

**The Implementation of an Evidence-Based Guideline for the Management of Polypharmacy in the Geriatric Population: A Quality Improvement Project**

THE DNP SCHOLARLY PROJECT  
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Kashaelyn Hollins-Henderson, MS, APRN, FNP-C

College of Nursing, Texas Woman's University

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Dr. Cheryl Thaxton

Dr. Lori Aaron

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## Abstract

**Aim:** The primary goal of this study was to evaluate the impact of evidence-based polypharmacy guidelines in managing polypharmacy and deprescribing. Geriatric patients are at high risk for polypharmacy and increasing their knowledge will increase awareness. **Methods:** A quality improvement (QI) project, which included a cross-sectional study, was performed on patients 65 and older during wellness medical visits over four weeks. The Patient Attitudes Towards Deprescribing (PATD) survey was given to each patient to evaluate pre- and post-intervention knowledge. The Beers criteria, polypharmacy clinical flow chart, and polypharmacy deprescribing flow chart were additional interventions utilized during the study. The exclusion criteria were patients aged less than 65 years, those who were not taking five or more medications, and those who were cognitively impaired.

**Results:** A total of 161 elderly patients were identified at risk for polypharmacy and overprescribing. Of the 161 patients with the prevalence of polypharmacy, 68 (42%) were deprescribed by utilizing the 2019 American Geriatrics Society Beers criteria. The average number of medications taken pre-intervention were 8.12 and 7.65 post-intervention. Patients' knowledge, across all questions, increased by 0.04% based on a paired samples *t* test. There was a slight growth despite the small effect size of 0.27, which was statistically significant  $P < 0.001$ . Clinically significant aspects of the project were the reduction of pill burden, the reduction in chances of adverse events, and the decrease in financial hardships due to unnecessary prescribing of medications. **Conclusion:** The findings show a decrease in polypharmacy and an increase in deprescribing and patient knowledge.

*Keywords:* Polypharmacy; Aging; Inappropriate prescribing; Deprescribing; Patient medication knowledge

## **Section I**

### **Introduction to the Problem**

The average person today lives longer than was common in the past, which means they are more likely to develop health problems as they age. Many people are seeing multiple doctors in response to an increasing number of age-related comorbidities and these specialty focused care providers may prescribe new medications. Thus, polypharmacy is a common problem among geriatric patients. Polypharmacy is defined as taking more medications than needed for current medical problems (Blanco-Reina et al., 2015; see Appendix A for a glossary of common terms). Health care providers must have an efficient method or tool to assess geriatric patients for polypharmacy.

Polypharmacy is the cause of many hospitalizations, falls, and cognitive declines (Brookes, 2017). Many older patients are seeing more than one doctor, and this increases the risk of polypharmacy. Living longer can be a blessing and a curse as more medications are prescribed for current medical problems and then additional treatment is needed for adverse effects of current medication regimens (Elliott, 2016). As the older population continues to grow it is imperative that guidelines are in place to help decrease the risk of polypharmacy and overprescribing. When it comes to prescribing medications, many factors must be taken into consideration; the reason, risk vs. benefit, and patients' compliance (Romskaug et al., 2017).

Many adults in the United States who are age 65 and older take more than five medications (Brookes, 2017). Older patients become accustomed to taking a medication and never question if it is still appropriate years later. According to Brunet et al. (2016), polypharmacy among the older adult population is increasing year by year. It is important to get ahead of overprescribing that is putting the elderly at risk for polypharmacy. Providers must advocate for ways to become proactive in identifying, accessing, and correcting issues that result in polypharmacy in the older population (Elliott, 2016).

The 2019 American Geriatric Society (AGS) Beers Criteria® is a tool that can help providers identify potentially inappropriate medications. This tool represents the needed attention to help aid the healthcare provider in medication reconciliation and flag possible unsafe pharmacotherapy practices for

the senior population. To create continuity of care and prevent potential pharmacotherapy problems, patients and healthcare professionals need to address polypharmacy at the primary care level.

### **Practice Setting**

The QI project was conducted by a Doctor of Nursing (DNP) student at the LTH Family Medicine (LTHFM) house call practice in Cedar Hill, Texas. This privately owned nurse practitioner practice primarily focuses on geriatric patients of all ethnicities. The practice staff includes a family nurse practitioner (FNP), a licensed vocational nurse (LVN), medical assistants (MA), an office manager, and a facilities supervisor. The practice focuses on reducing potential health risks, whereas polypharmacy remains prominent in this fragile population. There have been numerous reports of overprescribing medications to the elderly, which has led to the need to address polypharmacy and deprescribing guidelines. Inconsistent prescribing methods increase the risk of polypharmacy and decrease the rate of deprescribing. According to Romskaug et al. (2017), there is evidence supporting that many Norwegian emergency room admissions correlate with the prescribing of potentially inappropriate medications. There was an increase in adverse effects, frequent hospitalizations, and mortality the geriatric population due to the lack of polypharmacy and deprescribing guidelines. In the absence of standard guidelines for managing polypharmacy and deprescribing, there is a higher potential for unfavorable outcomes. This QI project aimed to evaluate the effectiveness of the guideline in managing polypharmacy and deprescribing using the Beers criteria (AGS, 2019) and additional screening tools within the practice.

### ***Target Population***

The target population consists of geriatric patients at risk for polypharmacy and the potential need for deprescribing. The patients selected for the study were from all ethnicities, at least 65 years of age, and taking at least five medications daily. Those under 65 years of age or taking fewer than five prescription medications were excluded.

### ***Needs Assessment***

Guidelines for managing polypharmacy and deprescribing are discussed in the literature but are not frequently used. To identify the local concerns the needs assessment focused on collected clinical

data: (a) primary demographic data, (b) polypharmacy presence, (c) medication list, (d) polypharmacy knowledge assessment, and (e) potential for deprescribing

The assessment indicated there was a knowledge deficit in staff, patients, and caregivers regarding medication use, the prescriber, and electronic medical records or patient portals. Many prescribers exhibited a clinical disconnection from each other leading to failures in performing medication reconciliation and collaboration with other prescribers or subspecialists caring for the same patient. The lack of caregiver support at home also played a vital role in placing many patients at risk for polypharmacy. Prescribers' non-compliance with guidelines currently in place to prevent polypharmacy and overprescribing is evident with the increasing number of geriatric patients falling into the category of polypharmacy. Non-compliance with the current management of polypharmacy guidelines is impacting the entire senior population (See Appendix B).

### ***SWOT Analysis***

A SWOT analysis is an effective method for devising a successful future outcome. According to Wang & Wang (2020), SWOT analysis involves identifying strengths (S), weaknesses (W), opportunities (O), threats (T), as well as other relevant factors. The SWOT methods helps identify the most effective way to audit an organization prior to research. Organizations can use a SWOT analysis to identify their strengths, weaknesses, opportunities, and threats to address what is lacking, identifying new opportunities, and minimizing risks (Mindtools, 2022). The SWOT analysis creates an opportunity to implement a method to decrease the risk of adverse polypharmacy effects by promoting transparent and concise interventions for the healthcare staff (see Appendix C).

### ***Strengths***

The foundation of helping to combat polypharmacy is based in recognizing the organizational strengths and how to build upon the strengths. The strengths determined were being a mobile clinic, utilizing highly trained staff, and who provide healthcare to the uninsured and underserved population. Healthcare professionals play an essential role in our patients' lives, especially patients who are in greater need, like the elderly. According to estimates, older adults are more susceptible to medication side effects

(Jennings et al., 2020). This senior population has many challenges regarding quality healthcare, including lack of transportation, limited or no insurance, and access to quality healthcare. Having an opportunity to be served by a mobile clinic with highly trained staff available to all populations in the community is an excellent resource.

### ***Weaknesses***

Identifying weaknesses is important as they can affect the senior population regarding the adverse effects of polypharmacy. The combined effects of polypharmacy, functional decline, multimorbidity, and frailty are likely to negatively affect older adults (Davies et al., 2019). There are several challenges to face when there is a patient knowledge deficit, electronic medical record (EMR) knowledge deficits among the staff, a lengthy-time gap between patient visits, and lack of funding. Patients affected by polypharmacy must be identified to provide early intervention and teaching. Training in the EMR system is essential to ensure everyone understands the importance of updating the medication administration record each visit to provide checks and balances between all medical providers caring for the senior population. Patients require education on their medication, mainly when a new one is prescribed. Providing verbal instruction followed by a medication information sheet allows the patient to access the information when needed. Elderly patients tend to forget at times and having a written document will decrease the risk of them taking the medication wrong and allow the patient to share it with their caregiver.

### ***Opportunities***

There are several opportunities to help decrease the number of geriatric patients who suffer from polypharmacy. Increasing patients' knowledge regarding their prescribed medications prevent unintentional and possible deadly errors. The identified opportunities were the ability to educate patients, offer mobile labs in homes including pharmacogenomics, and improvement of quality measures. Close monitoring patients taking multiple drugs helps identify potential adverse drug effects (Jennings et al., 2020).

### ***Threats***

There are many elderly patients at risk for taking potentially inappropriate medications that all threats must be considered to aid in a resolution. Some of the threats identified were pharmacological companies' pressure to prescribe, social media and news outlets, COVID-19 pandemic, and religious and cultural beliefs. "A careful review of the need for such drugs, consideration of safer alternatives, and awareness of the familiar and often non-specific nature of ADR [adverse drug reaction] manifestations in older people should, in theory, minimize ADRs and their effects in older hospitalized patients (Jennings et al., 2020)."

### **Inquiry Question**

For a primary care clinic, how does implementing an evidence-based guideline, patient/family education on polypharmacy, and utilizing a flow chart for deprescribing measures impact the rate of polypharmacy and deprescribing over four weeks?

### **PICOT Question**

The population, intervention, comparison, outcome, timeframe (PICOT) method provided the structure used to create a clinical question to find the best solution to help identify patients affected by polypharmacy and formulate a solution. The PICOT method helps guide, articulate, and narrow projected practice transformation and delivers the timeline for a short-term project (Melnik & Fineout-Overholt, 2019). The QI project definition of these elements is

- Population: Primary care clinic patients 65 years of age and older.
- Intervention: Implementation of an evidence-based guideline, patient/family education on polypharmacy, and the utilization of a flow chart (see Appendix D).
- Comparison: Current polypharmacy and describing management.
- Outcome: Rates of polypharmacy and deprescribing; and
- Time: Over four weeks

## **Purpose / Aim(s)**

The primary aim of the project was to evaluate the impact of clinical practice changes after utilizing the polypharmacy guidelines to evaluate outcomes for managing polypharmacy and deprescribing. The secondary aim was to implement a pre-and post-survey to assess patients' knowledge of polypharmacy to help determine the most effective way to decrease any knowledge deficits. Many patients are at high risk of polypharmacy and increasing their knowledge will increase their awareness and potential self-efficacy. Several variables were identified and measured during evaluation the impact of the use clinical practice guidelines on patient outcomes for the management of polypharmacy. These data were analyzed based on alignment with the Beers criteria (AGS, 2019), definitions of polypharmacy, and deprescribing flow charts. The risk of polypharmacy can be decreased by increasing healthcare professionals' knowledge. Physicians, NPs, physician assistants, and clinical pharmacists can resolve these issues through different approaches by decreasing the number of medications patients are taking. The increased cost in polypharmacy patients and decreasing the number of medications taken also helps to increase patient compliance (Rambhade et al., 2012).

## **Conceptual Framework**

### ***Iowa Model***

A framework based on the Iowa model was used for the DNP QI project. The Iowa model emphasizes the inclusion of different types of evidence through organizational collaboration (Doody & Doody, 2011). The model was chosen because it was clear, concise, and easy to follow. There are seven steps of the model: (1) selection of a topic, (2) forming a team, (3) evidence retrieval, (4) grading the evidence, (5) developing an evidence-based practice (EBP) standard, (6) implementing the EBP, and (7) evaluation (Doody & Doody, 2011). This model encourages healthcare staff to formulate questions relevant to research that will create a positive outcome in patient care. The next step was forming a team of all disciplines with different perspectives. In the subsequent evidence step, relevant resources were chosen from credible databases on polypharmacy associated with the senior population. The research reports were then selected based on the evidence grading system and only those with highest grading were

selected as supporting resources. Developing an EBP standard was reasonably straightforward as we used the *Patients Attitude Towards Deprescribing* (PATD; Schiøtz, 2018) survey screening tools to assess knowledge pre- and post-intervention (see Appendix E). Using the Iowa model was very effective and optimized implementing evidence-based research project.

There is genuine evidence supporting the need to intervene in the prevalence of polypharmacy in the geriatric population. The overall results suggest no unique solution when dealing with polypharmacy (see Appendix F). Hospital admissions show a positive correlation with polypharmacy (Wimmer et al., 2014). This finding documents the importance of ensuring a healthcare provider monitors this population's medications to help decrease hospital readmissions. Implementing the PATD survey screening tool (Schiøtz, 2018) could provide valuable information regarding the potential for medication associated death. As Elliot (2016) observes, geriatric medicine has evolved over the past century to become among the largest medical specialties in many countries (Elliott, 2016). For this reason, the DNP student who is also the project leader focused on implement screening tools which help decrease the prevalence of polypharmacy. Implementing these policies and processes will evolve geriatric health care into the future.

## Section II

### Presentation of the Evidence and Literature Review

#### Search Strategy

Finding the highest quality databases for journal selections can be very challenging. Modern libraries have unique ways of searching for literature. Texas Woman's University Library has an extensive collection of research databases. EBSCO's *CINAHL Complete* is an excellent database for healthcare-related topics. The CINAHL Complete is the digital form of the *Cumulative Index to Nursing and Allied Health Literature* with indexing of 5,400 journals of which 1,400 journals are also full text. It also has peer-reviewed books, dissertations, software, and EBP care sheets (TWU, 2022). The leading search words utilized for this project were polypharmacy and geriatric. The term geriatric allowed for excluding materials about polypharmacy dealing with other populations. As the database indexing used specific vital words, this allowed for the inclusion of all articles that dealt with the geriatric population and polypharmacy. Within this set of resources, various studies were identified and used in the compilation of a reliable amount of evidence-based research. Two studies used the same methodology is evidence of multiple perspectives were presents and documents the effort toward lack of bias in the QI project. The studies used are summarized in Appendix F.

