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Educational Intervention for Healthcare Providers on Using the STOPP/START Tool to Manage Polypharmacy in Older Adults: A Quality Improvement Program

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**Educational Intervention for Healthcare Providers on Using the STOPP/START Tool to
Manage Polypharmacy in Older Adults: A Quality Improvement Program**

A Scholarly Project Presented to the Faculty of the
Nicole Wertheim College of Nursing and Health Sciences

Florida International University

In partial fulfillment of the requirements
For the Degree of Doctor of Nursing Practice

By

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Date: _____

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Abstract

Polypharmacy is a significant healthcare issue among older adults in the United States. It is associated with an increased risk of medication errors, adverse drug interactions, adverse outcomes, and a high mortality rate. Application of polypharmacy management protocols such as the Screening Tool of Older Persons' Prescriptions (STOPP) and Screening Tool to Alert to Right Treatment (START) criteria can result in a significant reduction in polypharmacy rates among older adults. However, healthcare providers often lack knowledge and awareness of such protocols and fail to use them to improve outcomes for older adults with or at risk of polypharmacy. This project aimed to implement an educational intervention for healthcare providers to improve their awareness and application of the STOPP/START tool in practice. A total of 25 healthcare providers were recruited into the project, completed a pre/post-intervention survey, and watched an educational video. Results showed that the intervention led to an improvement in knowledge of the STOPP/START tool from 30% to 100%. Regular application of the tool in practice improved from 12% to 85%. Perceptions, behaviors, and practices concerning the application of the tool also improved with all participants answering that screening for polypharmacy should be done always or sometimes, up from 80% pre-intervention. Post-intervention 96% of the participants reported always or sometimes screening for polypharmacy up from 60% pre-intervention. The findings show that an educational intervention for healthcare providers on the use of the STOPP/START tool can improve their awareness of the tool and its application in the screening and management of polypharmacy in older adults.

Key Words: Polypharmacy, STOPP/START, pre-prescribing, older adults

Introduction

The U.S. population is aging with estimates projecting the age of older adults over 65 years of age to rise to 88.5 million by 2050 from 40 million in 2010 (Frey, 2018). The elderly population experiences increased susceptibility and vulnerability to diseases due to a decrease in physiological activities, lower adaptation to stimuli, and biochemical changes to their tissues. These factors result in an increased risk of developing chronic conditions that require multiple medications to improve their quality of life and survivability (Ferrucci et al., 2020). The use of multiple medications can result in a reduction in the quality of life and satisfaction of older adults due to poor outcomes. Prescription of multiple drugs also increases the risk of medication errors, adverse drug interactions, and increased risk of adverse outcomes, and even death (Valenza et al., 2017).

The concurrent use of more than five medications is referred to as polypharmacy. The condition is higher in older adults due to their higher multi-morbidity and the lack of proper guidelines on the use of medication to manage multiple chronic conditions (Mansoon et al., 2017). Polypharmacy affects close to 40% of older adults aged 65 and above in the United States. An additional 20% of older adults use ten or more drugs (Valenza et al., 2017). Another study by Wastesson et al. (2018) reported that for patients over 80 years of age, the rate of polypharmacy shoots up to 70%. According to Davies et al. (2020), the condition accounts for close to 30% of hospital admissions and is the fifth leading cause of death in the United States. Polypharmacy also costs the nation close to \$50 billion annually (Mehta et al., 2021). Combating and reducing polypharmacy in older adults is thus crucial to reducing healthcare costs and improving the healthcare outcomes for older adults with and at risk for polypharmacy.

Problem Statement

Polypharmacy is a significant health concern for older adults in the United States. It results in poor healthcare outcomes and higher healthcare costs. The condition also makes patient care difficult as healthcare providers must consider all medications taken by the patient and coordinate care appropriately to prevent further complications from medication errors (Muth et al., 2019). Despite its high prevalence in older adults, the significant challenges in its management, and severe outcomes related to polypharmacy, there is still limited awareness among providers of the conditions. Healthcare providers also have limited awareness of protocols for screening and management of polypharmacy for older adults.

Significance

Investigating effective interventions and protocols to improve healthcare providers' awareness of polypharmacy in older adults has several potential bearings in the care of older adults. For instance, the application of the Screening Tool of Older Persons' Prescriptions (STOPP) and Screening Tool to Alert to Right Treatment (START) criteria have resulted in a significant reduction in polypharmacy rates in older adults receiving care in primary care settings and long-term care facilities. A study by Unutmaz et al. (2018) on the effectiveness of the tool found a reduction in the risk of polypharmacy from 56.7% to 34.4% in a cohort of older patients. This DNP project aimed to determine whether the implementation of an educational intervention for healthcare providers on the use of the STOPP/START criteria improved their awareness of polypharmacy in older adults.

The project also aimed to benefit healthcare providers by improving their knowledge and skills in the management of polypharmacy at the clinical site. The projected benefit to society was a reduction in the number of medications prescribed to older adults and thus a reduction in

polypharmacy rates. The findings from this study add to the limited literature available on polypharmacy awareness and the use of the STOPP/START criteria for polypharmacy management in older adults.

Summary of the Literature

The scholar conducted a literature search with the goal to identify, retrieve, summarize, and synthesize literature relevant to answering the PICO clinical question: Will the implementation of an educational video for healthcare providers on the use of the STOPP/START tool and its application increase their awareness of polypharmacy in adults 65 years and older in a senior healthcare center in South Florida? Studies published within the past five years were selected for inclusion from literature searches in Medscape, MEDLINE, PubMed, NIH, and AACN. The target population of the articles was mainly older adults with or at risk of polypharmacy.

Various articles were retrieved for the literature review including primary studies, systematic reviews, meta-analyses, clinical guidelines, and statements from professional organizations relevant to the management of polypharmacy in older adults. Information from the retrieved articles was extracted based on five main-level constructs. These were: risk factors for polypharmacy in older adults, the impact of polypharmacy in older adults, prevention and management of polypharmacy, and guidelines for the management and reduction of polypharmacy. The use of the STOPP/START criteria was a major focus of the literature review and is addressed under the last two constructs: prevention and management of polypharmacy and guidelines for the management and reduction of polypharmacy. Table 1 below provides a summary of the articles retrieved and used for the literature summary.

Table 1: Article Search Summary

Database/Source	Records Identified	Articles included
Medscape	17	4
MEDLINE	20	5
PubMed	34	8
NIH	2	1
AACN	1	1
TOTAL	74	19

Risk Factors for Polypharmacy in Older Adults

Knowledge of the mechanisms for the prevention of polypharmacy in older adults requires an understanding of its genesis. Multiple factors contribute to polypharmacy among older adults. The synthesized literature points to two different levels namely clinician factors, patient-related factors, and system-level factors (Halli-Tierney et al, 2019). It was noted that these factors often interact and overlap thus contributing to the complexity of polypharmacy prevention and management. For instance, a clinician factor that contributes to higher rates of polypharmacy in older adults is the multidisciplinary management of multiple chronic conditions among older adults (Halli-Tierney et al., 2019). Such a prognosis requires management by multiple clinicians and specialists. In my clinical practice experiences, there is often a greater risk for medical errors when patient management relies on the collaboration of a large group of clinicians and specialists. This is mainly due to poor collaboration or miscommunication. The responsibility of the clinician is complicated when they must review multiple healthcare conditions and medications prescribed by other providers. This can often lead to medication errors and complications related to polypharmacy among older adults (Halli-Tierney et al., 2019).

