinal pre-post deprescribing self-efficacy	Longitudinal data showed the profound increase in self-efficacy where	Level 3: quasi-experimental design	Low number of survey respondents and lack of psychometric	Yes, this study shows the use of evidence-based

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
M. W., & Conklin, J. (2018). Self-efficacy for deprescribing: A survey for health care professionals using evidence-based deprescribing guidelines.	guidelines would change the perception of self-efficacy of the clinician.	nurse practitioners, and pharmacists from 3 long-term cares and 3 family health teams. Total participants = 50.	survey in a quasi-experimental design.	guidelines were routinely used.		testing of the instrument.	guidelines in deprescribing increase confidence and self-efficacy.
Fried, T. R., O'Leary, J., Towle, V., Goldstein, M. K., Trentalange, M., & Martin, D. K. (2014). Health outcomes associated with polypharmacy in	Summarize health outcomes associated with polypharmacy in elderly community-dwelling persons.	The sample is 50 observational research studies of elderly persons in the community. The majority of the studies are identified as cross-sectional	A systemic review of selected observational research studies.	When polypharmacy was 4 or more medications there was more likely to be an association between measured outcomes and polypharmacy. Although	Level 4: Cohort studies (there is not a higher level of evidence using Melnyk for a systemic review of cohort/case-control studies)	Heterogeneity in study populations and the definition of polypharmacy between studies made direct comparisons challenging. Many of the	Yes, although there is a lot of heterogeneity between the studies, the association between polypharmacy and negative health outcomes is

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
community-dwelling older adults: A systematic review.		or longitudinal cohort studies with 4 case-control studies.		results and outcomes studied varied per study, the majority of studies demonstrated relationships between polypharmacy and falls, fall outcomes, fall risk factors, adverse drug events, hospitalization, mortality, measure of function and level of cognition.		studies were found through searching study reference lists; this may indicate the other relevant studies were missed. Some of the studies were broad in medications prescribed, while others were not specific to excluded or included drugs or drug classes.	strong when viewed in the overall context.
Kimura, T., Ogura, F., Yamamoto, K.,	The efficacy of an assessment	A convenience sample of 822 inpatients aged	A prospective observational	A total of 346 patients were prescribed 1 or	Level 4: cohort study	Study's generalizability limited by one	Yes, the research shows the

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Uda, A., Nishioka, T., Kume, M., . . . Hirai, M. (2017). Potentially inappropriate medications in elderly Japanese patients: Effects of pharmacists' assessment and intervention based on screening tool of older persons' potentially inappropriate prescriptions criteria ver.2.	and intervention by hospital pharmacists using the STOPP criteria related to potentially inappropriate prescriptions (PIMs) in elderly patients.	65 or older.	study from April 2015 to March 2016.	more PIMs, 310 PIMs were recommended to be discontinued, with a total of 292 PIMs discontinued or changed related to the intervention.		study site and the prescribing of PIMs drug classes may vary in different countries. Change in patient outcomes with use of the STOPP criteria was not evaluated. Reason for initial prescribing of PIM was not considered in intervention.	prescribing of PIMs is a significant problem in the elderly, which needs to be addressed. The research also found PIMs can effectively be addressed using tools that are currently available.
Komagamine, J., & Hagane,	Evaluate the effectiveness	A convenience sample of 164	A retrospective	The total number of	Level 4: correlational	The setting was a single	Yes, the intervention

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
K. (2017). Intervention to improve the appropriate use of polypharmacy for older patients with hip fractures: An observational study.	of an intervention to improve appropriate polypharmacy for elderly patients admitted to the hospital for hip fractures.	patients admitted to the hospital for a hip fracture over a two-year period. All were 65 years of age or older and prescribed 5 or more medications at admission.	observational study.	potentially inappropriate medications at discharge was significantly lower in the intervention group compared to the control group. No significant differences were observed in clinical outcomes, at the 6-month follow-up, when comparing intervention control groups.	design - cohort study	site. Observational study not a randomized controlled trial. Database information was used, with no direct contact with patient. Those lost to follow-up was high. Long-term outcomes are unknown. Adverse reactions to medications changes are not recorded.	was successful in lowering the number of medications in the control group. Other studies have shown improvements in multiple outcomes that were not measured in this study. Only looking at a special subset of patients for the intervention may dilute the real effect of the