#### Level of Evidence

Each study's strength was evaluated by a level-based measurement from the Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) model (Dang & Dearholt, 2017). These measures are

- Level I: Systematic reviews or meta-analysis of RCTs.
- Level II: Randomized controlled trials.
- Level III: Non-experimental studies, qualitative or systematic review with or without meta-synthesis.
- Level IV: Case opinions from experts, including systematic reviews and clinical practice guidelines; and
- Level V: Literature reviews, opinions of nationally recognized experts, case reports.

## Critical Appraisal

The literature search yielded many results relating to polypharmacy. Utilization exclusion criteria were patients less than 65 years of age, those not experiencing polypharmacy, and any patients who showed a cognitive impairment that could not complete the research project requirements. The DNP student critically appraised each of the 17 selected publications. Based on their evidence level, the critical appraisal evaluation yielded four systematic reviews, six random control trials, four quasi-experimental, and three guidelines (see Appendix G).

## Evidence Synthesis

The AGS (2019) updated AGS Beers criteria for potentially inappropriate medication use in older adults. There is a wide spread of prescribers who provide potentially inappropriate medication to seniors. The Beers criteria are designed primarily for use by practicing clinicians in an ambulatory, acute, and institutionalized settings, except for hospice and palliative care settings, for adults 65 years and older. The Beers criteria were created by prescribing clinicians and patients to decrease drug side effects that will prevent overprescribing in older adults. The AGS publication noted that the Beer criteria is currently under-utilized by many healthcare providers who work the senior population.

Blanco-Reina et al. (2015) conducted a cross-sectional study to determine the occurrence of polypharmacy and potential prescribing omissions in the elderly and to identify any associations among the two variables. The study focused on patients who were taking five or more medications daily. Researchers found that a total of 1844 medications were prescribed to the 407 study participants, which resulted in a polypharmacy prevalence rate of 45%. The researchers concluded that there were high rates of polypharmacy and potential prescribing omissions, as well as a clear relationship between these two concepts. Blanco-Reina et al. (2015) developed a foundation for identifying the need to provide optimal treatment to elderly patients without putting them at risk for polypharmacy.

Brookes (2017) describes the different tools that can be utilized to decrease polypharmacy and increase prescribing. These include the Beers criteria, the *Screening Tool of Older Persons Prescriptions* (STOPP), and the *Screening Tool to Alert Doctors Right Treatment* (START), all of which have been

shown to reduce polypharmacy. Given that current clinical practice guidelines do not consider long-term harms and benefits associated with all medication's older patients with multiple chronic conditions would take if evidence-based guidelines were followed, Brooks supports using Beers criteria to help manage polypharmacy. This advocacy supports the goals of this QI project's focus, deprescribing and polypharmacy education for healthcare professionals.

Often older patients will require some drug therapy, but as they get older and suffer from more chronic conditions, additional prescription therapy may be required. Brunet et al. (2015) conducted a prospective observational study of patients admitted to an acute care elderly unit. The study can be used to improve other clinicians' understanding how to effectively de-prescribe medication in older patients. Utilizing the patient-centered prescription model, based on a shared decision-making process with the patient, physicians, and a clinical pharmacist, the main objective was to identify inappropriate prescriptions in older patients and optimize them accordingly (Brunet et al., 2015).

Polypharmacy in older people may be appropriate, but it also has potential negative effects, including reduced adherence, adverse drug events, increased health care utilization, falls, cognitive impairment, and mortality (Davies et al., 2020). A systematic review done by Davies et al. (2020) showed that adverse polypharmacy outcomes in older people are complex, extensive, and conflicting. Examining 26 reviews, Davis et al. identified 230 unique studies from North America, Europe, Asia, and Australia, with five of the reviews having a distinct polypharmacy focus with 21 of the studies contributing relevant data. This information supports the QI project as it includes efforts toward making polypharmacy awareness more operationalized in the clinical setting.

The Diez-Manglano et al. (2015) study aimed to identify relationships between polypharmacy and polypathological patients. These researchers conducted a multicenter observational, prospective study on patients with poly pathologies who were admitted of internal medicine and acute geriatrics departments. Excessive polypharmacy was found to be directly associated with heart disease, respiratory disease, peripheral artery disease/diabetes with retinopathy or neuropathy, and each patient's number of

admissions. The Diez-Manglano et al. (2015) study is relevant to the QI project as it supports the need for creating awareness among clinicians on the management of polypharmacy.

As patients age, medical professionals must understand the care involved in geriatric medicine. Elliot (2016) proposes that the older population medication regimen has become intricate, increasing the need for clinical pharmacists to perform medication reconciliations. The use of multiple medications can lead to iatrogenic disease. Increasing rates of polypharmacy, therefore, make it even more important to review and revise a patient's medications to ensure that the treatment is itself not causing. Elliot's work supports all aspects of care that will help senior medical treatment and skilled pharmacy care.

Brown (2016) explains that a recent study of American nursing homes found 50% of residents were prescribed least one inappropriate medicine. This is significant because in the United States, seniors account for over one-third of all outpatient prescription drug spending (Brown, 2016). Among Brown's conclusion is that as medical treatments advance, it extends the life expectancy of elderly patients, but there is a risk for polypharmacy. Polypharmacy has critical negative consequences for the growing number of older adults, and healthcare teams need to work to decrease polypharmacy whenever feasible (Brown, 2016).

Halli-Tierney et al. (2019) notes that polypharmacy is most often observed in older adults due to chronic conditions and longer medication lists. Their study aimed to create a strategy to monitor current patient's medications and deprescribe those not clinically indicated. Halli-Tierney et al. (2019) concluded that deprescribing has many benefits and can be recognized at various levels of the clinical healthcare. The Halli-Tierney et al. study applies to the QI project and any medical providers caring for the geriatric population.

Jennings et al. (2020) conducted a systematic review and meta-analysis of hospital admissions due to medication side effects. The prevalence of adverse drug reactions in hospitalized older patients, their clinical presentations, causative drugs, severity, preventability, and measurable outcomes are unclear, and these reactions are an increasing challenge to older patient safety (Jennings et al., 2020). These researchers found that on average, 16% of hospitalized older patients experience significant adverse drug

reactions, varying in severity and primarily preventable, with commonly prescribed drug classes accounting for most ADRs. These reviewers' investigation is valid as it emphasizes the importance of the clinician's education playing a vital role in prescribing and deprescribing to prevent significant adverse drug reactions. Jennings et al.'s findings support the QI project and the need to increase awareness of tools that help prevent adverse drug reactions.

The Khamis et al. (2019) study focused on the application of the Beers criteria to determine older patients' knowledge of medication use at the University Hospital in Northern Cyprus. A cross-sectional study identified 119 elderly patients of whom 107 were eligible and 12 excluded. The prevalence of polypharmacy was 79.4%, which is identified as unpreventable formant polypharmacy of elders. Khamis et al found that several potentially inappropriate medications were identified as medications that should be avoided in hospitalized older adults. Khamis et al. used the same evidence-based guideline as this QI project.

Kilgore (2018) surveyed members of the Society for Post-Acute and Long-Term Care Medicines to determine ways to ascribe medication deeply. The respondents reported strong agreement that deprescribing can improve residents' quality of life, prevent emergency room visits in the hospital, reduce admissions time, and burden and reduce the cost to residents. One of the main focuses at the conference was understanding one's patient population and assessing any current barriers to be faced. The survey results supported deprescribing to include patients' input, targeting high-risk or not indicated medications; and for deprescribing to be successful, patients and caregivers must see improvement in quality of life. The survey results align with the QI project and can be utilized among various clinicians.

A systematic review of polypharmacy definitions was conducted by Masnoon et al. (2017) and provides one of most accurate definitions of polypharmacy. These reviewers Medline, EMBASE, and the Cochrane Library systematically searched, as well as gray literature, in their attempt to identify documents that define polypharmacy. The most common definition of polypharmacy among the 110 relevant publications was the use five or more medications per day ( $n = 51$ , 46.4%). Masnoon et al. provided the definitive definition of polypharmacy for the QI project.

Mohamed et al. (2020) conducted a systematic review and meta-analysis to compare associations of polypharmacy and inappropriate medications with adverse outcomes in older adults with cancer. The study utilized 47 articles, with several indicating an association between polypharmacy and adverse outcomes. This study highlighted implications for practice and the need to review medication profiles carefully and determine if any inappropriate medications are identified. Mohamed et al.'s results supports this QI project utilization of the Beers criteria as an implication for standardizing polypharmacy guidelines throughout practices.

Patterson et al. (2018) conducted a systematic review to determine which interventions would improve the appropriate use of polypharmacy in older adults. The studies chosen for the review focused on patients 65 years of age and older who suffered from polypharmacy and that used validated measures of appropriateness such as the Beers criteria or the medication appropriateness index (MAI). Twelve studies were used for comparison; the review results yielded post-intervention pooled group data showing a lower summated MAI score and fewer drugs per participation in intervention with the control group. Although Patterson et al. determined that it remained unclear which intervention proved to be the most helpful the review does support the QI project's goal of reducing inappropriate prescribing.

Rambhade et al. (2012) conducted a retrospective study in the Bhopal district (capital of Madhya Pradesh, India) regarding polypharmacy and the use of inappropriate medications. Rambhade et al. emphasized that polypharmacy is preventable; however, it continues to increase at an alarming rate. These researchers blame not only vehicle collisions for polypharmacy but patients as well. The risk can be decreased by emphasizing polypharmacy among the senior population and providing education to improve knowledge (Rambhade et al., 2012). This project mirrors the study in creating guidelines to prevent polypharmacy.

Sagon (2016) explains that medication costs for seniors are continuing to rise, and hundreds of medications have increased costs ten times faster than the general inflation period. This author found that consumer who took 4.5 brand-name prescription drugs daily, the annual cost of these medication rose more 300% over the 10 years prior to the 2015 cost of \$26,000. Medication cost can be an issue for

elderly patients as it could have them choose between buying their medications or paying bills. Many elderly patients are retired and on a fixed income; however, some must work to make ends meet. As a result of these findings, polypharmacy guidelines need to be adopted swiftly.

## **Themes**

### ***Primary Theme***

The primary theme for this QI project was to evaluate the importance of utilizing evidence-based guidelines to decrease polypharmacy and increase deprescribing. The evidence-based research conducted by nurse researchers helps to streamline clinical practice and promote optimal patient outcomes (Grady & Gough, 2015). The use of standard practice guidelines helps improve quality care and reduce healthcare costs, but education has a significant role in standardizing the practice guidelines (Car et al., 2019).

### ***Second Theme***

The second theme identified is to increase patient and caregiver knowledge of polypharmacy and medication use. Many patients and caregivers have no idea why they have been prescribed a medication and its use; this is one of the contributing factors to polypharmacy and overprescribing that must be addressed. Multiple chronic conditions complicate therapeutic management for healthcare providers and patients and negatively impact health outcomes (Masnoon et al., 2017).

### ***Third Theme***

The third theme was to echo the importance of provider medication reconciliation at each patient visit. Although multiple medicines or polypharmacy may be clinically appropriate in many instances, it is essential to identify patients with inappropriate polypharmacy that could increase the risk of adverse events and poor health outcomes (Masnoon et al., 2017). The elderly is at greater risk of polypharmacy, which is why prescribers must be conservative in their approach to treatment.

### **Section III**

#### **Methodological Framework**

##### **Inquiry Question Restated**

For a primary care clinic, how do implementing an evidence-based guideline, patient/family education on polypharmacy, and utilizing a flow chart for de-prescribing measures impact the rate of polypharmacy and rate of de-prescribing over a 4-week period?

##### **Project Design**

This is a QI project, and the objective is to provide an evidence-based guideline and education on polypharmacy and deprescribing. The literature review revealed that there is an increasing rate of polypharmacy among the elderly population. Patients are seeing multiple providers prescribing medications without thorough medication reconciliation during their medical visit. This can cause an overwhelming occurrence of adverse effects and overprescribe. The lack of utilization of the Beers criteria and other screening tools for polypharmacy has led to an increase in irresponsible medication prescribing. The family practice clinic staff acknowledged the need to reduce the risk of polypharmacy and increase deprescribing in our older population. Official members of the QI team include the facility's FNP, MA, clinical site supervisor, and subspecialists for consultation related to deprescribing.

##### **Institutional Review Board**

In advance and periodically, Institutional Review Boards (IRBs) protect the rights and welfare of humans participating in research (U.S. Food and Drug Administration). IRBs review research protocols and related materials (such as informed consent documents and investigator brochures) in a group process to protect the rights and welfare of human subjects (FDA, 2022). All studies that use human samples (blood, urine, tissue) or enroll human participants must obtain this approval; see Appendix H for copy of the IRB approval letter related to this project.

##### **Methodological Framework**

The methodological framework used for this quality improvement project is the Plan, Do, Study, and Act (PDSA) protocol. The Institute for Healthcare Improvement's PDSA cycle involves

-Do-planning, conducting, observing, and learning from a test and -Act- determining what changes need to be made to the test (Acumentra Health, 2013). Within the PDSA framework, we should answer the following questions: (a) What are we trying to accomplish? (b) How will I know that a change is a positive change? (C) What can be done to improve the situation? PDSA is known for gaining valuable insight from tiny sample sizes and determining if a change is necessary. The project sample size for this study is 160 and based on calculations using the Heinrich-Heine-Universität Düsseldorf (n.d.) *G\*Power* software, this sample size will yield an 80%.

### **Objective**

The project's primary aim was to evaluate the impact of clinical practice changes after utilizing polypharmacy guidelines to determine the outcomes for managing polypharmacy and deprescribing. Variables were measured to evaluate the impact of clinical practice guidelines and patient outcomes for the management of polypharmacy by analyzing the evidence using the Beers criteria, polypharmacy, and deprescribing flow charts.