The study by Morin et al. (2018) was also relevant to understanding the risk factors for polypharmacy in older adults. The study involved the synthesis of data from 1,742,336 older adults aged 65 years and older at baseline. The use of such a large cohort of older adults provides and improves the reliability of the study findings. The findings indicate that among the population, the average number of medications per participant was 4.6 at baseline with a polypharmacy prevalence of 44% in the group. One patient-level factor reported in the study as contributing to polypharmacy is the presence of multiple chronic conditions. (Morin et al., 2018). These findings support the hypothesis that polypharmacy reflects multimorbidity among older adults. While prescribing multiple medications is justified to manage multiple chronic conditions, polypharmacy poses multiple risks to the patient including adverse drug events. This necessitates interventions to reduce and manage polypharmacy in this population.

The wide availability of effective drug therapies and prescription guidelines that recommend the use of multiple medications to prevent and manage conditions is a system-level factor that increases the risk of polypharmacy in older adults. A study by Brown-Taylor et al. (2021) investigates how the implementation of individuals of individual practice guidelines can lead to polypharmacy in patients. The authors note that non-coordinated clinical practice guidelines can lead to unintended polypharmacy. While clinical practice guidelines are good resources for treating separate conditions, they are not intended to be used as recommendations for the management of multimorbidity. Blind adherence to recommendations from each guideline when managing conditions among older adults can lead to conflict and overlap of medications. This can lead to polypharmacy and other negative impacts on the patient which can complicate their care and recovery (Brown-Taylor et al., 2021). Optimizing care to prevent and

manage polypharmacy requires individualized care and selective implementation and prioritization of clinical recommendations to improve the healthcare outcomes for older adults.

Other system-level factors identified in the literature as contributors to polypharmacy in older adults are poor keeping of medical records, services that provide automated refills for medications, and prescribing whose sole aim is to meet disease-specific quality metrics (Halli-Tierney et al, 2019). According to Halli-Tierney et al. (2019), poor keeping of medical records can result in polypharmacy if discontinued medications are not removed from a patient's medical records. Similarly, a study by Shrestha and Khanal (2019) points out that well-kept medical records are essential for proper prescription. Health records should contain details on earlier and current prescriptions, routes of administration and dosage, previous hypersensitivity reactions, and treatment durations (Shrestha & Khanal, 2019). Automated refills of medications using incorrect medical records can lead to polypharmacy due to the lack of a medication review by a clinician. Lastly, prescription regimens that aim at meeting disease-specific quality metrics often fail to consider complex multimorbidity in older adults thus adding to their risk for polypharmacy (Rankin et al., 2018).

Impact of Polypharmacy on Older Adults

Polypharmacy is a highly prevalent healthcare condition affecting close to 40% of older adults aged 65 years and older in the United States (Valenza et al., 2017). The authors add that over 20% of this population uses ten or more drugs daily which further increases the risk for adverse outcomes (Valenza et al., 2017). An example of an adverse outcome that is significantly increased by polypharmacy in older adults is drug interactions. In a study by Szilvay et al. (2021) drug interactions are grouped into pharmacodynamic and pharmacokinetic interactions. Aging results in changes in pharmacodynamics and pharmacokinetics which can negatively impact a

patient's interaction with drugs. According to the authors, pharmacodynamic interactions occur when concurrent medications have additive or opposite effects on the patient's body at the molecular level. On the other hand, pharmacokinetic interaction occurs when one medication affects the concentration of other medications as a result of its metabolism, absorption, or excretion (Szilvay et al., 2021). Despite advancements in drug management strategies, the risk for pharmacodynamic and pharmacokinetic interactions persists with one study reporting an interactions prevalence of 96% among older adults with polypharmacy (Nusair et al., 2020). It is important to identify and evaluate potential drug interactions to reduce the negative impact of polypharmacy.

Drug interactions resulting from polypharmacy have serious health risks to the patient. For instance, interactions that reduce or increase the effectiveness of therapy can lead to hospitalizations, morbidity, and mortality. Chang et al. (2020) conducted a cohort study to investigate polypharmacy and its impact on hospitalization and mortality risk in older adults. All approaches used to analyze the findings including adjustment of comorbidity index and propensity-score matching analysis showed a consistent association between polypharmacy and a higher risk of hospitalization and mortality. A study by Schöttker et al. (2017) also observed twofold mortality among participants with polypharmacy in a population-based cohort of older adults with a median age of 70 years. Effects of polypharmacy such as higher hospitalization rates, higher mortality, frailty and falls, drug interactions, and adverse drug interactions greatly increase the cost burden on the patient and the healthcare system (Midão et al., 2018). Frey (2018) reports that polypharmacy costs the United States an estimated \$50 billion annually. The findings from these studies underscore the negative impacts of polypharmacy in older adults and

highlight the need for the implementation of effective interventions to help prevent and manage polypharmacy in older adults.

Prevention and Management of Polypharmacy

Prevention and management of polypharmacy can be achieved through a wide range of interventions. The interventions rely on the clinician's ability to identify potentially inappropriate medication among older adults. The reviewed literature identifies several tools that can be used to identify the risk for polypharmacy in older adults. These are the screening tool of older people's prescriptions (STOPP) and screening tool to alert to right treatment (START) (O'mahony, 2019), the Beers tool, and the Medication Appropriateness Index (Halli-Tierney et al, 2019). According to Halli-Tierney et al. (2019), none of these tools or strategies are superior when used singly to improve polypharmacy outcomes and patients' quality of life. Nonetheless, the tools are still effective strategies to identify and evaluate the potential for polypharmacy and associated adverse events. For instance, the START/STOPP criteria have been successfully applied to improve prescribing by identifying drug interactions, therapies that increase the risk of falls, and duplicate therapies (Nwadiugwu, 2020). A study by Unutmaz et al. (2018) also used the tool to increase the risk of non-polypharmacy from 43.3% to 65.6% in a cohort of older patients. Appendix 2 outlines the START/STOPP criteria.