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
							intervention.
Kostas, T., Zimmerman, K., Salow, M., Simone, M., Whitmire, N., Rudolph, J. L., & McMahon, G. T. (2014). Improving medication management competency of clinical trainees in geriatrics.	Evaluation of workshop that improves medical trainees ability to perform accurate medication reviews that result in positive changes in the management of patients' medication regimens.	A convenience sample of internal medicine residents, physician assistant students, and geriatric fellows. Total of 76 participants in the workshop and follow-up.	Quasi-experimental, before-after intervention design, with survey	The medication management workshop improved medical trainees' ability to accurately perform medication review and ability to make appropriate medications changes using deprescribing protocols.	Level 3: quasi-experimental design	The study design did not include a control group. Conducted at a single site. Low participation rate for the follow-up survey.	Yes, medical trainees in multiple disciplines were able to identify appropriate medications for deprescribing and make changes in the clinical setting with the lessons learned in the workshop.
Kua, C., Mak, V. S. L., & Huey Lee, S. W. (2019). Health outcomes of	Evaluate deprescribing studies performed among the elderly	The sample is 41 randomized clinical studies conducted in nursing homes on elderly	A systematic review and meta-analysis of randomized control trials	Medication review with directed deprescribing had significant benefits.	Level 1: systemic review and meta-analysis of randomized	Measureable clinical outcomes in areas such as falls and mortality in	Yes, deprescribing was found to be an effective approach to

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
deprescribing interventions among older residents in nursing homes: A systematic review and meta-analysis.	residents in nursing homes and the resulting clinical outcomes.	patients		Overall deprescribing interventions reduced by 59% the number of potential inappropriate medications.	controlled trials	several studies, limited the study's ability to pool data and conduct meta-analysis. Many studies had short study periods and absence of blinding. There were also variations in reporting measures for the same outcome.	reducing potentially inappropriate medications. Also, the methods in this study did not increase risks to the patients.
Martin, P., Tamblyn, R., Benedetti, A., Ahmed, S., & Tannenbaum, C. (2018). Effect of a	Compare the effect of a pharmacist-led educational intervention versus	There were 69 community pharmacies with a total of 489 recruited patients, aged 65 or older.	A pragmatic, cluster-randomized clinical trail, with the pharmacy used as the	At the six months, 43% of the intervention group was no longer receiving	Level 2: randomized controlled trial	Limited recruitment of patient using NSAIDs and 1st generation antihistamines. Guidelines	Yes, even with the limitations of the study education of the patient and primary