### **Model for Improvement**

By developing the model for improvement, Associates in Process Improvement has developed a powerful tool for accelerating improvement. Instead of replacing change models an organization may already use, this tool aims to accelerate its improvement (Acumentra Health, 2013). The short-term goal for this QI project is to increase the utilization of evidence-based practice guidelines to decrease polypharmacy and increase deprescribing. In contrast, the long-term goal is to increase the knowledge of prescribers on the implementation of polypharmacy and deprescribing flow charts.

### **Steps of the PDSA cycle**

The QI project was supported by the project leader's understanding of the model for improvement who tested changes on a small scale with Plan-Do-Study-Act (PDSA; Acumentra Health, 2013). The PDSA cycle will guide this project to improve provider-patient and provider knowledge while utilizing highly effective evidence-based tools to decrease the risk of polypharmacy. Testing a change using PDSA

involves planning the change, executing the test, observing, and learning from the results, and determining what modifications need to be made (Acumentra Health, 2013).

### ***Plan***

The four-step approach for this project involved first its planning. PDSA cycles help identify the need for change and the background process involved before implementing the change (Institute for Healthcare Improvement, 2022). This step included forming a team which consisted of the staff from LTH Family Medicine and subspecialists for collaboration throughout the project.

### ***Do***

The next phase of the cycle consisted of educating the staff on the implementation of the project and the importance of understanding the effects of polypharmacy in the geriatric population. The patients completed a survey pre-and post-intervention to determine their knowledge of their medication regimen. The DNP student/project lead reviewed the patients experiencing polypharmacy utilizing the Beers criteria and determined if any medications should be deprescribed. Once the medications were identified, the DNP student collaborated with the subspecialist and determined if the discontinuation was appropriate. Once the intervention was concluded, the data was transcribed into an Excel spreadsheet and the data analyzed.

### ***Study***

The next step of the study was to analyze and evaluate the outcome measures. Analyzing the data and determining the effectiveness of the implementation phase made up this study phase. These data were extracted from the Excel sheet and were used to calculate the polypharmacy and deprescribing rates. The PATD survey (Schjøtz, 2018) was given pre- and post-intervention to determine if a change in knowledge was present.

### ***Act***

The screening tools identified the patients who were then currently experiencing polypharmacy were good candidates for deprescribing, and the outcome was to be permanently implemented into the

clinical practice. We implemented the appropriate modifications and will repeat the PDSA process if we need to reevaluate our update process in the future.

### **Ethical Considerations**

Ethical consideration of QI involves scientific validity, fair subject selection, and a favorable risk-benefit ratio (Melnik & Fineout-Overholt, 2019). During the QI project, ethical considerations needed to be clear and concise to ensure the study's validity. This ensured that the sample, collection, and result data yielded unbiased and high-quality results. To analyze this small sample set, the IHI model was used, as it has a powerful potential for improvement. Inclusion and exclusion criteria aligned with the project's objectives (Melnik & Fineout-Overholt, 2019). An evidence-based quality improvement project may have a relatively low risk-benefit ratio since it only uses available evidence (Melnik & Fineout-Overholt, 2019).

### ***Interprofessional Collaboration***

The QI project was led by the DNP student who was responsible for forming the team, setting aims, establishing measures, selecting changes, testing changes, and implementing. The DNP preceptor was an internal medicine physician who served as the clinical site manager. He is also a Clinical Assistant Professor of Family and Community Medicine at a nearby medical school. He is an expert panelist on topics such as lipoprotein analysis and cardiovascular risk, diabetes management, aciphex and gastroesophageal reflux disease, and combination treatment options for the complex hypertensive patient. The other key stakeholders for this project were the members of family practice clinic, the pharmacist, and collaborating physicians of the cardiology, pulmonology, rheumatology, and pulmonary specialties.

### ***Data Collection Process and Planning***

Implementing the guidelines of the QI project was conducted systematically to ensure the study's validity and produce optimal results. The first step involved looking at the patient roster for patients 65 aged years and older. Next, the medication administration records of the selected patients were reviewed to determine if the patients were experiencing polypharmacy, defined as taking five or more medications. Before the intervention, a pre-survey was conducted to assess patients' knowledge of polypharmacy.

Patients identified for polypharmacy were evaluated using the evidence based AGS Beers criteria on medication administration records. A poster, video, handouts, and short video were used to educate patients, families, and caregivers about polypharmacy and the potential need for deprescribing.

Afterward, the DNP student performed medication reconciliation after presenting the knowledge and conducting a post-education survey to assess the patient's knowledge of polypharmacy. Data analysis was carried out as the final step to depict polypharmacy and deprescribing rates. In an Excel spreadsheet, the data were transcribed and analyzed by the health care team to determine the effectiveness of the screening tool and discuss its permanent continuation.

***Plan for Data Analysis.*** Baseline demographics, polypharmacy, and deprescribing data characteristics were synthesized, and the statistical analysis took place in conjunction with Research and Design Analysis at TWU. Upon the completion of the data collection and analytical tool known as the CHI square and dependent samples T-test was performed to analyze the collected data. CHI Square statistical test compared the pre- and post-ratio of polypharmacy and deprescribing to determine if the ratio is significantly different from one another. Ideally, we want the ratio to decrease.

A dependent samples *t* test measured the change in knowledge of the patients/caregiver pre- and post-intervention, anticipating an increase in knowledge.

### ***Evaluation Plan***

After the project analysis was completed, the results were evaluated to determine the QI project's effectiveness. Showing improvement data on how many patients were at risk for polypharmacy and how many medications were discontinued were definitive measurements to show statistical validity. The Beers criteria screening tool would benefit family, adult, and geriatric clinicians who prescribe medications to decrease the risk of polypharmacy and increase deprescribing. Patients visit the emergency room and urgent care clinics when their primary physician offices are closed. Utilizing this tool universally will help the healthcare worker in more effective medication reconciliation and prevent possible polypharmacy and adverse medication reactions. The Beers screening tool is cost and time effective with a benefit that can be lifesaving for the elderly population.

**Proposed Budget and Timeline**

The QI project proposed budget was reasonable as the clinic covered it. Data collection is performed during clinic hours as approved by the clinic's owner. The clinic staff and all required resources are available for the QI project. The DNP student implemented the screening tools during the patient's medical visit using the EMR. The timeline proposed for the project was seven months from the first to the last step. The project started in December 2021 and was completed by July 2022. A GANTT chart illustrates the timeline (See Appendix I).

## Section IV

### Findings and Results

#### Characteristics of the Sample

Data were collected for patients who presented with polypharmacy and were 65 years of age or older. One hundred sixty-one patients met the inclusion criteria and were selected for the study. Sixty-six patients were excluded from the study. The reasons for excluding the patients were less than 65 years of age and taking less than five medications daily. The initial data was collected using an Excel spreadsheet, organized by demographics and categories which were then easily analyzed and assessed. Medications and updates were made to the Excel document to ensure proper data collection. The DNP student consulted with a TWU statistician, and data was tested several times to ensure accuracy, decrease error rate, and maintain stability (see Appendix J). Statistical analysis was performed using IBM SPSS.

#### Power Analysis for Targeted Sample

The *G\*-Power* software program (Heinrich-Heine-Universität Düsseldorf, n.d) was used to calculate a power analysis to determine the optimal sample size. The intention was to estimate the target sample size for 80% power,  $p$  of 0.05, and a medium effect size of 0.50. Based on the assumptions, the determined desired sample size was 161 patients. Figure 1 illustrates the results of a two-tailed, independent sample  $t$  test.

Figure 1

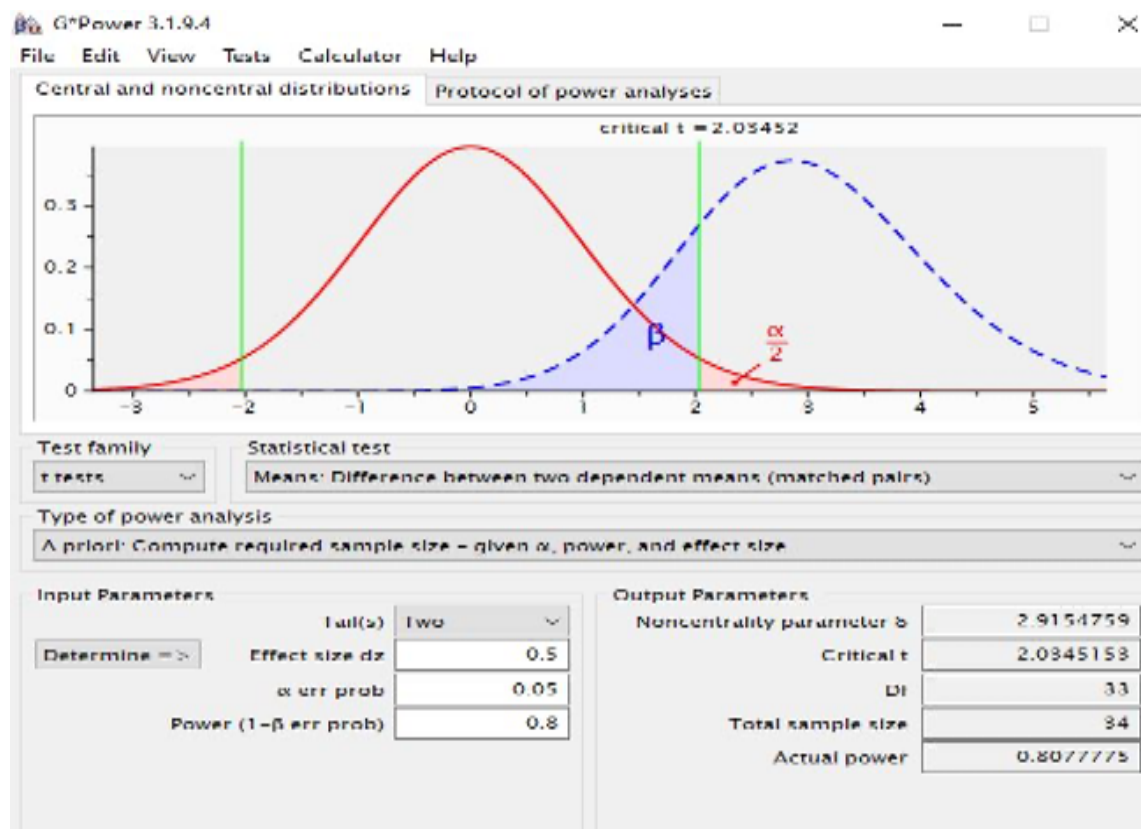
*Power Analysis of Sample***Demographic Characteristics**

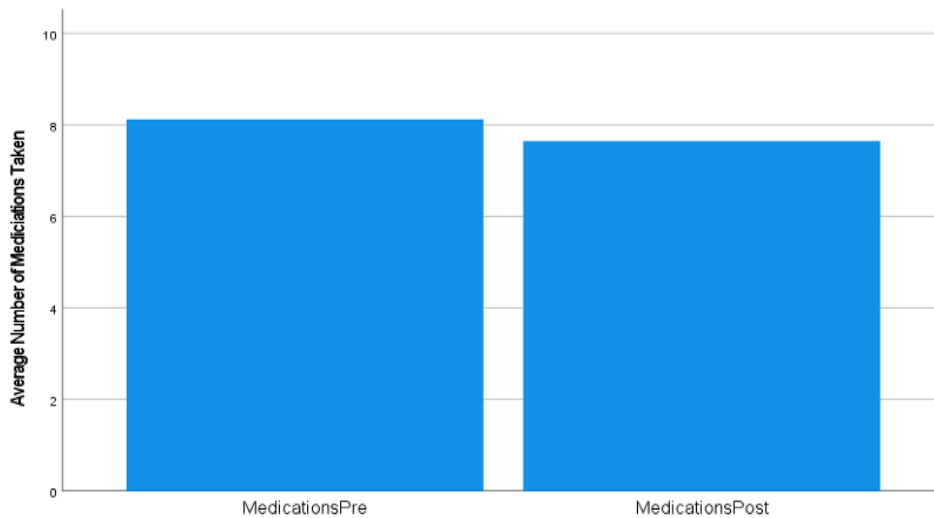
Table 1 shows the patients' basic demographics, medications pre/post, and deprescribing status. In the patient population, the median age was 74 (%), 105 (65%) were female, 56 (35%) male, 22 (14%) Caucasian, 90 (56%) African American, 46 (29%) Hispanic, and 2 (1%) other. 68 (42%) patients had a decrease in medications taken.