The study by Rankin et al. (2018) also identifies several effective interventions to prevent and manage polypharmacy including educational interventions for patients and prescribers, review of medications, and prescribing audits. The reviewed literature presents different efforts to reduce polypharmacy using educational interventions. One of the reviewed articles investigated the impact of a pharmacist-led educational intervention on polypharmacy prevention and management. The study reported improvements in the discontinuations of medications that

had been prescribed inappropriately (Martin et al., 2018). Another study by Yang et al. (2021) sought to investigate and develop a protocol for an effective self-management educational intervention delivered to older adults in a community setting. The authors note that self-management interventions can help to improve medication adherence and health outcomes for older patients with multimorbidity (Yang et al., 2021). Many older adults struggle with understanding and managing their healthcare due to limited health literature. Educational involvement for the population can improve their familiarity with medication safety strategies to avoid polypharmacy. Approaches such as the use of presentations, audiovisuals, and lessons in understandable languages are potentially effective strategies to educate older adults on polypharmacy and its management (Shrestha & Khanal, 2019).

The study by Halli-Tierney et al. (2019) outlined the importance of medication review in the prevention and management of polypharmacy. Medication review involves monitoring the medications that a patient is currently taking and de-prescribing any that are unnecessary. Nusair et al. (2020) agree that medication review and reconciliation are critical to identifying clinically relevant risks for drug interactions (Nusair et al. 2020). Reconciliation involves conducting prescribing audits to minimize pill burden, medical costs, and risks of drug interactions (Halli-Tierney et al, 2019). Clinicians should view prescribing audits as an opportunity to de-prescribe unnecessary medications. When reviewing and de-prescribing medications to manage polypharmacy in older adults, they should consider caregiver and patient therapy goals. They should also consider priorities concerning the goals of prescriptions such as addressing symptoms, preventing health decline, or slowing the progression of a condition (Halli-Tierney et al, 2019). Lastly, healthcare providers can use point-of-care tools to guide them in making medication decisions that reduce the burden of polypharmacy on their patients. Despite the

benefits of educational interventions, medication reviews, and prescribing audits, Chang et al. (2020) report there is a shortage of sufficient long-term literature on whether these strategies have a significant impact on the prevention and management of polypharmacy. There is still a need for long-term studies to investigate clinical endpoints related to polypharmacy such as hospitalization and mortality rates (Chang et al. 2020).

Guidelines and Tools for the Management and Reduction of Polypharmacy

Various authors have cataloged the effectiveness of various tools and guidelines set forth to manage and reduce the problem of polypharmacy among elderly patients. The interventions analyzed have, for a large part, demonstrated improvements in the reduction of inappropriate prescribing. O'mahony (2019) presented a revised version of the STOPP/START criteria that can be employed to curtail potentially inappropriate prescriptions given to older patients. STOPP (Screening Tool of Older Person's Prescriptions) and START (Screening Tool to Alert to Right Treatment) are guidelines that facilitate the review of prescriptions for older patients in clinical settings. The author notes that while the STOPP/START criteria have been in use since it was first published in 1991, the original model has weaknesses which include the misclassification of drugs as well as the omission of drug-to-drug interactions in the human body. The author proposes updating the STOPP/START to a newer model that will involve the inclusion of electronic health records into the criteria and the involvement of pharmacists who have undergone special training in geriatric pharmacology. A better STOPP/START model should also have the ability to distinguish between life-threatening wrongful prescriptions and those that will only result in trivial effects. This will prevent attending prescribers from receiving too many notifications for possible prescribing errors and reduce the risk of alert fatigue. Appendix 2 outlined the START/STOPP criteria.

In a cluster randomized controlled trial protocol, McCarthy et al. (2017) sought to prove the effectiveness of guidelines set forth by the National Institute for Clinical Excellence (NICE). The NICE guidelines advise clinicians on prescribing for older patients with multi-morbidity that have been prescribed 15 or more repeat medicines. The study, which took place in Ireland, involved 450 patients aged 65 and over across 30 general practices. In the process of testing the efficacy of NICE guidelines, the researchers developed and evaluated new criteria for prescribing to older adults, the SPPiRE intervention (Supporting prescribing in older patients with multimorbidity and significant polypharmacy). The SPPiRE intervention model seeks to tailor the delivery of care using an explicit set of guidelines that address patients' priorities. According to McCarthy et al. (2017), a previous implementation of the SPPiRE has proven that the median percentage of admission to hospital due to complications with medications stands at 34%, while antiplatelets, diuretics, and anticoagulants form the bulk of commonly misprescribed drugs to elderly patients. The SPPiRE intervention was also influenced by Medical Research Council's Framework for developing complex interventions as well as the OPTI-SCRIPT intervention (Optimizing Prescribing for Older People in Primary Care, a cluster-randomized controlled trial).

The European Union funded the development of the electronic PRIMA-eDS-tool (Polypharmacy in chronic diseases: Reduction of Inappropriate Medication and Adverse drug events in older populations by electronic Decision Support) to help provide a set of guidelines to general practitioners so they can reduce instances of inappropriate medication towards older patients with multiple comorbidities. Rieckert et al. (2018) carried out a qualitative study to determine the effectiveness and practical implementation of this tool. The study found that most general practitioners viewed the electronic data entry tool as well as the set of guidelines that

were provided to be inconvenient and time-consuming. Most of the data in electronic case reports were done without patients present and outside the hours of practice. When patients requested to switch medication, the PRIMA-eDS tool prevented them even in valid cases. These problems caused the authors to conclude that the PRIMA-eDS set of guidelines ought to be disbanded and that the tool is discontinued from patient data entry in the future. For any guidelines that seek to curtail instances of polypharmacy among elderly patients to be successful and widely adopted, such guidelines need to be time-efficient, effective, and cost-effective.

Table 2: Summary of Studies

Author	Purpose /Focus of the Article	Study Characteristics/ Research Method	Participants' Characteristics/ Target	Results and Significance to the Project
Halli-Tierney et al. (2019)	Evaluating the risks of polypharmacy and deprescribing and outlining key recommendations	Practice recommendation/ guideline	Older adults and younger people with complex healthcare conditions in the United States	The study outlines several tools that can be used to identify inappropriate medication use including the STOPP/START tool which would be used in this project. The study recommends monitoring active medication and deprescribing unnecessary medication
Morin et al. (2018)	Investigate the epidemiology of polypharmacy in older adults	Prospective cohort study	Older adults \geq 65 years at baseline	There is a high prevalence of polypharmacy in older adults Interventions should also target patients at risk of polypharmacy, not just those already with polypharmacy
Brown-Taylor et al. (2021)	Impact of multiple disjointed practice guidelines on polypharmacy in patients with poly-trauma clinical triad (PCT)	Practice recommendation/ guideline	Patients with PCT	Multiple unconnected practice guidelines can lead to polypharmacy Guidelines and tools that coordinate care for multiple medications such as the STOPP/START criteria can help to streamline and prevent polypharmacy
Shrestha & Khanal (2019)	Management and challenges in the management of polypharmacy in elderly cancer patients	Systematic review	Studies focusing on elderly cancer patients	Healthcare providers such as pharmacists and nurses can make a great contribution to solving polypharmacy through the identification of risk factors for polypharmacy and the management of the risks