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
pharmacist-led educational intervention on inappropriate medication prescriptions in older adults: The D-PRESCRIBE randomized clinical trial.	standard care for the reduction of inappropriate prescriptions. Community dwelling older adults and their physicians are the focus of the intervention.	Each patient was prescribed one or more of 4 specific Beers Criteria medication groups.	unit of randomization.	prescriptions for the inappropriate medication(s) compared with 12% of the control group. No adverse events requiring hospitalization were reported.		changes for treatment of type 2 diabetes calling for the discontinuation of glyburide, was a confounding factor. Pharmacists were inconsistent distributing evidence-based information to physicians. No data collection for adverse effects not requiring hospitalization. Reasons for deprescribing were not	care providers is a consistent theme in the literature. Also, deprescribing using the Beers Criteria has reliably demonstrated positive patient outcomes in the literature.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
						collected from patients or physicians.	
Mecca, M. C., Thomas, J. M., Niehoff, K. M., Hyson, A., Jeffery, S. M., Sellinger, J., . . . Brienza, R. (2019). Assessing an interprofessional polypharmacy and deprescribing educational intervention for primary care post-graduate trainees: A quantitative and qualitative evaluation.	Assess internal medicine and nurse practitioner residents' knowledge of polypharmacy and perceptions of the interprofessional education intervention – IMPROVE	Total residents = 36, with 18 in the intervention group and 18 in the control group. Veterans receiving care = 71. Study performed in a Veterans Administration polypharmacy clinic.	Prospective cohort controlled study without randomization.	Intervention group had significant greater improvement on test scores, perceived improvement in knowledge and skills, noting positive change in practice in the clinical setting. The average number of medications discontinued per veteran was two.	Level 3: quasi-experimental design	Small number of residents in the study. Selection bias. Safety of medication discontinuation long term was not evaluated.	Yes, this study is consistent with the theme that education for deprescribing of medical trainees in multiple disciplines is an effective method to reduce polypharmacy and the importance of precepting by other professional to improve

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
							care and build confidence.
Muth, C., Uhlmann, L., Haefeli, W. E., Rochon, J., van den Akker, M., Perera, R., . . . Harder, S. (2018). Effectiveness of a complex intervention on prioritising multimedication in multimorbidity (PRIMUM) in primary care: Results of a pragmatic cluster randomised controlled trial.	Investigate the effectiveness of a computer decision support system in general practice for improving appropriately prescribed medication in older patients with multiple morbidities.	From 72 general practices in Hesse, Germany a random sampling of 505 cognitively intact patients, 60 years of age or older, 3 or more chronic diagnoses requiring 5 or more long-term drug prescriptions.	A pragmatic, cluster randomized control trial. Unit of randomization was the practice.	Findings indicate the PRIMUM intervention had no significant effects patient prescriptions, functional status, or quality of life.	Level 2: randomized control trial	Definition of polypharmacy was arbitrary. The study was population based and response rate was low, limiting the generalizability of the study. It was felt the outcome measures were more insensitive then expected. Because of the intense collection of data at every study visit, the	Likely, in this study group there was already a high quality of life and functional status and there were few medications determined to be inappropriate. This study is still provides important outcomes to consider in the overall scope of the proposed project.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
						risk of the Hawthorne effect was potentially higher than normal.	
Pasina, L., Brucato, A. L., Falcone, C., Cucchi, E., Bresciani, A., Sottocorno, M., . . . Nobili, A. (2014). Medication non-adherence among elderly patients newly discharged and receiving polypharmacy.	Identify adherence to medication regimen in elderly patients identified with polypharmacy after hospital discharge.	A convenience sample of 100 patient aged 65 or older recently discharged from an internal medicine ward in Italy throughout 2012.	Non-experimental, structured telephone interview.	Non-adherence to medication regimens was 55.1% at first follow-up (15-30 days after discharge) and 69.6% at 3-month follow-up. Number of drugs prescribed at discharge was related to medication non-adherence. Only 28.1% of patients at the	Level 6: qualitative study	Small sample size. The self-reporting method of the interviews is likely to lead to overestimation of adherence. Lack of information concerning clinical outcomes.	Yes, as it provides good data and rational for the simplification of drug regimens and the importance of patient understanding the reason for each medication prescribed.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
				first follow-up and 25.3% at the second follow-up understood the reasons for their medications.			
Potter, K., Flicker, L., Page, A., & Etherton-Beer, C. (2016). Deprescribing in frail older people: A randomised controlled trial.	Reduction in the number of medications consumed by people living in a residential aged care facility.	A convenience sample of 95 people over the age of 65, living in 4 residential aged care facilities in rural Western Australia	A randomized control study, in an open trial using a parallel design	Findings show of the 348 medications targeted for deprescribing, 207 medications or 59% were successfully discontinued.	Level 2: randomized controlled trial	Small sample size, an open design that can contribute to treatment bias.	Yes, deprescribing in the frail elderly can be accomplished without adverse affects and health outcomes.
Schäfer, I., Kaduszkiewicz, H., Mellert, C., Löffler, C., Mortsiefer, A., Ernst, A., . . .	Demonstrate an intervention based on patient-centered	Randomly selected patients from those who accepted invitations after	A two-arm cluster-randomized control trial.	There was no difference between the control and the intervention groups related	Level 2: randomized controlled trial	There is a slight patient selection bias regarding gender and specific	Likely, but valuable information is found in the study. The intensity of