**Table 1*****Patient's Basic Demographic Characteristics***

| Descriptive Statistics |         |         |           |           |                |
|------------------------|---------|---------|-----------|-----------|----------------|
|                        | N       | Minimum | Maximum   | Mean      | Std. Deviation |
| Age                    | 161     | 65      | 102       | 74.37     | 8.037          |
| MedicationsPre         | 161     | 5       | 25        | 8.12      | 3.471          |
| MedicationsPost        | 161     | 3       | 23        | 7.65      | 3.325          |
| Valid N (listwise)     | 161     |         |           |           |                |
| Frequencies            |         |         |           |           |                |
| Statistics             |         |         |           |           |                |
|                        |         | Gender  | Ethnicity | Caregiver | Deprescribing  |
| N                      | Valid   | 161     | 161       | 161       | 161            |
|                        | Missing | 0       | 0         | 0         | 0              |
| Mode                   |         | 1       | 2         | 1         | 0              |
| Range                  |         | 1       | 3         | 1         | 1              |
| Minimum                |         | 1       | 1         | 0         | 0              |
| Maximum                |         | 2       | 4         | 1         | 1              |

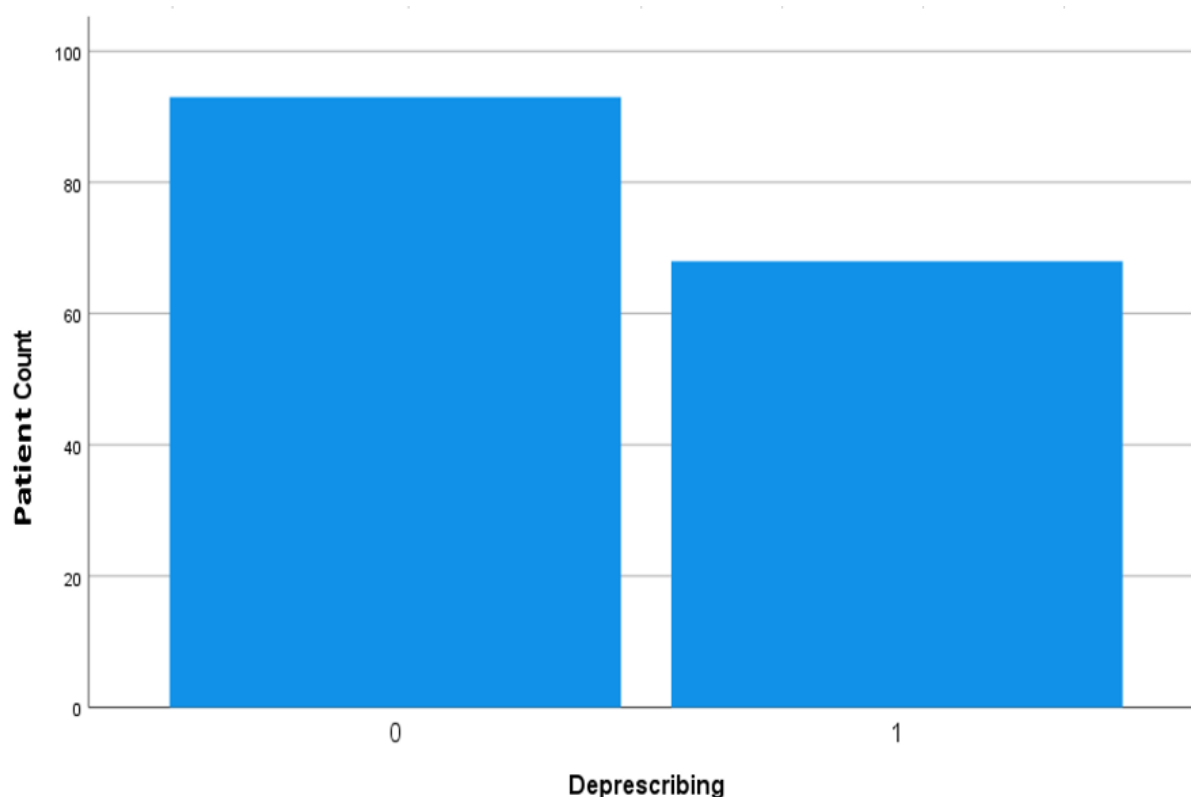
***Bar Chart on Change in Medications Pre- and Post-Implementation***

A bar chart for medication change rate pre- and post-implementation is used to describe the number of medications the patients were taking pre- versus post-implementation (See Figure 2). The minimum number of medications taken pre-intervention was five, while the maximum number medications taken was 25, with a mean of 8.12. Post-intervention, the minimum number of medications taken was 3, with the maximum being 23, with a mean of 7.65. There was a significant decrease in the number of patients taking medications.

**Figure 2*****Medication Change******Independent Samples t Test of Deprescribing***

An independent sample *t* test was conducted to compare the mean number of medications being deprescribed across all the patients identified for polypharmacy. The Beers criteria were utilized to determine inappropriate medication prescribing and evaluated those medications on the list to determine if a change was appropriate. Results of the analysis indicated that the number of patients differed on the number of medications being deprescribed,  $p < .001$  (Appendix K). Regarding deprescribing, the independent samples *t* test indicated that there was a significant difference in the number of medications deprescribed between patients,  $t(159) = -33.245$ ,  $p < .001$ ,  $d = -5.30$  (See Table 2). As shown in Figure 3, 68 (42%) patients deprescribed shows statistically significance with large effect sizes.

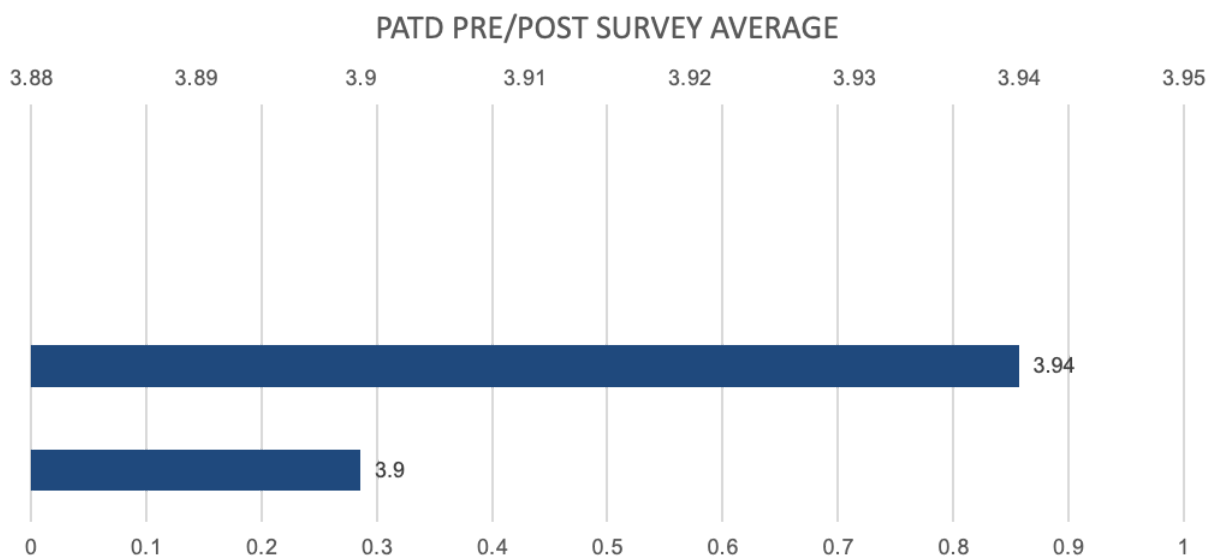


**Figure 3*****Deprescribing Outcomes******Paired Samples *t* Test of Patient's Knowledge Pre- and Post-Implementation***

Using the paired samples *t* test, we compared all patients' knowledge of medication use pre- and post-intervention (see Appendix L). The PATD survey screening tools were given during the visit and then again after intervention and education. As shown in the Table 3, the first bar labeled zero represents the number of patients who were not deprescribe, whereas the second bar labeled one represents the 68 patients (42%) who were deprescribed. Results of the analysis indicated an increase in knowledge from pre-survey to post-survey,  $p = .001$ . Regarding patient knowledge, the paired samples *t* test indicated a significant difference in the number of patients that had an increase in knowledge between patients themselves,  $t(160) = 3.357$ ,  $p = .001$ ,  $d = 0.27$  (See Table 3). As shown in Figure 4, on average, patients demonstrated an increase in knowledge of deprescribing of 0.03 points (from 3.90 to 3.94) across all items.

**Table 3*****Patients Who Were Deprescribed***

| Paired Samples Test                                                                                                                                                                                                                        |                        |                    |                          |                 |                                           |         |       |     |              |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------|--------------------------|-----------------|-------------------------------------------|---------|-------|-----|--------------|-------------|
|                                                                                                                                                                                                                                            |                        | Paired Differences |                          |                 |                                           |         | t     | df  | Significance |             |
|                                                                                                                                                                                                                                            |                        | Mean               | Std. Deviation           | Std. Error Mean | 95% Confidence Interval of the Difference |         |       |     | One-Sided p  | Two-Sided p |
|                                                                                                                                                                                                                                            |                        |                    |                          |                 | Lower                                     | Upper   |       |     |              |             |
| Pair 1                                                                                                                                                                                                                                     | Post_Total - Pre_Total | 0.03478            | 0.13146                  | 0.01036         | 0.01432                                   | 0.05524 | 3.357 | 160 | 0.000        | 0.001       |
| Paired Samples Effect Sizes                                                                                                                                                                                                                |                        |                    |                          |                 |                                           |         |       |     |              |             |
|                                                                                                                                                                                                                                            |                        |                    | Standardize <sup>a</sup> | Point Estimate  | 95% Confidence Interval                   |         |       |     |              |             |
|                                                                                                                                                                                                                                            |                        |                    |                          |                 | Lower                                     | Upper   |       |     |              |             |
| Pair 1                                                                                                                                                                                                                                     | Post_Total - Pre_Total | Cohen's d          | 0.13146                  | 0.265           | 0.107                                     | 0.421   |       |     |              |             |
|                                                                                                                                                                                                                                            |                        | Hedges' correction | 0.13208                  | 0.263           | 0.107                                     | 0.419   |       |     |              |             |
| a. The denominator used in estimating the effect sizes.<br>Cohen's d uses the sample standard deviation of the mean difference.<br>Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor. |                        |                    |                          |                 |                                           |         |       |     |              |             |

**Figure 4*****Patient Knowledge Outcome******Paired Samples t Test of Medication Numbers Pre- and Post-Implementation***

Once the inappropriate medications were identified using the Beers criteria, the polypharmacy deprescribing and clinical practice flowchart were used in the deprescribing process. To depict the rate of deprescribing, a paired samples *t* test was conducted to compare the patient's number of medications pre-

and post-intervention to depict rate of deprescribing (see Appendix M). Results of the analysis indicated a decrease in the number of medications taken from pre-intervention to post-intervention,  $p < .001$ .

Regarding the number of medications taken pre/post-intervention, the paired samples  $t$  test indicated that there was a significant difference between patients deprescribing that had a decrease in medication use between patients themselves,  $t(160) = -10.11$ ,  $p < .001$ ,  $d = -.80$  (See Table 4). As shown in Figure 5, patients had a statistically significant decrease in medications taken from, on average, 8.12 to 7.65 (.47 decrease).

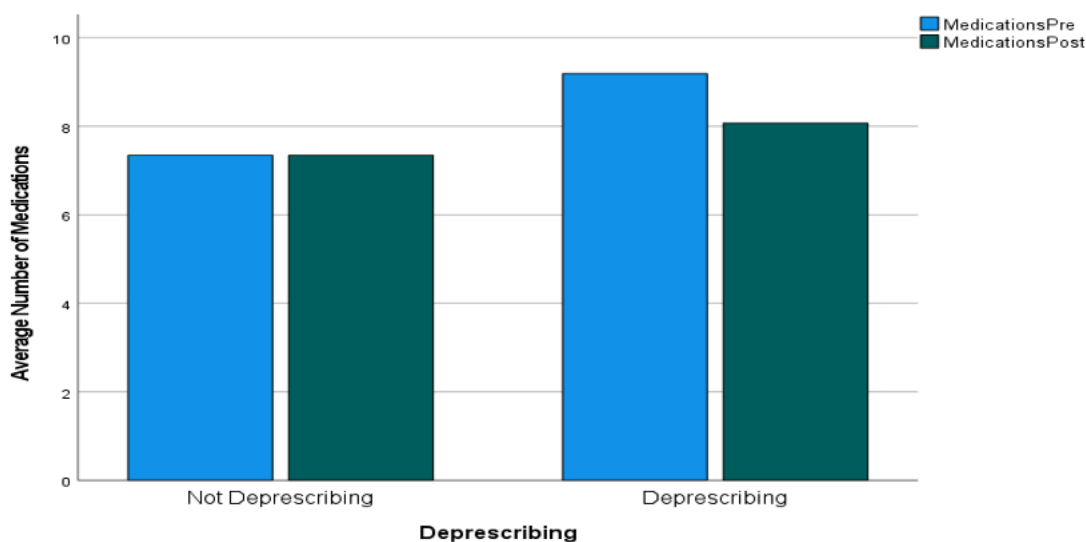
**Table 4**

**Number of Medications Taken Per Person Pre/Post-intervention**

| Paired Samples Test                                                                                                                                                                                                                        |                                  |                           |                |                         |                                           |        |              |     |             |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------|----------------|-------------------------|-------------------------------------------|--------|--------------|-----|-------------|-------------|
|                                                                                                                                                                                                                                            |                                  | Paired Differences        |                |                         |                                           |        | Significance |     |             |             |
|                                                                                                                                                                                                                                            |                                  | Mean                      | Std. Deviation | Std. Error Mean         | 95% Confidence Interval of the Difference |        | t            | df  | One-Sided p | Two-Sided p |
|                                                                                                                                                                                                                                            |                                  |                           |                |                         | Lower                                     | Upper  |              |     |             |             |
| Pair 1                                                                                                                                                                                                                                     | MedicationsPost - MedicationsPre | -0.472                    | 0.592          | 0.047                   | -0.564                                    | -0.380 | -10.113      | 160 | 0.000       | 0.000       |
| Paired Samples Effect Sizes                                                                                                                                                                                                                |                                  |                           |                |                         |                                           |        |              |     |             |             |
|                                                                                                                                                                                                                                            |                                  | Standardized <sup>a</sup> | Point Estimate | 95% Confidence Interval |                                           |        |              |     |             |             |
|                                                                                                                                                                                                                                            |                                  |                           |                | Lower                   | Upper                                     |        |              |     |             |             |
|                                                                                                                                                                                                                                            |                                  |                           |                |                         |                                           |        |              |     |             |             |
| Pair 1                                                                                                                                                                                                                                     | MedicationsPost - MedicationsPre | Cohen's d                 | 0.592          | -0.797                  | -0.973                                    | -0.619 |              |     |             |             |
|                                                                                                                                                                                                                                            |                                  | Hedges' correction        | 0.595          | -0.793                  | -0.969                                    | -0.616 |              |     |             |             |
| a. The denominator used in estimating the effect sizes.<br>Cohen's d uses the sample standard deviation of the mean difference.<br>Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor. |                                  |                           |                |                         |                                           |        |              |     |             |             |

**Figure 5**

**Medication Outcome Pre vs. Post Intervention**



## Discussion and Conclusion

Polypharmacy is a growing issue among the geriatric population that needs a solution to decrease adverse effects and save lives. Many older adults are left without a consistent or reliable caretaker. Health care workers must become an advocate for this population and implement policies and tools to recognize overprescribing of medication. "The incidence of seniors at risk for polypharmacy is alarming as many of the participants usually took greater than or equal to 10 drugs" (Blanco-Reina et al., 2015, p. 22). There is genuine evidence supporting the need to intervene in the prevalence of polypharmacy in the geriatric population. The overall results suggest no unique solution when dealing with polypharmacy. However, polypharmacy is associated with over-prescribing; therefore, medication reviews triggered by polypharmacy may identify people who would benefit from deprescribing (Turner et al., 2016). Medication reviews demonstrates the importance of ensuring a healthcare provider monitors this population's medication to help decrease hospital readmissions. Implementing the Beers criteria screening tool could provide valuable information that could have been overlooked and could have save lives. As Elliot (2016) notes, geriatric medicine is now among the largest medical specialties in developed countries. For this reason, we must implement screening tools to help decrease the prevalence of polypharmacy. Implementing these policies and processes will evolve geriatric health care today and in the future.