Rankin et al. (2018)	Investigate interventions to improve the appropriate use of polypharmacy in older people	Systematic review	32 Studies focusing on intervention to improve appropriate polypharmacy	Appropriate polypharmacy can help to improve outcomes for patients Interventions can be delivered by healthcare professionals such as nurses, geriatricians, and pharmacists.
Valenza et al. (2017)	Investigate the dangers of polypharmacy	Case reports	Patients on multiple medications	The article provides definitions of polypharmacy and an analysis of scenarios involving polypharmacy and evidence-based interventions to reduce the prevalence and complications of polypharmacy
Szilvay et al. (2021)	Analyze interaction risks for patients with polypharmacy and pharmacist interventions aimed at solving the risks	Multi-center descriptive study	Healthcare providers and patients with or at risk of polypharmacy	The study involved the medication review of 755 patients guided by pharmacists and general practitioners The most common sources of drug-related problems were found to be drug interactions Modification of therapy was recommended to reduce interaction risks
Nusair et al. (2020)	To investigate the severity and prevalence of drug interactions in adult patients with polypharmacy	Descriptive cross-sectional study	Polypharmacy patients in outpatient clinics	Therapy modification is needed for most patients with polypharmacy to improve care and outcomes This project investigates the education of healthcare providers on the use of the STOPP/START tool to modify therapy
Chang et al. (2020)	A national cohort of polypharmacy mortality risks and hospitalization	Cohort study	Older patients aged ≥ 65 years on at least one routine prescribed medication but no	Higher hospitalization and mortality were associated with a higher number of daily prescribed medications This points to the need for medication review among older patients to reduce hospitalization and mortality rates

			hospitalization within the past year	
Schöttker et al. (2017)	Investigation of polypharmacy and mortality	Cohort Study	Older adults	The study did not find an independent association between polypharmacy and non-cancer polypharmacy. This points to the importance of investigating other confounding factors for polypharmacy and poor outcomes. Using the STOPP/START tool can help to ensure patients stop unnecessary medication and take necessary medications to improve their outcomes even when they require more than 5 medications
Midão et al. (2018)	Determination of prevalence of polypharmacy in older adults from health surveys on aging and retirement	Cross-sectional analysis study	Older adults in 17 European countries and Israel	Polypharmacy was found to have a high prevalence in older adults Identification of variables associated with polypharmacy such as age, economic position, and number of chronic diseases is important for proper monitoring and management of polypharmacy
Frey (2018)	Investigate demographic dynamics related to increased aging in the USA population	Cross-sectional study	Aging population in the USA	The article identifies the high cost of polypharmacy in the USA thus pointing to the need for effective interventions to reduce polypharmacy in the aging population
O'mahony (2019)	Origin and development of the STOPP/START criteria	Expert opinion	Multi-morbid older adults	The article notes that the application of the STOPP/START criteria for older adults with multimorbidity can improve their clinical outcomes The study also recommends face-to-face interaction between patients and trained

				healthcare providers for the effective implementation of recommendations in the STOPP/START criteria
Nwadiugwu (2020)	Investigation of frailty and the risks of polypharmacy in older adults	Expert opinion	Older adults	The use of prescribing tools such as STOPP/START and Beers criteria can help in medication reconciliation to minimize polypharmacy
Unutmaz et al. (2018)	Evaluating the impact of geriatric assessment on the cost of medications for older patients	Retrospective evaluation	79 Older patients that have undergone comprehensive geriatric assessment (CGA)	The study used both CGA and the STOPP/START tool to determine drugs taken by patients, their number, drug groups, and costs The CGA and STOPP/START criteria helped to reduce the prevalence of polypharmacy. There was a reduction in both potential prescribing omissions (PPOs) and potentially inappropriate medications (PIM)
Martin et al. (2018)	Determine the effect of an educational intervention for pharmacists on reducing inappropriate medication prescriptions in older adult	Randomized controlled trial	Healthcare providers (Pharmacists) Older adults	The study found that implementation of an educational intervention resulted in higher discontinuation of inappropriate prescriptions Although the authors note that the generalizability of the findings in other settings will require further research, it is hoped that the implementation of an educational intervention in this study will result in similar results
Yang et al. (2021)	Determine the impact of self-management intervention on medication adherence among older adults	Randomized controlled trial	Community-based nurses Older patients with multimorbidity	The study recommends the use of medication self-management intervention for older adults to improve adherence and health outcomes. This project includes a patient

				information leaflet in both English and Spanish that improves patient involvement in the medication review (Appendix 6)
McCarthy et al. (2017)	Guideline to support prescribing for older adults with multimorbidity and polypharmacy	Cluster Randomized controlled trial	30 general practices and 450 patients aged 65 years and over	The study investigates a complex intervention that can be used to coordinate care across multiple conditions and address concerns about medication safety in older patients Tools such as the STOPP/START tool can be used for such complex interventions for patients with multimorbidity and polypharmacy
Rieckert et al. (2018)	The attitude of general practitioners on the use of electronic decision support to reduce inappropriate medication	Qualitative study	General practitioners using the PRIMA-eDS tool to reduce inappropriate medications in older patients with polypharmacy	The PRIMA-eDS tool was found to be too time-consuming resulting in lower utilization An alternative tool such as the STOPP?START can be used in this instance to reduce inappropriate medications

Purpose/PICO Clinical Questions/Objectives

Purpose Statement

Older adults are known to experience an increased risk of adverse events and outcomes due to polypharmacy and inappropriate prescribing as explored in the literature review. Evidence suggests some common drugs are related to increased risk for polypharmacy and adverse outcomes in older adults. The primary purpose of this DNP project was to determine whether the education of healthcare providers on the STOPP/START criteria and its implementation as a care protocol in a senior healthcare center helps to increase their awareness of polypharmacy among older adults. The primary goals of the DNP project were increasing healthcare providers' awareness concerning the management of polypharmacy and dissemination of knowledge on the effectiveness of using the STOPP/START criteria to improve awareness of polypharmacy in older adults with polypharmacy.

PICO Clinical Question

The PICO (population, intervention, comparison, and outcomes) tool was used to develop the DNP project question: Will the implementation of an educational video for healthcare providers on the use of the STOPP/START tool and its application increase their awareness of polypharmacy in adults 65 years and older in a senior healthcare center in South Florida? Below is a breakdown of the question within the PICO components as outlined by Dearholt and Dang (2017).