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Altiner, A. (2018). Narrative medicine-based intervention in primary care to reduce polypharmacy: Results from the cluster-randomised controlled trial MultiCare AGENDA.	communication will reduce polypharmacy in the patient without negatively affecting the quality of life.	meeting study criteria, across 55 primary care practices in Germany for a total sample of 604 patients. Age 65-84 years old with at least three chronic diagnoses.		to a change in number of medications taken or quality of life indicators. The intervention group was twice as likely to receive an analgesic over the course of the study as well as spend fewer days in the hospital.		diagnosis groups. Compared to the average population, volunteers may have been more cooperative and have a higher satisfaction with their primary care. Consultations were not observed, so intervention implementation may not have followed the protocol.	the intervention (3 – 30 minute consultations) does not necessarily reduce the number of medications taken. Although not a primary outcome, days hospitalized was found to be reduced in the intervention group.
Snell, R., Langran, T., &	Investigate patient views	The sample is 819 patients,	A patient feedback	The education was found	Level 6: qualitative	Only 51% of the patient	Yes, even with the

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Donyai, P. (2017). Patient views about polypharmacy medication review clinics run by clinical pharmacists in GP practices.	regarding a patient-centered clinical pharmacist-led polypharmacy medications review service incorporated within GP clinics.	75 years of age or older with 15 or more prescribed medications, served by one of 34 GP practices in southeast England.	questionnaire was analyzed using thematic analysis and descriptive statistics.	helpful by 83% of respondents, 80% stated they understood their medications better, and 94% stating medication-related concerns before the review had their concern addressed.	design study	eligible for a medication review attended, and of those patients, only 40% filled out a feedback questionnaire. Views of the intervention were not measured for a longer period of time.	limitations of patient response, patients saw medication reviews positively. Patient understanding of their medications is important step in deprescribing and decreasing polypharmacy
Urfer, M., Elzi, L., Dell-Kuster, S., & Bassetti, S. (2016). Intervention to improve appropriate	Assess the safety and efficacy of a prescriber checklist for reducing polypharmacy	A convenience sample of 450 patients aged 65 or older, consecutively hospitalized in the internal	Single-center, intervention, quasi-experimental, before-after, cohort study.	The intervention was associated with a 22% reduction in PIMs prescribed at	Level 4: correlational design - cohort study	This study does not have the same strength of evidence as a randomized control study.	Yes, an easy to use intervention checklist produced a significant reduction in

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
prescribing and reduce polypharmacy in elderly patients admitted to an internal medicine unit.	and inappropriate prescribing using the STOPP criteria as well as the START criteria to identify potentially inappropriate prescribing omissions.	medicine wards, of a Swiss hospital. Patients were prescribed 5 or more medications at admission. The control group will be 450 consecutively admitted patients in the same wards, with the same characteristics, during the same time period the previous year.		discharge. Although an overall decrease in the number of prescription medications at discharge occurred, it was less than the 20% hypothesized. The expected reduction in the risk of potentially inappropriate prescribed omissions at discharge did not occur.		The generalizability of the study is questionable with execution at a single site. Rotation of Internal Medicine physicians to a different ward every 1-2 months can skew results.	the risk of PIMs at discharge, even with the study limitations.
Van der Linden, L., Decoutere, L.,	Assess the effect of a pharmacist	A convenience sample of 172 patients	A monocentric, perspective	In the intervention group, more	Level 3: quasi-experimental	There was no attempt to randomize the	Yes, the safe reduction of prescribed