**Limitations/Barriers**

The most significant limitation of the QI project was the data collection period, as it was impacted by scheduling patients for home visits and being available the day of the visit. COVID-19 also played a significant role in seeing some of the patients who would have been excellent candidates for the project but were hesitant about having a provider come to their homes. Older patients tend to be more regimented and may prefer to follow a routine schedule as it provides them a sense of stability. The other limitation was difficulty getting fellow providers to understand the benefit of utilizing the Beers criteria during patient visits due to their belief that the implementation would decrease the number of patients seen in the clinic daily. However, there was still significant evidence to support utilizing Beers criteria and following the polypharmacy and deprescribing guidelines.

## **Section V**

### **Recommendations / Implications for Practice**

#### **Recommendations and Implications for Practice**

“Age is a risk factor in developing chronic diseases. Patients with multiple diseases are at a greater risk of adverse health outcomes, frequent hospital admissions, extended hospital stays, regular medical specialist visits, and mortality” (Benny Gerard et al., 2020, Introduction). Polypharmacy has become a rising problem in the geriatric population, along with overprescribing. Early recognition and prompt intervention in identifying patients at risk for polypharmacy and overprescribing are essential. With results from this QI project being statistically significant, there is an expected change in practice guidelines with increased adherence to the guidelines for managing polypharmacy and deprescribing.

The most significant goal of this QI project was to integrate standard practices of the management of polypharmacy and deprescribing guidelines, thus improving patient outcomes and this goal was reached. Using evidence-based guidelines across the continuum of senior patient care will increase health care compliance. Educating doctors, nurse practitioners, and physician assistants regarding this QI project outcome will thus transcend to improved practice guidelines that decrease polypharmacy and overprescribing among the elderly population.

The support received from the stakeholders provided invaluable resources to ensure the success of the QI project success. The number of older patients at risk for overprescribing and polypharmacy are increasing daily. To continue improving polypharmacy guidelines, the goal will be to conduct another study focusing on how polypharmacy affects adverse reactions such as falls, confusion, and hospitalizations. The DNP student understood the importance and projected value of standardizing and evidence-based guidelines for geriatric patients at risk for polypharmacy.

#### **Application to Other Clinical Settings**

The evaluation of polypharmacy guidelines was essential to positive patient outcomes that support the importance of utilizing this clinical practice and deprescribing guidelines. The

data analysis findings bolstered the risk factors, helping improve the significance of early identification of patients at risk for polypharmacy. This action will help improve the standard practice, increase patient compliance and outcomes, and help patients be more knowledgeable about their medication regimen.

### **Self-Reflections**

Overprescribing and polypharmacy and the number of patients at risk are occurring at an alarming pace. As an older patient's lifespan increases, so does the risk of comorbidities. Implementing this QI project as a DNP scholar provided excellent insight on how to conduct a QI project. The Iowa model provided the foundation for meeting the pertinent objective of evidence-based practice research. One of this QI project's most significant accomplishments is seeing the patients benefit. The elderly population must face many new normals that align with aging; being overmedicated should not be one of them.

### **Alignment with DNP Essentials**

Collaborating with other health care professionals is essential to providing excellent patient care. According to the American Association of Colleges of Nursing (AACN), the essentials provide the framework that consists of core competencies for professional nursing education. There are ten domains of the AACN essentials. The domains focus on an approach that emphasizes collaboration across professions, care team members, and the patient population (AACN, 2021). This project addressed the following essential domains:

#### ***1: Domain I: Knowledge for Nursing Practice***

The DNP scholar demonstrated Domain I by translating and synthesizing nursing knowledge and other scientific knowledge into practice and demonstrating the application of nursing science into practice (AACN, 2021).

#### ***2: Domain II: Patient-Centered Care***

The DNP scholar demonstrated Domain II by promoting caring relationships to improve outcomes, using advanced communication systems with a diverse audience, and implementing an evidence-based consultation tool to standardize the practice of promoting patient-centered care (AACN, 2021).

### ***3: Domain VI: Interprofessional Partnership***

The DNP scholar demonstrated interprofessional partnership by conducting this QI project, with feedback from stakeholders and medical provider collaborations to produce optimal patient outcomes (AACN, 2021).

### ***4: Domain VII: Information and Healthcare Technologies***

The DNP scholar effectively and proactively coordinated resources to provide safe, quality, and equitable care to diverse populations (AACN, 2021).

### **Next Steps**

As a next step, members of this North Texas family medicine practice will implement the clinical practice flow chart for polypharmacy and polypharmacy deprescribing flow chart (see Appendix N) as a standardized practice for those patients who are over 65 and who take five or more prescription medications. The DNP student will recommend starting the PDSA cycle with medication reconciliation and sharing other collaborating medical providers with patients. During provider onboarding, there will be a thorough in-service on utilizing the Beers criteria, clinical practice flow chart for polypharmacy, and polypharmacy deprescribing flow chart. Furthermore, the conclusive results from the data analysis will help mitigate the risk factors and emphasize the importance of following polypharmacy guidelines.

### **Project Dissemination**

Dissemination of research findings is a crucial part of the research process and ensures that research benefits are passed on to others. As dissemination is essential for current and future research periods; this QI project provides further evidence about the importance of managing polypharmacy which will benefit healthcare practices of various levels. The DNP student presented the QI project process and outcome via zoom to the TWU faculty and peers. The DNP student presented this project to the North

Texas facility's family medicine staff during the monthly in-service meeting and received positive feedback. The QI project will be filed in the TWU e-repository upon the project's completion. Following the project's completion, the goal is to submit it for publication in the AGS Journal. Primary care clinics are the first line of defense in identifying polypharmacy in older patients (Benny Gerard et al., 2020). Elderly patients rely on medical professionals to provide them with compassionate and patient-centered care and helping to decrease the risk of polypharmacy and overprescribing will benefit them today and us in the future.

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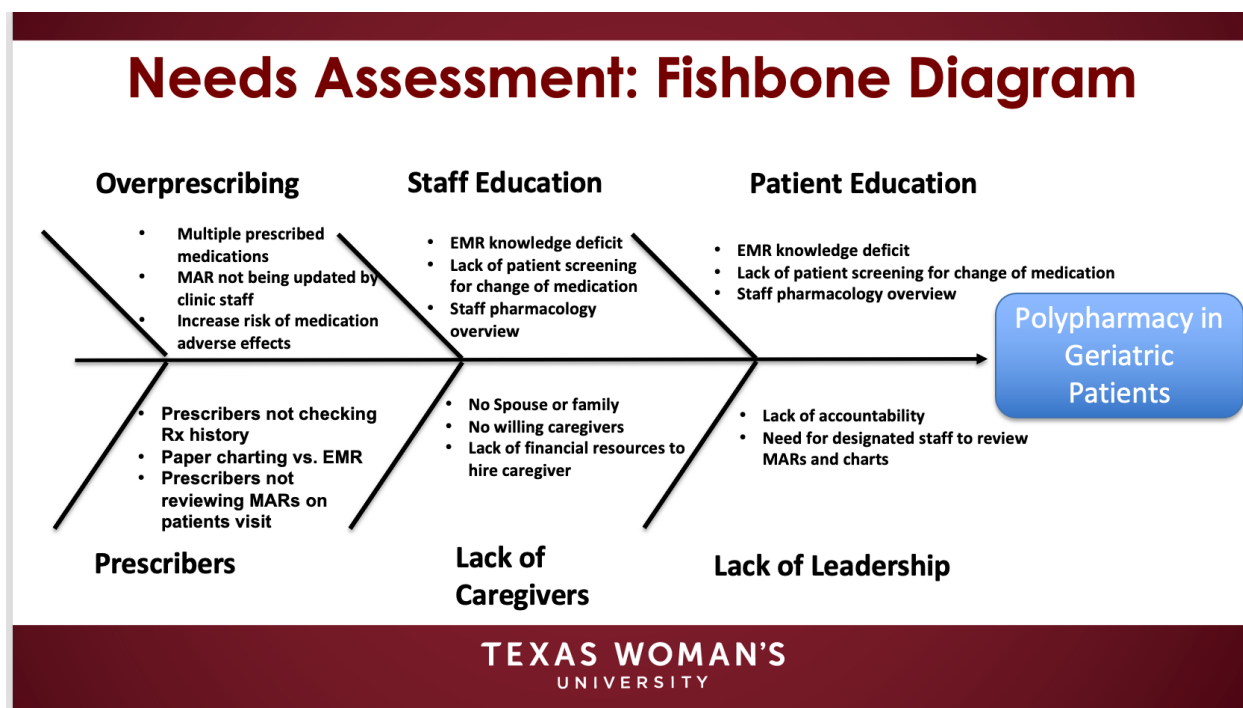
**Appendix A**  
**Common Terminology**

| <b>Variables</b>      | <b>Definition</b>                                                                                                                 |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>Polypharmacy</b>   | Five or more prescribed medications and/or the administration of more medicines than clinically indicated                         |
| <b>Deprescribing</b>  | Is the planned process of tapering, withdrawing, discontinuing, or stopping medications and is important in reducing polypharmacy |
| <b>Beers Criteria</b> | The AGS Beers Criteria is an essential evidence-based tool that should be used as a guide for drugs to avoid in older adults.     |
| <b>Caregiver</b>      | Non-medical individual caring for the patient (Family member, neighbor, friend)                                                   |

*Note:* Stedman, T. L. (2006). *Stedman's medical dictionary*. Lippincott Williams & Wilkins.

## Appendix B

### Gap Analysis – Needs Assessment



## Appendix C

### SWOT Analysis

# SWOT Analysis (Gap Analysis)

**Strengths**

- Mobile Clinic
- Highly trained staff
- Providing healthcare to all populations including underserved and uninsured

**Weakness**

- Patient knowledge deficit
- EMR knowledge deficit among staff
- Delay in scheduling patient follow-up visits
- Lack of funding

**Opportunities**

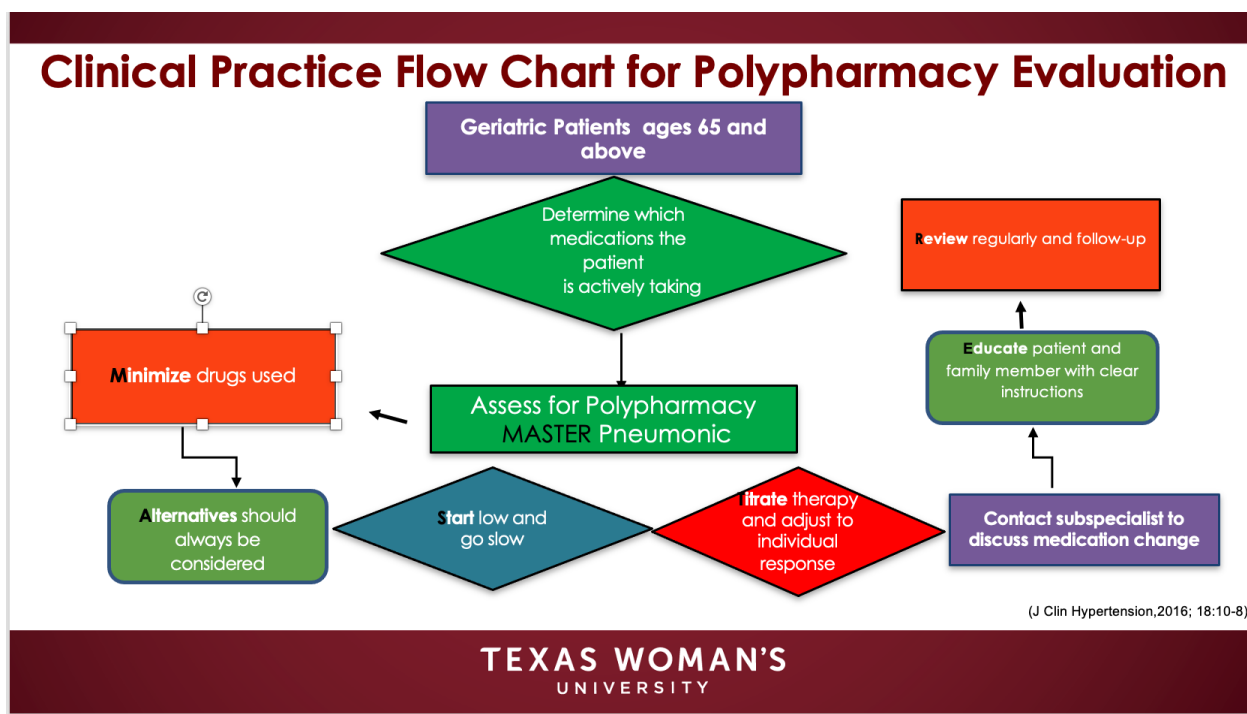
- Increase patient knowledge
- Mobile labs
- Improvement of quality measures

**Threats**

- Pharmacological companies' pressure to prescribe
- Social media and news outlets
- COVID-19 pandemic
- Religious and cultural beliefs

## Appendix D

## Polypharmacy Guidelines



*Note.* Derived from “Nonadherence to Antihypertensive Medication Among Hypertensive Adults in the United States—HealthStyles, 2010” by Xin Tong, Elizabeth K. Chu, Jing Fang, Hilary K. Wall, & Carma Ayala, *Journal of Clinical Hypertension*, 18(9), 892-900. (<https://doi.org/10.1111/jch.12786>). Copyright 2016.