- **Population:** Healthcare providers caring for older adults 65 years and older with polypharmacy at a senior healthcare center

- **Intervention:** Educational video for healthcare providers on the use of the STOPP/START tool
- **Comparison:** Polypharmacy awareness before the intervention
- **Outcome:** Increase in healthcare provider's awareness of polypharmacy in adults 65 years and older

Project Objectives

The objectives of the DNP project were developed to ensure they are specific, measurable, attainable/achievable, relevant, and time-bound. Appendix 1 provides further details on the tasks and timeline for the project. The timeline was developed in consultation with the DNP project team. The objectives were bound to the anticipated outcomes of the project as outlined below:

- To develop a STOPP/START awareness educational program to manage and optimize medication in older adults with polypharmacy. The STOPP/START criteria are outlined in Appendix 2.
- To educate healthcare providers at the clinical site on the use of the STOPP/START criteria
- Incorporation of the STOPP/START tool into the healthcare center's protocol for the management of polypharmacy in older adults
- To evaluate the impact of the educational video and implementation of the STOPP/START tool on healthcare provider's awareness of polypharmacy in adults 65 years and older

Definition of Terms

Polypharmacy

The systematic review by Mansoon et al. (2017) reviews different definitions of polypharmacy in literature. The most widely reported definition of polypharmacy is the concurrent use of five or more medications daily. Some articles, however, define polypharmacy as the concurrent use of as low as two or more medications to eleven or more medications (Mansoon et al., 2017). For this DNP project, polypharmacy will refer to individuals taking five or more medications daily. The use of five or more medications is common among older adults due to their susceptibility and vulnerability to disease and biochemical changes in their bodies which forces them to use multiple medications (Ferrucci et al., 2020). Polypharmacy increases the risk of adverse medical outcomes (Halli-Tierney et al., 2019).

Older Adults

The CDC defines older adults as individuals who are 65 years or older. This population represents 16% of the population in the United States (NCCDPHP, 2022). Another study by Singh and Bajorek (2014) sought to investigate the definition of older adults in clinical practice guidelines for pharmacotherapy. Of the investigated guidelines, most defined older adults as individuals at the age of 65 years or older, and one defined older adults as individuals at the age of 75 years or older (Singh & Bajorek, 2014). In the case of this DNP Project, older adults are the chronological age of 65 years or older. Older adults face increased risk for chronic conditions and are the US's leading drivers of high healthcare costs, disability, illness, and death (NCCDPHP, 2022).

STOPP/START Criteria

The STOPP/START criteria is a tool that helps healthcare providers to appraise the medications taken by older adults based on their clinical conditions. The criteria were developed and rated by experts in geriatric pharmacotherapy. It was then validated for use in patients ages 65 and over. Nonetheless, healthcare providers should use clinical judgment when determining drug contraindications and interactions that are not listed in the STOPP/START tool.

Additionally, healthcare providers should consider manufacturer recommendations, national and local guidelines, and published literature when faced with any doubts concerning the application of the criteria (O'Mahony, 2019).

Conceptual Underpinning and Theoretical Framework

The project aimed to implement the STOPP/START criteria for the management of polypharmacy among older adults at the clinical site. Guidelines and tools for the management of polypharmacy including the STOPP/START criteria, NICE guidelines, PRIMA-eDS-tool, SPPiRE intervention, and OPTI-SCRIPT intervention that are outlined in the literature review section provide healthcare providers with frameworks that can be applied in the management of polypharmacy. This project sought to educate healthcare providers on the STOPP/START criteria to improve their awareness of polypharmacy in older adults. To this end, Kurt Lewin's Change Model was relied on as the theoretical framework for the project. The model describes changes as containing three main phases namely, unfreezing, change, and refreezing (Burnes, 2020).

In the first step of unfreezing, awareness was created of the impending change and its benefits to the healthcare providers, patients, and the healthcare facility. It included an organizational assessment to understand the state of the clinical site regarding polypharmacy

management in older adults. The phase also involved communicating to stakeholders the background and problem of polypharmacy among patients at the facility and the need for increased awareness. The stakeholders were then consulted in the preparation and approval of the educational program on STOPP/STOPP criteria that were used in the project.

In the change phase, the healthcare providers received educational intervention on the use of the STOPP/START tool in the management of polypharmacy. They were also expected to apply the criteria in the management of older adults receiving care at the clinical site. Lastly, the refreeze phase involved the cementing of the changes as the new normal (Burnes, 2020). This included monitoring and reporting outcomes and developing a sustainability plan. Figure 1 below outlines the theoretical and conceptual framework used in the project.

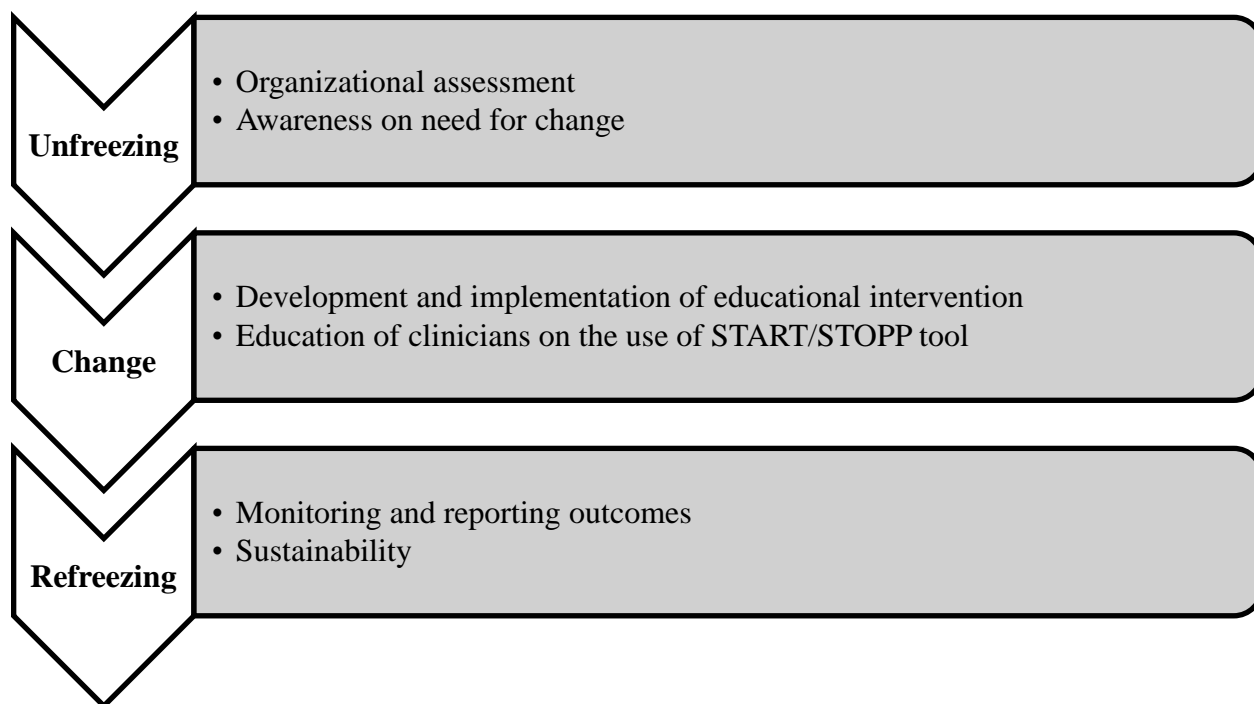


Figure 1: Theoretical and Conceptual Framework

Methodology

Setting and Participants

The DNP Project will be conducted at the Sanitas Medical Center located in Miami, Florida. The organization is part of the larger network of Sanitas Group Practice situated across several states in the United States. It provides both primary and urgent care in family medicine, general practice, and occupational medicine alongside other specializations. The practice also provides services such as lab work, imaging, virtual care, and vaccinations. The selection of the practice as the site for the DNP project was influenced by the large number of older adults that it serves in the community. The educational intervention on the use of the STOPP/START criteria will be implemented on 23 healthcare providers at the clinical site. An assessment of the providers' awareness before and after the intervention will be used to determine the impact of the intervention on their awareness of polypharmacy in older adults.