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Walgraeve, K., Milisen, K., Flamaing, J., Spriet, I., & Tournoy, J. (2017). Combined use of the rationalization of home medication by an adjusted STOPP in older patients (RASP) list and a pharmacist-led medication review in very old inpatients: Impact on quality of prescribing and clinical outcome.	intervention using the Rationalize home medication by an Adjusted STOPP in older Patients (RASP) on inappropriate prescribing, polypharmacy, and clinical outcomes.	admitted to one of three acute geriatric wards in a university hospital in Flanders, Belgium.	control trial. Assignment to control or intervention arm determined by ward.	medications were discontinued by discharge, including PIMs, compared to the control group. In the control group there was significant improvement in quality of life, decrease in emergency department (ED) visits and hospitalizations and no adverse health events.	design	ward assignment at admission. Follow-up of patients was limited to 3 month for ED visits and hospitalization. The cause of ED visits was not tracked. The university hospital setting may not be generalizable to other acute care setting hospitals.	medications in geriatric patients has a positive effect on the quality of life and a downward trend in emergency department visits.

Appendix C

[redacted]

November 26, 2019

Attention: Institutional Review Board
Liberty University
Lynchburg, VA

RE: Catherine Steiner's Doctor of Nursing Practice Scholarly Project

To Who It May Concern,

[redacted] Outpatient Clinics are committed to improving patient care and health through the application of the most up to date, evidence-based, best practices. Ms. Catherine Steiner's Doctor of Nursing Practice Scholarly Project: The Impact of an Evidence-based Protocol to Enhance Provider Awareness and Confidence in Addressing Polypharmacy in the Outpatient Setting aligns with our commitment and we are please to support this project pending Liberty University IRB approval.

The outpatient clinics that will be eligible to participate in the project are: [redacted].

Please feel free to contact me for further assistance.

Sincerely,

[redacted]

[redacted], Administrator
Outpatient Clinics
Office: [redacted]

Appendix D

[redacted]

December 3, 2019

Attention: Institutional Review Board
Liberty University
Lynchburg, VA

RE: Catherine Steiner's Doctor of Nursing Practice Scholarly Project

To Who It May Concern,

My practice [redacted] is committed to improving patient care and health through the application of the most up to date, evidence-based, best practices. Ms. Catherine Steiner's Doctor of Nursing Practice Scholarly Project: The Impact of an Evidence-based Protocol to Enhance Provider Awareness and Confidence in Addressing Polypharmacy in the Outpatient Setting aligns with the practice's commitment and I am please to support this project pending Liberty University IRB approval.

Please feel free to contact me for further assistance.

Sincerely,

[redacted]

Appendix E

[redacted] **Medical Associates, PLC**
[redacted]
Phone: [redacted]

December 3, 2019

Attention: Institutional Review Board
Liberty University
Lynchburg, VA

RE: Catherine Steiner's Doctor of Nursing Practice Scholarly Project

To Who It May Concern,

[redacted] Medical Associates, PLC is committed to improving patient care and health through the application of the most up to date, evidence-based, best practices. Ms. Catherine Steiner's Doctor of Nursing Practice Scholarly Project: The Impact of an Evidence-based Protocol to Enhance Provider Awareness and Confidence in Addressing Polypharmacy in the Outpatient Setting aligns with the practice's commitment and we are please to support this project pending Liberty University IRB approval.

Please feel free to contact me for further assistance.