## Appendix E

### Patients Attitude Towards Deprescribing Survey

|                                                                                                                                  | <b>strongly agree</b> | <b>agree</b> | <b>unsure</b> | <b>disagree</b> | <b>strongly disagree</b> |
|----------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------|---------------|-----------------|--------------------------|
| Overall, I am satisfied with my current medicines                                                                                |                       |              |               |                 |                          |
| I like to be involved in making decisions about my medicines with my doctors                                                     |                       |              |               |                 |                          |
| I have a good understanding of the reasons I was prescribed each of my medicines                                                 |                       |              |               |                 |                          |
| I like to know as much as possible about my medicines                                                                            |                       |              |               |                 |                          |
| I always ask my doctor, pharmacist or other health care professional if there is something I don't understand about my medicines |                       |              |               |                 |                          |
| I know exactly what medicines I am currently taking, and/or I keep an up to date list of my medicines                            |                       |              |               |                 |                          |
| If my doctor said it was possible I would be willing to stop one or more of my regular medicines                                 |                       |              |               |                 |                          |
| I feel that I am taking a large number of medicines                                                                              |                       |              |               |                 |                          |
| Taking my medicines every day is very inconvenient                                                                               |                       |              |               |                 |                          |
| I spend a lot of money on my medicines                                                                                           |                       |              |               |                 |                          |

*Note.* Adapted from “Polypharmacy and medication deprescribing: A survey among multimorbid older adults in Denmark” by M. L. Schiøtz, A. Frølich, A. K. Jensen, L. Reuther, H. Perrild, T. S. Petersen, J. Kornholt, and M. B. Christensen, *Pharmacology Research & Perspectives*, 6(6), e0043 1 (<https://doi.org/10.1002/prp2.431>). Copyright 2018.

## Appendix F

### Evidence Table

| Citation of Evidence                                                                                                                                                                                                                                                                                                                                                        | Study Question or Hypothesis                                                                                                                                                                                                                            | Study Design               | Sample/Setting                                                                                                                                                                                                        | Independent and Dependent Variables & Tools Used                                                                                                                                                                                                                        | Data Collection & Analysis                                                                                                                                                                             | Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Recommendation/ Implications                                                                                                                                                                                                                                                    | Level of Evidence (JHNEBP) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| American Geriatrics Society 2019 updated AGS Beers Criteria® for potentially inappropriate medication use in older adults. (2019). <i>Journal of the American Geriatrics Society</i> , 67(4), 674–694. <a href="https://doi.org/10.1111/jgs.15767">https://doi.org/10.1111/jgs.15767</a>                                                                                    | The aim of this study was to update the AGS Beers criteria                                                                                                                                                                                              | The GRADE method was used. | Expert panel that consisted of 13 healthcare professionals                                                                                                                                                            | Previous AGS Beers Criteria from 2015 to 2017 along with previous updates from 2012 and 2015                                                                                                                                                                            | 244 comments were received from individuals, organizations, pharmaceutical companies, and peer organizations                                                                                           | There were 25 medication classes dropped from the AGS Beers Criteria. Several were moved to new tables. Four new medications or medication classes were added to the AGS Beers criteria to be used with caution.                                                                                                                                                                                                                                                                                                                                                             | It recommends that prescribing clinicians utilize the Beers criteria when caring for the older adults but should not be utilized as a determination or used without clinical judgement. The clinicians should further investigate whether the drug risk outweighs the benefits. | Level IV                   |
| Blanco-Reina, E., Ariza-Zafra, G., Ocaña-Riola, R., León-Ortiz, M., & Bellido-Estévez, I. (2015). Optimizing elderly pharmacotherapy: Polypharmacy vs. undertreatment. Are these two concepts related? <i>European Journal of Clinical Pharmacology</i> , 71(2), 199-207. <a href="https://doi.org/10.1007/s00228-014-1780-0">https://doi.org/10.1007/s00228-014-1780-0</a> | This study is aimed to estimate the prevalence of polypharmacy and potential prescribing omissions (PPO) and their related factors in community-dwelling elderly patients and to examine any possible relationship between these two concepts (p. 199). | Cross-sectional study      | Sample of 407 patients over the age of 65 via 15 primary healthcare centers. Patients were selected randomly within each healthcare card issued by the National Health System and provided by the Primary Care Board. | Polypharmacy and potential prescribing omissions were used as the dependent variable. According to each criterion, chi-square or Fisher tests were used to analyze the differences in polypharmacy and PPO prevalence rates across categories of independent variables. | The main sources of data collection came from interviews with each patient using a structured questionnaire, further complemented by a review of the packaging of all medications and medical records. | The overall prevalence of polypharmacy was 45%. The risk factors associated with polypharmacy were comorbidity, limitations in activity of daily living, and being prescribed a drug in the Anatomical Therapeutic Chemical classifications (ATC) C group. Screening Tool to Alert doctors to Right Treatment (START) criteria identified a total of PPO in 170 subjects. The risk of PPO increased by 60% for every additional point in the Charlson Comorbidity Index. Polypharmacy also independently predicted the odds of at least one PPO according to start criteria. | The application of tools capable of identifying both PIM, mainly Screening Tool of Older Person's Potentially Inappropriate Prescriptions (STOPP) and 2012 American Geriatrics Society Beers Criteria and PPO (START) may be extremely useful.                                  | Level I                    |

| Citation of Evidence                                                                                                                                                                                                                                                                                                                                                                      | Study Question or Hypothesis                                                                                                                                                                      | Study Design                    | Sample/Setting                                                                                                                    | Independent and Dependent Variables & Tools Used                                                                                                                                                                                   | Data Collection & Analysis                                                                                                                                                                                                                                                                                                                                     | Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Recommendation/ Implications                                                                                                                                                                                                                                                                                                                                  | Level of Evidence (JHNEBP) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Brookes, L. (2017). Easy to start, hard to stop: Polypharmacy and deprescribing. <i>Medscape Perspective</i> . <a href="http://www.medscape.com/viewarticle/880716_2">http://www.medscape.com/viewarticle/880716_2</a>                                                                                                                                                                    | Polypharmacy and potentially inappropriate medications in older individuals are associated with adverse drug events, death, impaired physical and cognitive function, falls, and hospitalization. | Pilot Study                     | Patients with multiple chronic conditions. Patients that were over 65 years of age.                                               | Independent variables: polypharmacy, patients with no or fewer chronic conditions. Dependent variables: hypertension, heart disease, diabetes, lung problems, mental health problems, cancer and/or joint pain and arthritis.      | Recent survey among older adults in 11 countries. Medical reports showings seniors with three or more chronic conditions take an average of six prescriptions medications.                                                                                                                                                                                     | Several patients were on 25-30 medications. Medications that were started for certain conditions and never stopped. Approximately 53% of over-65s in the United States and 42% in Canada take four or more prescription drugs. Many over-65s take five or more prescription drugs, and this rate is increasing. Reports indicate that in Canada, seniors with three or more chronic conditions take an average of six prescriptions medications, and more than 30% of over-65s are believed to be taking at least one medication that is potentially inappropriate. | Mandates for older patients to have medication reviews every 3 months. Healthcare providers to increase the use of tools for deprescribing in older adults like Beer's criteria, STOPP (Screening Tool of Older Persons Prescriptions) and START (Screening Tool to Alert doctors to Right Treatment).                                                        | Level IV                   |
| Brunet, N. M., Panicot, o. E., Sánchez, D. S., Novellas, J. A., Bonada, N. S., Coromina, A. T., Jané, C. C. (2016). A patient-centered prescription model assessing the appropriateness of chronic drug therapy in older patients. <i>International Journal of Integrated Care (IJIC)</i> , 16(6), 1-4. <a href="https://doi.org/10.5334/ijic.2972">https://doi.org/10.5334/ijic.2972</a> | The main objective of this model is to identify potentially IP in a group of older patients and to optimize them according to care goals of each patient (p. 1).                                  | Descriptive Observational study | 382 patients were included. Average age of 86.7 years 40% of all patients met the criteria for advanced chronic conditions (ACC). | Independent variables: patient survival, improving or maintaining function or symptomatic control. Dependent variables: high risk medications (NSAIDS, antiplatelet, anticoagulants, hypoglycemic, insulin, digoxin, and opioids). | Each patient pharmacotherapeutic plan is assessed through application of the Patient-Centered Prescription Model. A systematic three-step process carried out by a multidisciplinary team made up of geriatricians and a clinical pharmacist. Step 1: Patient Centered Evaluation Step 2: Diagnosis Centered Evaluation Step 3: Medication centered assessment | At admission, median of medications per patient was 7, no differences between patients with ACC and the rest. 33% of patients with advanced chronic conditions (ACC) took 10 or medications. 20% of total of patients had 2 or more iatrogenic medications prescribed, no differences between patients with ACC and the rest. Overall, almost 40% of patients presented with an indication of at least one inappropriate prescribing (IP).                                                                                                                          | Patients with advanced chronic conditions do not have a prescription according to their needs. Patient –Centered Prescription model is a framework that should be implemented to minimize IP in a high-risk group of older patients. Patient-Centered Prescription model is applicable in other healthcare settings, such as nursing-homes or community care. | Level II                   |

| Citation of Evidence                                                                                                                                                                                                                                                                                                                                                                    | Study Question or Hypothesis                                                                                                                               | Study Design                                      | Sample/Setting                                                                               | Independent and Dependent Variables & Tools Used                                                                                                                     | Data Collection & Analysis                                                                                                                                                                                                                                                                                                                                                                                                                             | Findings                                                                                                                                                                                                                                                                                                                                                                                                                | Recommendation/ Implications                                                                                                                                                                                                                                         | Level of Evidence (JHNEBP) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Davies, L. E., Spiers, G., Kingston, A., Todd, A., Adamson, J., & Hanratty, B. (2020). adverse outcomes of polypharmacy in older people: Systematic review of reviews. <i>Journal of the American Medical Directors Association, 21</i> (2), 181-187. <a href="https://doi.org/10.1016/j.jamda.2019.10.022">https://doi.org/10.1016/j.jamda.2019.10.022</a>                             | To determine if adverse outcomes have any association to polypharmacy in elderly patients.                                                                 | Systematic review or meta Analysis                | Elderly patients of all ages of no healthcare setting or location                            | The patients experiencing adverse side-effects and their relation to polypharmacy. There was no comparison.                                                          | Systematic review of all data basis utilizing PROSPERO and PRISMA. Exclusions included duplicate articles and those not meeting the DARE criteria.                                                                                                                                                                                                                                                                                                     | 26 reviews were used out of 230 retrieved articles. It found that most hospital admissions were related to inappropriate prescribing and polypharmacy.                                                                                                                                                                                                                                                                  | There need be standardized guidelines to identify polypharmacy in the older adults. The increased risk of adverse effects related to polypharmacy will continue until there is a resolution.                                                                         | Level I                    |
| Díez-Manglano, J., Giménez-López, M., Garcés-Horna, V., Sevil-Puras, M., Castellar-Otín, E., González-García, P., & Morlanes-Navarro, T. (2015). Excessive polypharmacy and survival in polypathological patients. <i>European Journal of Clinical Pharmacology, 71</i> (6), 733-739. <a href="https://doi.org/10.1007/s00228-015-1837-8">https://doi.org/10.1007/s00228-015-1837-8</a> | The purpose of this study was to determine whether excessive polypharmacy is associated with a higher survival rate in polypathological patients (p. 733). | Observational, prospective, and multicenter study | Sample included 457 polypathological patients. Mean age was 81.0 years and 54.5% were women. | Independent variables were patients with excessive polypharmacy and those without. Dependent variables were those with heart disease, respiratory disease, diabetes. | Data was gathered for each patient of; sex, age, living at home or in a nursing home, admission to internal medicine or geriatrics. Diagnosed diseases and categories, comorbidity, ability to perform basic and instrumental of daily living prior to admission, cognitive function, socio-familial situation, number of drugs used in a chronic setting. Tools used were Lawton-Body index, Barthel index, Gijon scale and Pfeiffer's questionnaire. | In a total of 457 patient's polypharmacy was present in 246 (53.8%) patients. Excessive polypharmacy in 155 (33.9%). In a multivariate analysis, having heart or respiratory diseases or diabetes with retinopathy or neuropathy was associated with more excessive polypharmacy and having delirium with less. The number of admissions during the previous year was also associated with more excessive polypharmacy. | A greater use of drugs may not be harmful but is also not associated with a higher probability of survival in polypathological patients. Implementation of tools such as Beers and STOP-START criteria for assessing the adequacy of prescriptions would be helpful. | Level IV                   |