Approach and Project Procedures

The project will be conducted by the lead investigator and the staff at Sanitas Medical Center. The lead investigator will be responsible for the development of the educational video on the use of the STOPP/START tool for the management of polypharmacy in older adults. The lead investigator will consult with relevant stakeholders to develop and gain approval for the use of the STOPP/START educational program in the project. The educational video will include an explanation of the basics of the STOPP/START criteria and their application in the review, monitoring, reconciliation, optimization, and deprescribing of medications that are deemed unnecessary. The educational program will also train healthcare providers on the delivery of instructions and guidance to patients to prevent and manage polypharmacy and its effects. It was

expected that healthcare providers would apply the knowledge learned in the care of their older patients.

The lead investigator will be responsible for planning meetings with key stakeholders throughout all phases of the project. An internal committee will be formed to guide the implementation of the project. The healthcare providers involved in the project will be expected to complete a consent form before inclusion in the study. They would then complete a survey to collect data on their licensure, years of experience, and knowledge and use of the STOPP/START criteria. The questionnaire was developed using Qualtrics and sent to participants. Lastly, the healthcare providers were expected to apply the START/STOPP tool in the management of polypharmacy in older adults. Appendix 3 outlines the project activities and timeline.

Protection of Human Subjects

All participants recruited for the project will receive an information letter that will outline key information about the project including eligibility, what the participants were expected to do, how their information and identity would be protected, and the benefits and risks of participating in the project. The information will be explained to potential participants and any questions they have regarding the information will be answered. The privacy and confidentiality of the participants are also assured. Data collected as part of this project will only be accessible to the principal investigator and the preceptor. Participation in the project will be voluntary and participants will be free to withdraw their participation from the project at any time without loss of benefits or penalty.

Data Collection

The lead investigator will be responsible for data collection. A pre/post-test survey will be used to collect data on the details of the healthcare providers concerning their licensure, familiarity with the STOPP/START criteria, and awareness of polypharmacy and its management in older adults. The survey is included in appendix 4. The survey was developed on Qualtrics for easy collection and analysis of data. Each participant will receive a link to the survey in their emails once they have been recruited into the study and signed a consent form. They will also receive a link to the post-test questionnaire after completing the educational intervention. All information collected from the participants will be treated with the utmost confidentiality.

Instrument Reliability and Validity

The start STOPP/START criteria used in this project was originally developed through a collaboration of experts in geriatric pharmacotherapy. The tool has been validated for use in patients aged 65 years and over. Nonetheless, healthcare providers must use their clinical judgment when determining drug contraindications and interactions that are not listed in the STOPP/START tool. Additionally, healthcare providers should consider manufacturer recommendations, national and local guidelines, and published literature when faced with any doubts concerning the application of the criteria (O'Mahony, 2019).

Data Management and Analysis

Healthcare providers will be required to attend the educational program on the implementation of the STOPP/START criteria and complete a pre/post-test questionnaire. The collected data through the survey will be stored on Qualtrics software which is password

protected to ensure the safety and confidentiality of participants' data. Statistical analysis techniques will be used in the analysis of the collected data. Results from the pre-test and post-test survey will be used to assess the changes in awareness of polypharmacy among healthcare providers.

Results

Characteristics of the Study Population

A total of 25 healthcare providers were recruited for the project including Nurse practitioners, Medical Doctors, and Physician Assistants. All healthcare providers completed a pre-test survey, educational intervention, and post-test survey. The survey included demographic questions such as age, gender, position, and years of experience working in primary care. Of the 25 participants included in the project, 52% were male while 48% were female. Concerning their positions and titles, a majority of the participants were nurse practitioners at 72% (n=18). There were also 4 medical doctors, making up 16% of the population, and 3 physician assistants, which was 12% of the study population. Two of the participants selected "other" and indicated their position as a DNP nurse and an Adult-Gerontology Nurse Practitioner (AGNP). These were added to the number of nurse practitioners. Figures 2 and 3 below represent graphs of the participant's genders and positions.

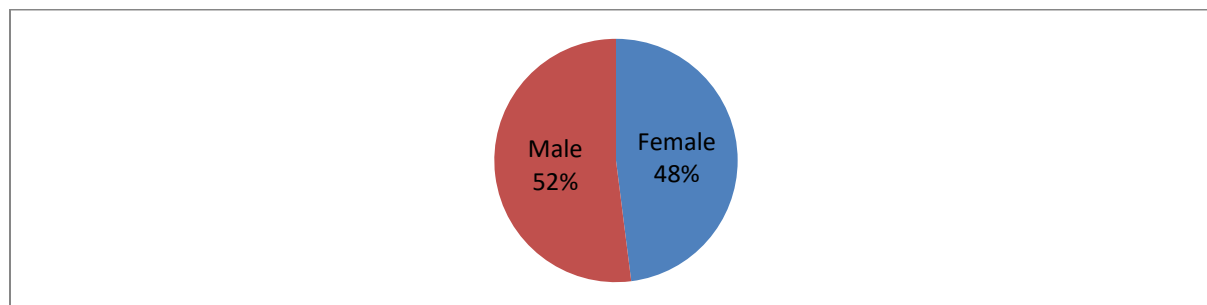


Figure 2: Participants' Gender

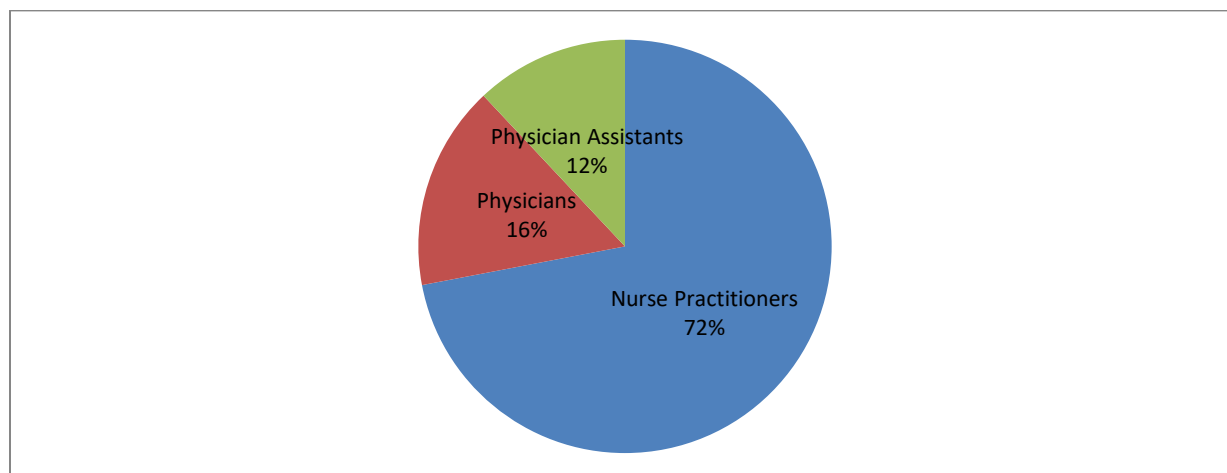


Figure 3: Participants' Positions/Titles

The participants had an average age of 43.4 years. The average years of experience working in primary care was 18.8 years. The ages of the participants ranged from 29 years to 45; years meaning the oldest healthcare provider in the project was 45 while the youngest was 29. The range in years of experience in primary care was between 4 years of experience (lowest) and 32 years of experience (highest). Table 3 below represents the participant's ages and years of experience working in primary care.