Sincerely,

[redacted]

[redacted]

Appendix F

CONSENT FORM

An Evidence-based Intervention to Enhance Provider Awareness and Confidence in Addressing Polypharmacy

Catherine M. Steiner, NP
Liberty University
School of Nursing

You are invited to be in a research study on increasing prescribing clinician's awareness and confidence in addressing polypharmacy. You were selected as a possible participant because you are a prescribing healthcare provider for patients in an outpatient clinic, either owned or affiliated with [redacted], and you work an average of 20 hours or more weekly seeing patients as their primary care provider. Please read this form and ask any questions you may have before agreeing to be in the study.

Catherine M. Steiner, a doctoral candidate in the School of Nursing at Liberty University, is conducting this study.

Background Information: The purpose of this study is to determine if an evidence-based tool for deprescribing and appropriate prescribing can increase clinician awareness and confidence to address polypharmacy.

Procedures: If you agree to be in this study, I would ask you to do the following things:

1. Complete confidential pre-survey form. This will take approximately 8 minutes
2. Take part in an introductory session providing instruction on the use of the deprescribing tool. Tool will be distributed at the beginning of the session. This will take approximately 10 minutes.
3. Complete confidential follow-up survey by email, 4 weeks after introductory session. This will take approximately 8 minutes.

Risks: The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

Benefits: The direct benefits participants may receive from taking part in this study are increased awareness and confidence in addressing polypharmacy through deprescribing and appropriate prescribing.

Compensation: Participants will not be compensated for participating in this study.

Confidentiality: The records of this study will be kept private. Any published report will not include information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records. Data will be stored in a password-protected file, on a password locked computer. Completed surveys will be stored in a locked, fireproof, file cabinet located in the researcher's private residence. Data may be used in

future presentations, with the privacy of the participants maintained. After three years, all electronic records will be deleted and original surveys will be shredded.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University or [redacted]. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

How to Withdraw from the Study: If you choose to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw, data collected from you, will be destroyed immediately and will not be included in this study

Contacts and Questions: The researcher conducting this study is Catherine M. Steiner. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at [redacted]. You may also contact the researcher's faculty chair, [redacted].

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at irb@liberty.edu.

Please notify the researcher if you would like a copy of this information for your records.

Statement of Consent: I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

_____

Signature of Participant Date

_____

Signature of Investigator Date

Appendix G

CITI PROGRAM

Completion Date 27-Mar-2019
Expiration Date 26-Mar-2022
Record ID 31074292

This is to certify that:

Catherine Steiner

Has completed the following CITI Program course:

Biomedical Research - Basic/Refresher (Curriculum Group)
Biomedical & Health Science Researchers (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

Liberty University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?wa901a392-d88a-4f0b-bbb1-5e398873e439-31074292

CITI PROGRAM

Completion Date 27-Mar-2019
Expiration Date 26-Mar-2022
Record ID 31076630

This is to certify that:

Catherine Steiner

Has completed the following CITI Program course:

LUMOC Biosafety Training (Curriculum Group)
Initial Biosafety Training (Course Learner Group)
1 - Biosafety/Biosecurity (Stage)

Under requirements set by:

Liberty University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?we4e9b3cc-8956-4552-aa18-118b46d00fe3-31076630

Appendix H

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

December 6, 2019

Catherine M. Steiner
IRB Application 4112: An Evidence-based Intervention to Enhance Provider Awareness and Confidence in Addressing Polypharmacy

Dear Catherine M. Steiner,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study does not classify as human subjects research. This means you may begin your research with the data safeguarding methods mentioned in your IRB application.

Your study does not classify as human subjects research because evidence-based practice projects are considered quality improvement activities, which are not considered "research" according to 45 CFR 46.102(d).

Please note that this decision only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued non-human subjects research status. You may report these changes by submitting a new application to the IRB and referencing the above IRB Application number.

If you have any questions about this determination or need assistance in identifying whether possible changes to your protocol would change your application's status, please email us at irb@liberty.edu.

Sincerely,

[redacted]
Administrative Chair of Institutional Research
Research Ethics Office

LIBERTY
UNIVERSITY.
Liberty University | Training Champions for Christ since 1971