| Citation of Evidence                                                                                                                                                                                                                              | Study Question or Hypothesis                                                                                                                                                                            | Study Design        | Sample/Setting                                                                              | Independent and Dependent Variables & Tools Used                                                                                                                                                                                                                        | Data Collection & Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                      | Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Recommendation/ Implications                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Level of Evidence (JHNEBP) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Elliott, R. A. (2016). Geriatric medicine and pharmacy practice: A historical perspective. <i>Journal of Pharmacy Practice &amp; Research</i> , 46(2), 169-177. <a href="https://doi.org/10.1002/jppr.1214">https://doi.org/10.1002/jppr.1214</a> | Managing and preventing iatrogenic disease and polypharmacy became an important element of geriatric medicine as the range of therapeutic drugs grew and life expectancy and multi-morbidity increased. | Observational study | Random patients over 65 in a hospital with multiple comorbidities and multiple medications. | Independent variables: immobility, instability (falls), incontinence, intellectual impairment (dementia and delirium), iatrogenic disease/polypharmacy. Dependent variables: medications, geriatric syndromes, social issues, comprehensive geriatric assessment (GEM). | The GEM model has been applied in hospital and outpatient settings. Aged Care Assessment Teams gather information on inappropriate admission to nursing homes and hospitals. Geriatric consultation services have deemed the average age of hospital inpatients climbed during the second half of the 20 <sup>th</sup> century and prevalence of multi-morbidity and polypharmacy grew; geriatric expertise was increasingly needed outside of geriatric units. | Geriatric medicine evolved over the last 60-70 years; and is now one of the largest medical specialties in developed countries. Geriatric pharmacy practice evolved over 30-40 years ago and recognized as a specialty around 20 years ago. As the number of older people globally continues to rise, the need for geriatric medicine and pharmacy practice will increase, and most medical practitioner and pharmacists working in adult medicine will require some expertise in geriatric assessment and management. | Pharmacists have begun contributing to the care of older people through services aimed at improving continuity of medication management (e.g., community liaison or hospital outreach pharmacy services) and involvement in ambulatory services such as aged Care Assessment Teams. Outreach pharmacy services have become well established at many hospitals.                                                                                                                                                                  | Level III                  |
| Greenleaf Brown, L. (2016). Untangling polypharmacy in older adults. <i>MEDSURG Nursing</i> , 25(6), 408-411.                                                                                                                                     | The purpose of this article is to discuss polypharmacy in older adults, associated negative effects, and strategies to improve outcomes.                                                                | Cohort Study        | Baby boomers over the age of 65 randomly selected. Several nursing homes.                   | Independent variables: physiological, psychosocial, cognitive, and functional abilities. Dependent variables: Two or more chronic illnesses and one-third of all prescriptions filled by older adults.                                                                  | Data collection: A. Beers criteria was used. B. A medication list for use in inpatient and outpatient settings was compiled. C. The START/STOPP tool kit was also used.                                                                                                                                                                                                                                                                                         | Nurses have a unique opportunity to identify problems related to polypharmacy. Drug therapy improves patient's quality of life by preventing, managing, and treating illnesses. The healthcare team must work to decrease polypharmacy whenever feasible.                                                                                                                                                                                                                                                              | Open lines of communication between patients and clinicians are crucial to addressing difficulties with polypharmacy. Conclusion may be drawn regarding medication adherence by observing refill dates and number of pills remaining. A pharmacist can converse with the patient and nurses to evaluate symptoms the patient may be experiencing and determine if the symptoms are related to the medications. A pharmacist also can improve drug safety by not dispensing medications that might cause drug-drug interactions. | Level II                   |

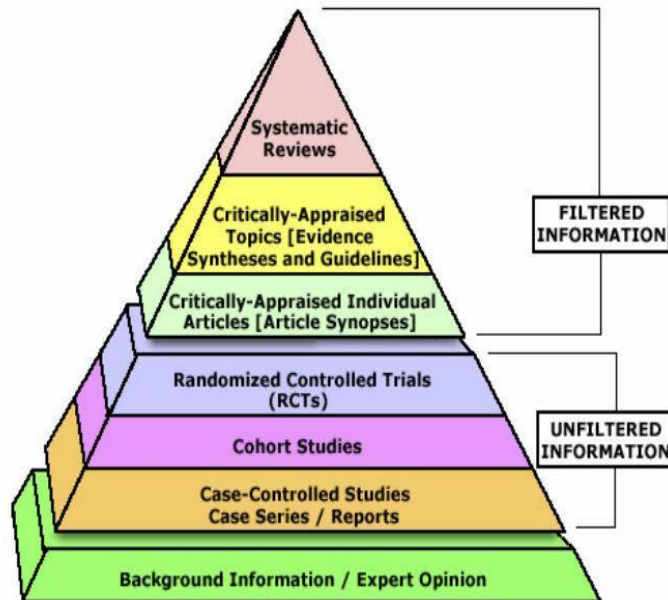
| Citation of Evidence                                                                                                                                                                                                                                                                                                                                    | Study Question or Hypothesis                                                                              | Study Design                           | Sample/Setting                                                                                   | Independent and Dependent Variables & Tools Used                                                                                                                   | Data Collection & Analysis                                                                                                                                                                                                                                     | Findings                                                                                                                                                                                | Recommendation/ Implications                                                                                                                                                                  | Level of Evidence (JHNEBP) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Halli-Tierney, A., Scarbrough, C., & Carroll, D. (2019). Polypharmacy: Evaluating risks and deprescribing. <i>American Family Physician</i> , 100(1), 32-38. <a href="https://www.aafp.org/afp/2019/0701/p32.html">https://www.aafp.org/afp/2019/0701/p32.html</a>                                                                                      | These studies aim to monitor patient medication list and deprescribe any inappropriate medication.        | Review of clinical practice guidelines | Patients older than 62 and younger adults.                                                       | Beers Criteria STOPP (Screening tool of older people's prescriptions) START (screening tool to alert to right treatment criteria) Medication Appropriateness Index | PubMed American board of internal medicine AGS Society Cochrane Database UpToDate                                                                                                                                                                              | Neither tool evaluate proved to be superior to the other nor does one meet all the criteria needed to evaluate polypharmacy.                                                            | There should be a medication reconciliation at each and a plan to deprescribe be established at each visit to ensure patients are taking the appropriate medications.                         | Level IV                   |
| Jennings, E. L. M., Murphy, K. D., Gallagher, P., & O'Mahony, D. (2020). In-hospital adverse drug reactions in older adults; prevalence, presentation, and associated drugs—a systematic review and meta-analysis. <i>Age &amp; Aging</i> , 49(6), 948–958. <a href="https://doi.org/10.1093/ageing/afaa188">https://doi.org/10.1093/ageing/afaa188</a> | The aim of the study was to determine the cause of hospital adverse drug reactions in older patients      | Systematic review and meta-analysis    | Patient's 65-years of age and older who were hospitalized and experienced an adverse drug effect | Systematic reviews examination older adults and ADRs frequency within the elderly population                                                                       | PubMed Embase EBSCO CINAHL Cochrane Library                                                                                                                                                                                                                    | Amongst 20,153 patients 65-years-of age where 2,479 patients experienced one or more adverse drug reactions while hospitalized                                                          | There were 16% of the elderly patients who had an ADR that could have been prevented due to inappropriate prescribing of medication.                                                          | Level I                    |
| Khamis S, Abdi AM, Uzan A, Basgut B. (2019). Applying Beers criteria for elderly patients to assess rational drug use at a university hospital in Northern Cyprus. <i>Journal of Pharmacy &amp; BioAllied Sciences</i> , 11(2), 133-141. <a href="https://doi.org/10.4103/jpbs.JPBS_208_18">https://doi.org/10.4103/jpbs.JPBS_208_18</a>                | The aim of this study was to determine the association of PIMs using the Beers criteria in older patients | Cross-sectional prospective analysis   | 451 patients admitted between September 25 and October 25, 2016                                  | Patient's 65 years of age who were hospitalized in various clinics.                                                                                                | Data was collected from case sheets from the patient hospitalized or discharged before the study ended. Data collected consisted of patient's age, gender, date of admission, date of review, diagnosis, creatinine clearance, and all medications prescribed. | 1039 prescribed medicine, 16.9% were PIMs during hospitalizations, with 12% at discharge. Polypharmacy occurred at 79.4% most were identified at not being able to prevent polypharmacy | There was a high incidence of patients who experienced polypharmacy while hospitalized and a standardized assessment is needed to decrease the risk of polypharmacy in the senior population. | Level V                    |

| Citation of Evidence                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Study Question or Hypothesis                                                                                                                          | Study Design                           | Sample/Setting                                                | Independent and Dependent Variables & Tools Used                                                                                                                             | Data Collection & Analysis                                                                                                                | Findings                                                                                                                             | Recommendation/ Implications                                                                                                                                                                                      | Level of Evidence (JHNEBP) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Kilgore, C. (2018). Make deprescribing facility-specific, with thoughtful communication. <i>Caring for the Ages</i> , 19(6), 14–15. <a href="https://doi.org/10.1016/j.carage.2018.05.010">https://doi.org/10.1016/j.carage.2018.05.010</a>                                                                                                                                                                                                                                      | How can deprescribing be done systematically to stop medication, avoid adverse effects, and reduce risk of polypharmacy                               | Survey on the process of deprescribing | 637 participants composed of medical directors and physicians | -Beers Criteria<br>-STOPP/START<br>-Anticholinergic Cognitive Burden Scales<br>-Medication Appropriateness Index<br>-NORGE-PNH<br>-ARMOR<br>-Medstopper.com<br>Deprescribing | The survey was completed by the participants using a Likert scale with 1 reflecting strong agreement and 5 reflecting strong disagreement | There were a 45% response rate not full results were available but showed great favor in adapting a tool for deprescribing.          | The deprescribing process should focus medications that no longer have no benefit to the patient. There should be an assessment that identifies high risk medications and the need to potentially be deprescribed | Level V                    |
| Masnoon, N., Shakib, S., Kalisch-Ellett, L., & Caughey, G. E. (2017). What is polypharmacy? A systematic review of definitions. <i>BMC Geriatrics</i> , 17(1), 230. <a href="https://doi.org/10.1186/s12877-017-0621-2">https://doi.org/10.1186/s12877-017-0621-2</a>                                                                                                                                                                                                            | The aim of this study is determining the most used definition of polypharmacy                                                                         | Systematic review<br>Meta-analysis     | 110 articles met the inclusion                                | Medline<br>EMBASE<br>Cochrane                                                                                                                                                | The databases were searched for definitions of polypharmacy without any restrictions                                                      | There were 111 numerical definitions.<br><br>The most common definition of polypharmacy is the use of five or more medications daily | The recommendation is a universal definition of polypharmacy to guide clinicians with a clear understanding.                                                                                                      | Level I                    |
| Mohamed, M. R., Ramsdale, E., Loh, K. P., Arastu, A., Xu, H., Obrecht, S., Castillo, D., Sharma, M., Holmes, H. M., Nightingale, G., Juba, K. M., & Mohile, S. G. (2020). Associations of polypharmacy and inappropriate medication with adverse outcomes in older adults with cancer: A systematic review and meta-analysis. <i>Oncologist</i> , 25(1), e94-e108. <a href="https://doi.org/10.1634/theoncologist.2019-0406">https://doi.org/10.1634/theoncologist.2019-0406</a> | The aim of this study is to analyze the potential correlation of polypharmacy and inappropriate medication with adverse effects on geriatric patients | Systematic review<br>Meta-analysis     | Older adults                                                  | PubMed<br>Embase<br>Web of Science<br>Cochrane                                                                                                                               | The databases were searched using the keywords for outcomes that correlate with polypharmacy and PIM                                      | PIM was correlate with adverse effects in 3 of 11 studies.                                                                           | The article recommends a close review of medications in older adults with the goal of improving outcomes by decreasing polypharmacy and identifying PIM.                                                          | Level II                   |

| Citation of Evidence                                                                                                                                                                                                                                                                                                                                                          | Study Question or Hypothesis                                                                                                   | Study Design                | Sample/Set ting                                          | Independent and Dependent Variables & Tools Used                                         | Data Collection & Analysis                                                                                                                                                  | Findings                                                                                                                                                       | Recommendation/ Implications                                                                                                                                                                | Level of Evidence (JHNEBP) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Patterson, S. M., Cadogan, C. A., Kerse, N., Cardwell, C. R., Bradley, M. C., Ryan, C., & Hughes, C. (2018). Interventions to improve the appropriate use of polypharmacy for older people. <i>Cochrane Database of Systematic Reviews</i> , 9, Article CD008165. <a href="https://doi.org/10.1002/14651858.CD008165.pub4">https://doi.org/10.1002/14651858.CD008165.pub4</a> | The aim of this study was to evaluate intervention(s) the improve inappropriate prescribing of medication in elderly patients. | Clinical practice guideline | Older adults 65-years-of-age                             | Beers Criteria<br><br>Medication Appropriateness Index (MAI)                             | Two independent reviewers analyzed abstracts using the Grades of recommendation, Assessment, Development and Evaluation (GRADE) to determine the quality of evidence.       | The GRADE system proved to have low quality of the evidence. There were not many medications listed on the Beers criteria and the MAI index was low.           | The study did show clinically significant when it came to interventions being beneficial in preventing inappropriate medications but not clear if the interventions decreased polypharmacy. | Level V                    |
| Rambhade S, Chakraborty A, Shrivastava A, Patil UK, Rambhade A. (2012). A survey on polypharmacy and use of inappropriate medications. <i>Toxicology International</i> , 19(1), 68-73. <a href="https://doi.org/10.4103/0971-6580.94506">https://doi.org/10.4103/0971-6580.94506</a> .                                                                                        | The aim of this study was to evaluate ways to reduce polypharmacy and the inappropriate use of medication via survey.          | Retrospective study         | Patients in clinic setting taking prescribed medications | Medications that are clinically appropriate vs. those not appropriate that leads to ADRs | The survey was completed with patient during their visits and the data analyzed. The patient was asked to bring their medications or a list of medications to be evaluated. | 2.38% (N=326) medications were determined to be overprescribed which turned out to be 60%.<br><br>There were 3.96% (N=326) medication showed to be repetitive. | It is recommended to discontinue medications that are not clinically indicated.                                                                                                             | Level III                  |
| Sagon, C. (2016). RX drug costs for older adults still soaring. <i>AARP, Drugs &amp; Supplements</i> . <a href="https://www.aarp.org/health/drugs-supplements/info-2016/drug-costs-for-older-adults-still-soaring-cs.html">https://www.aarp.org/health/drugs-supplements/info-2016/drug-costs-for-older-adults-still-soaring-cs.html</a>                                      | The aim of this article is to bring awareness of the cost of prescribed medication in older patients.                          | Clinical Report             | Older adults taking prescription medications             | The cost of brand name medications from 2014 to 2015                                     | Data collected from Truven Health Market Sean Research Databases of medications and cost.                                                                                   | Medications have increased 97% of the 268 brand name medications.<br><br>CMS reported there spending on drugs increased from \$146 million to \$486 million    | The cost of prescribed medications will not be controlled if the pharmaceutical companies are not regulated and can charge whatever they like.                                              |                            |

## Appendix G

### Johns Hopkins Nursing Evidence-Based Practice Model and Guidelines



*Note.* Adapted from *Johns Hopkins nursing evidence-based practice: Model and guidelines* (3rd ed.), by D. Dang, & S. Dearholt, Sigma Theta Tau International. Copyright 2018.