Age	Years of Experience in Primary Care
Average: 43.4 Years	Average: 18.48 Years
Range: 29 to 45 Years	Range: 4 to 32 Years

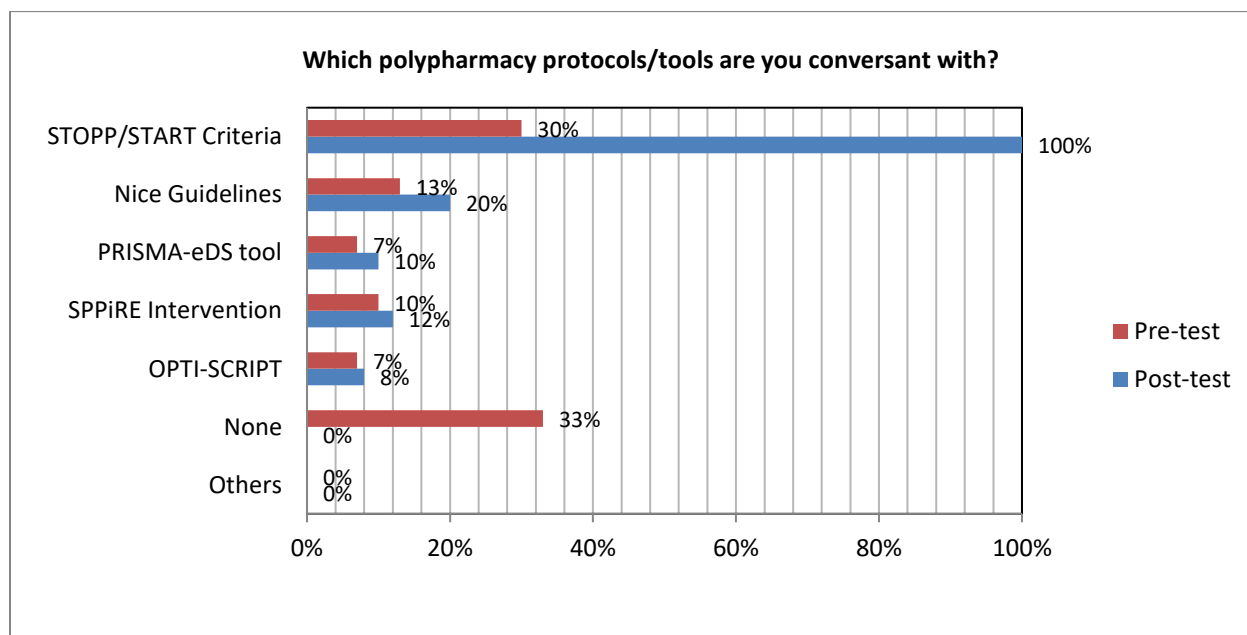
Table 3: Ages and Years of Experience Working in Primary Care.

Knowledge and Attitudes Concerning the Assessment and Management of Polypharmacy

The second set of questions in the pre/post-intervention survey sought to understand the healthcare providers' knowledge of different polypharmacy management protocols and their attitudes towards the use of the protocols in the management of polypharmacy. The baseline pre-intervention survey revealed that only 30% were conversant with the STOPP/START tool.

Nonetheless, only 12% reported applying the tool in the care of older adults. Other polypharmacy tools that the participants were conversant with included NICE Guidelines at 13%, PRISMA-eDS-tool at 7%, SPPiRE intervention at 10%, and OPTI-SCRIPT at 7%. It was also interesting to note that a large majority of the participants (33%) were not conversant with any of the polypharmacy management protocols at baseline. Similarly, 84% of the participants reported not using any polypharmacy management protocol.

The knowledge of healthcare providers on the STOPP/START tool and its application increased significantly from baseline to post-intervention. For instance, the knowledge and conversance with the STOPP/START tool increased from 30% to 100%. For the second question, 85% of the healthcare providers reported regularly applying the STOPP/START tool in the management of polypharmacy in older adults following the intervention. Figure 4 below represents two graphs of the pre-intervention and post-intervention scores on the knowledge and attitudes of healthcare providers concerning the assessment and management of polypharmacy.