## Appendix H

### Letter from Educational Institution IRB

# IRB Process

April 28, 2022

Kashaelyn Hollins-Henderson  
Nursing - Dallas

Re: IRB Not Required for IRB-FY2022-337 The Implementation of an Evidence-Based Guideline for the Management of Polypharmacy in the Geriatric Patient Populations: A Quality Improvement Project

Dear Kashaelyn Hollins-Henderson,

The above referenced project has been received by the TWU IRB - Dallas and it has been determined that this project does not require IRB review.

The project described is a quality improvement study and there is no intention of contributing to generalizable knowledge. Therefore, this study does not require IRB review or approval.

If you have any questions or need additional information, please contact the IRB at [irb@twu.edu](mailto:irb@twu.edu) or refer to the [IRB website](#).

Sincerely,

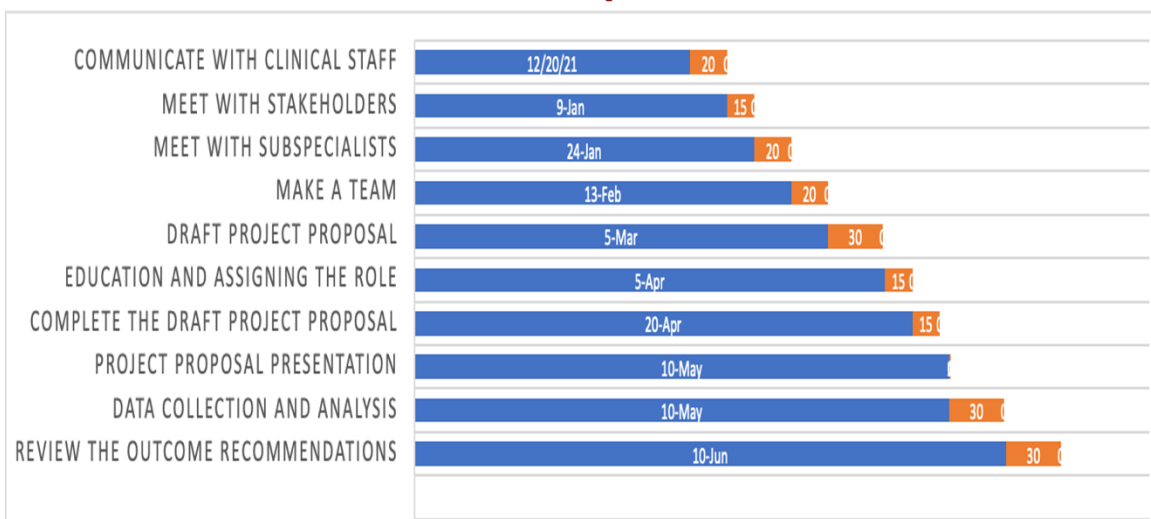
TWU IRB - Dallas

**TEXAS WOMAN'S**  
UNIVERSITY

## Appendix I

### Project Gantt Chart

#### Gantt Chart - Proposed Timeline



**TEXAS WOMAN'S**  
UNIVERSITY

## Sample Data Sheet

[illegible]

## Appendix K

## Independent Samples $t$ Test: Deprescribing

|                                                                                                                                                                                                                                                                                             |                             | Independent Samples Test                |                |                              |        |              |             |                 |                       |                                           |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------|----------------|------------------------------|--------|--------------|-------------|-----------------|-----------------------|-------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                             |                             | Levene's Test for Equality of Variances |                | t-test for Equality of Means |        |              |             |                 |                       | 95% Confidence Interval of the Difference |          |
|                                                                                                                                                                                                                                                                                             |                             | F                                       | Sig.           | t                            | df     | Significance |             | Mean Difference | Std. Error Difference | Lower                                     | Upper    |
|                                                                                                                                                                                                                                                                                             |                             |                                         |                |                              |        | One-Sided p  | Two-Sided p |                 |                       |                                           |          |
| ChangeinMeds                                                                                                                                                                                                                                                                                | Equal variances assumed     | 65.215                                  | 0.000          | -33.245                      | 159    | 0.000        | 0.000       | -1.11765        | 0.03362               | -1.18404                                  | -1.05125 |
|                                                                                                                                                                                                                                                                                             | Equal variances not assumed |                                         |                | -28.394                      | 67.000 | 0.000        | 0.000       | -1.11765        | 0.03936               | -1.19621                                  | -1.03908 |
| Independent Samples Effect Sizes                                                                                                                                                                                                                                                            |                             |                                         |                |                              |        |              |             |                 |                       |                                           |          |
|                                                                                                                                                                                                                                                                                             |                             | Standardizer <sup>a</sup>               | Point Estimate | 95% Confidence Interval      |        |              |             |                 |                       |                                           |          |
|                                                                                                                                                                                                                                                                                             |                             |                                         |                | Lower                        | Upper  |              |             |                 |                       |                                           |          |
| ChangeinMeds                                                                                                                                                                                                                                                                                | Cohen's d                   | 0.21070                                 | -5.304         | -5.963                       | -4.641 |              |             |                 |                       |                                           |          |
|                                                                                                                                                                                                                                                                                             | Hedges' correction          | 0.21170                                 | -5.279         | -5.935                       | -4.619 |              |             |                 |                       |                                           |          |
|                                                                                                                                                                                                                                                                                             | Glass's delta               | 0.32459                                 | -3.443         | -4.100                       | -2.780 |              |             |                 |                       |                                           |          |
| <p>i. The denominator used in estimating the effect sizes.</p> <p>h Cohen's d uses the pooled standard deviation.</p> <p>hedges' correction uses the pooled standard deviation, plus a correction factor.</p> <p>hlass's delta uses the sample standard deviation of the control group.</p> |                             |                                         |                |                              |        |              |             |                 |                       |                                           |          |

## Appendix L

## Paired Samples $t$ Test: Knowledge

| Paired Samples Test                                                                                     |                        |                    |                           |                 |                                           |         |              |     |             |             |
|---------------------------------------------------------------------------------------------------------|------------------------|--------------------|---------------------------|-----------------|-------------------------------------------|---------|--------------|-----|-------------|-------------|
|                                                                                                         |                        | Paired Differences |                           |                 |                                           |         | Significance |     |             |             |
|                                                                                                         |                        | Mean               | Std. Deviation            | Std. Error Mean | 95% Confidence Interval of the Difference |         | t            | df  | One-Sided p | Two-Sided p |
|                                                                                                         |                        |                    |                           |                 | Lower                                     | Upper   |              |     |             |             |
| Pair 1                                                                                                  | Post_Total - Pre_Total | 0.03478            | 0.13146                   | 0.01036         | 0.01432                                   | 0.05524 | 3.357        | 160 | 0.000       | 0.000       |
| Paired Samples Effect Sizes                                                                             |                        |                    |                           |                 |                                           |         |              |     |             |             |
|                                                                                                         |                        |                    | Standardizer <sup>a</sup> | Point Estimate  | 95% Confidence Interval                   |         |              |     |             |             |
|                                                                                                         |                        |                    |                           |                 | Lower                                     | Upper   |              |     |             |             |
| Pair 1                                                                                                  | Post_Total - Pre_Total | Cohen's d          | 0.13146                   | 0.265           | 0.107                                     | 0.421   |              |     |             |             |
|                                                                                                         |                        | Hedges' correction | 0.13208                   | 0.263           | 0.107                                     | 0.419   |              |     |             |             |
| a. The denominator used in estimating the effect sizes.                                                 |                        |                    |                           |                 |                                           |         |              |     |             |             |
| Cohen's d uses the sample standard deviation of the mean difference.                                    |                        |                    |                           |                 |                                           |         |              |     |             |             |
| Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor. |                        |                    |                           |                 |                                           |         |              |     |             |             |

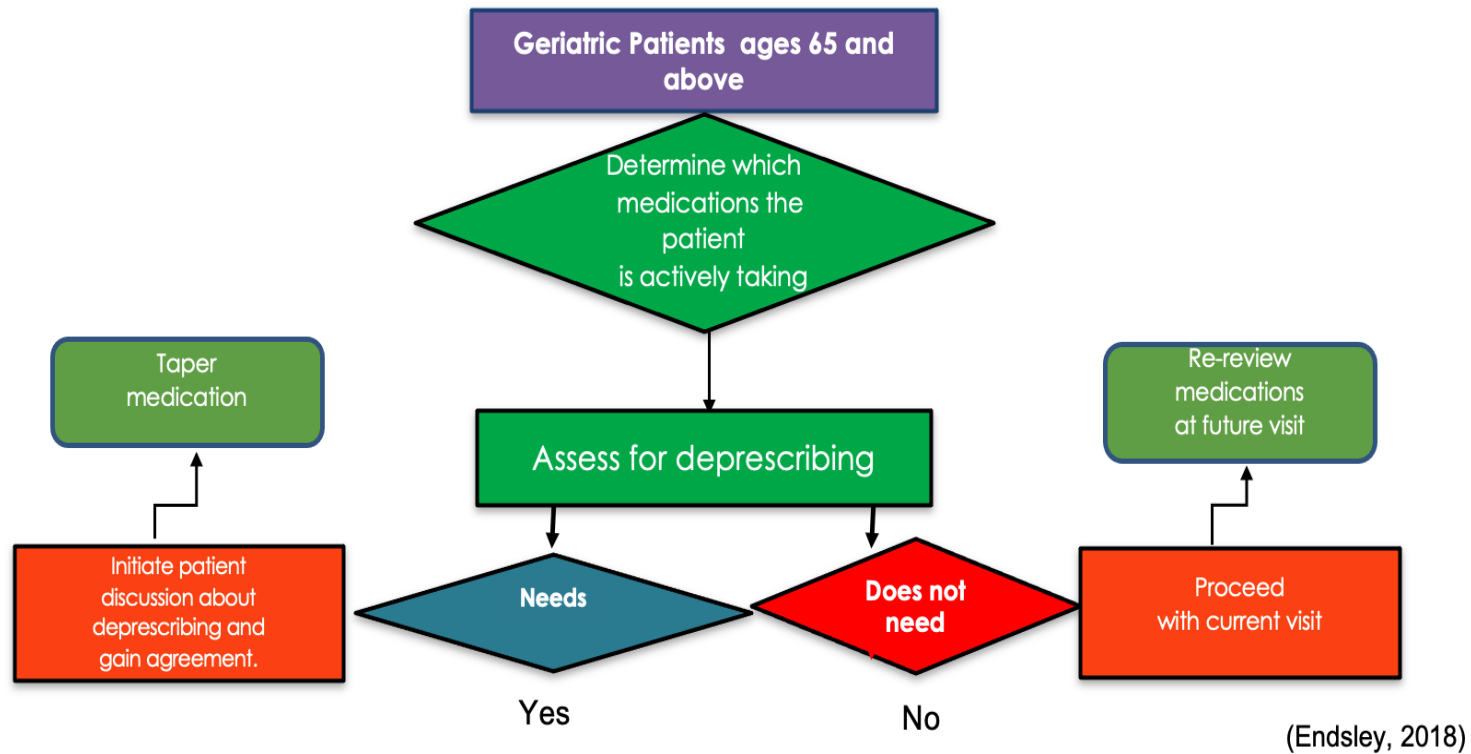
## Appendix M

### Paired Samples *t* Test: Medications

|          | A  | B   | C      | D         | E         | F            | G              | H               | I             | J     | K      | L      | M      | N      | O      | P       | Q       | R       | S       | T       | U                             |  |  |  |  |
|----------|----|-----|--------|-----------|-----------|--------------|----------------|-----------------|---------------|-------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|-------------------------------|--|--|--|--|
| 1        | ID | Age | Gender | Ethnicity | Caregiver | Polypharmacy | MedicationsPre | MedicationsPost | Deprescribing | Beers | PRE_Q1 | PRE_Q2 | PRE_Q3 | PRE_Q4 | PRE_Q5 | Post_Q1 | Post_Q2 | Post_Q3 | Post_Q4 | Post_Q5 | MedicationsPRE                |  |  |  |  |
| 2        | 1  | 75  | 1      |           | 0         | 1            | 8              | 7               | 1             | 45    | 1      | 5      |        |        |        |         |         |         |         |         | medication1, medication 2, me |  |  |  |  |
| 3        | 2  | 65  | 2      |           | 1         | 1            | 6              | 5               | 1             | 16    | 5      | 4      |        |        |        |         |         |         |         |         |                               |  |  |  |  |
| 4        | 3  | 45  | 1      |           | 0         | 1            | 1              | 1               | 0             | 20    | 6      | 5      |        |        |        |         |         |         |         |         |                               |  |  |  |  |
| 5        | 4  | 60  | 1      |           | 0         | 0            | 5              | 4               | 1             | 49    | 7      | 1      |        |        |        |         |         |         |         |         |                               |  |  |  |  |
| 6        | 5  |     | 1      |           | 1         | 1            | 4              | 4               | 0             |       | 1      | 23     |        |        |        |         |         |         |         |         |                               |  |  |  |  |
| 7        | 6  |     | 2      |           | 1         | 1            | 9              | 8               | 0             |       |        |        |        |        |        |         |         |         |         |         |                               |  |  |  |  |
| 8        |    |     | 2      |           | 1         |              |                |                 |               |       |        |        |        |        |        |         |         |         |         |         |                               |  |  |  |  |
| 9        |    |     |        |           |           |              |                |                 |               |       |        |        |        |        |        |         |         |         |         |         |                               |  |  |  |  |
| Sheet1 + |    |     |        |           |           |              |                |                 |               |       |        |        |        |        |        |         |         |         |         |         |                               |  |  |  |  |

## Appendix N

### Polypharmacy Deprescribing Flow Chart



*Note.* Adapted from “Deprescribing unnecessary medications: A four-part process” by S. Endsley, *Family Practice Management*, 25(3), 28-32 (<https://www.aafp.org/pubs/fpm/issues/2018/0500/p28.html>). Copyright 2018.