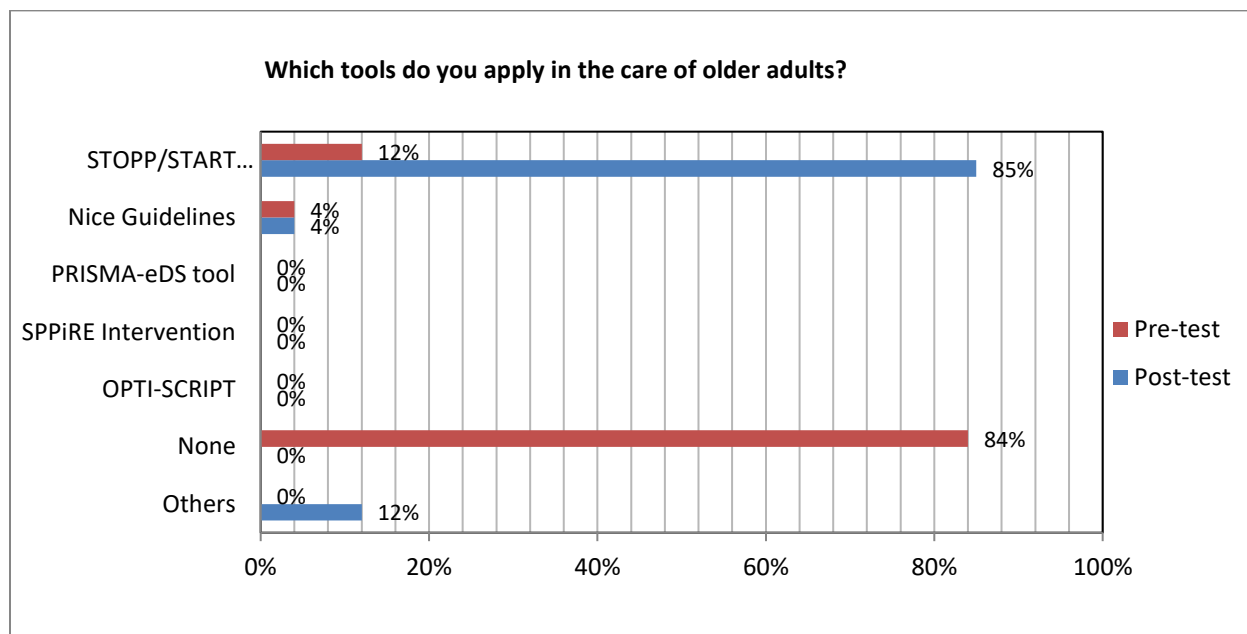


Figure 4: Knowledge and Attitudes

Behaviors and Practices Concerning the Assessment and Management of Polypharmacy

The last set of questions in the pre-intervention and post-intervention surveys sought to assess the behaviors and clinical practices of the healthcare providers concerning the screening and use of polypharmacy management protocols to optimize medication and manage polypharmacy in older adults with or at risk of polypharmacy. The first question sought to understand the views of the participants on how often they think healthcare providers should screen for polypharmacy in older adults. A majority of the healthcare providers (76%) thought screening for polypharmacy should be done always. An additional 20% replied that screening should be done sometimes in the pre-intervention survey.

Post-intervention, 84% of the healthcare providers answered that healthcare providers should always screen for polypharmacy in older adults while 16% reported that healthcare providers should screen for polypharmacy sometimes. It was also interesting to note that despite the higher pre-test perceptions on the importance of regular screening for polypharmacy, only

12% reported always applying polypharmacy protocols in the second question which inquired how often healthcare providers applied polypharmacy management protocols. Post-intervention, the percentage of participants that reported always applying polypharmacy protocols grew to 80% while 16% reported applying protocols sometimes. The percentage of healthcare providers who never applied polypharmacy protocols also reduced from 16% to 0%. Figure 5 below presents the graphs of results for questions on behaviors and practices of healthcare providers concerning the assessment and management of polypharmacy.

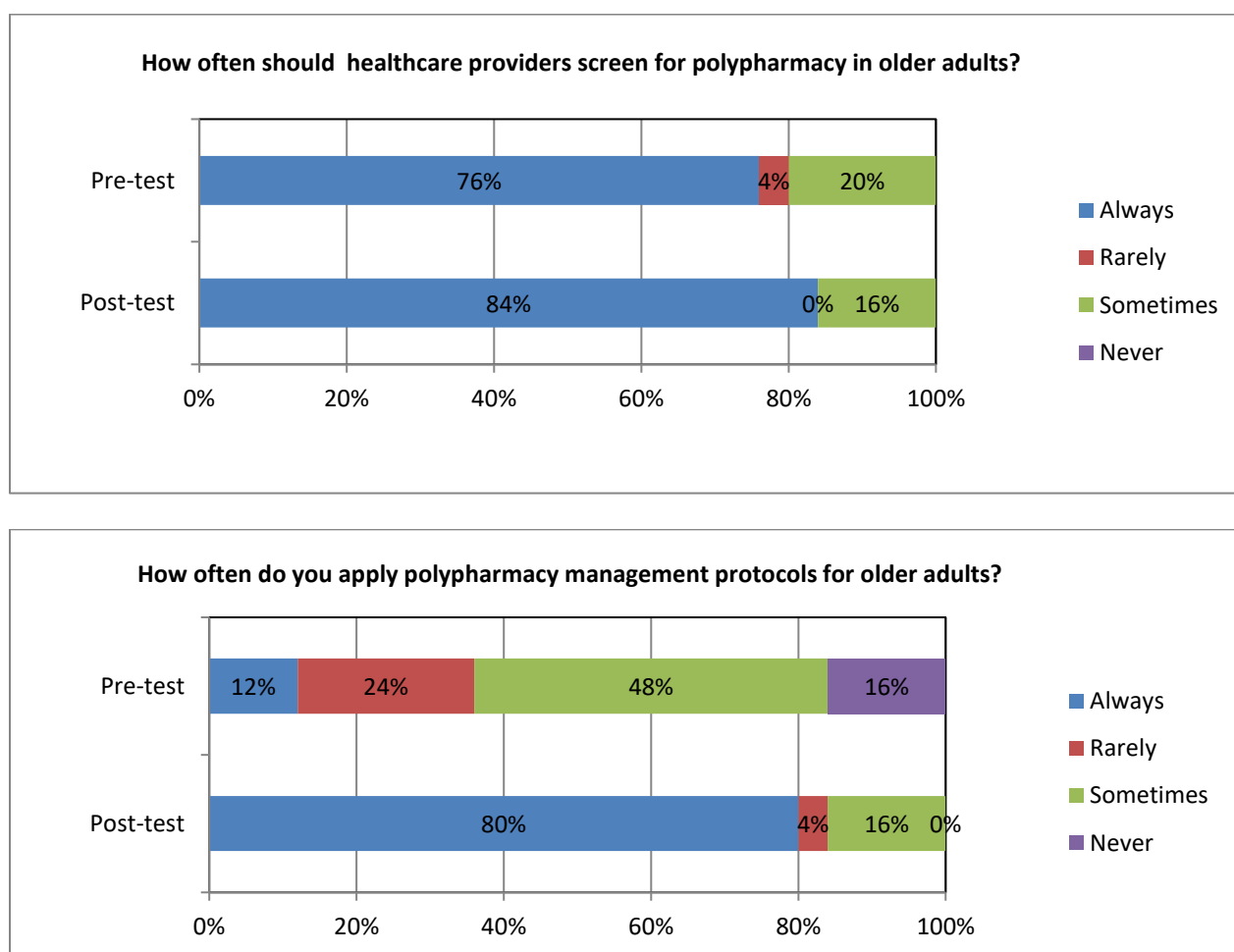


Figure 5: Behaviors and Practices

Discussion

Major Findings

This quality improvement project aimed to determine whether an educational intervention for healthcare providers on the STOPP/START tool improved their awareness of polypharmacy and the implementation of the protocol in the management of polypharmacy. A total of 25 healthcare providers were recruited into the project, completed the pre/post-implementation surveys, and watched an educational video. Results show that before the intervention, there was low provider awareness of the STOPP/START tool, polypharmacy, and the implementation of protocols in the management of polypharmacy in older adults. The findings were similar to those by Muth et al. (2018) that noted that there is limited awareness among healthcare providers concerning polypharmacy, its associated effects, and screening and management protocols.

The design of the educational intervention in this project was based on evidence of the effectiveness of the STOPP/START tool in improving the management of polypharmacy in older adults. For instance, a study by Unutmaz et al. (2018) on the effectiveness of the tool found a statistically significant reduction in the risk of polypharmacy. Educational interventions for prescribers is a recommended interventions to improve awareness (Rankin et al., 2018). The educational intervention in this project results in a 70% improvement in providers' knowledge concerning the assessment and management of polypharmacy. There was also an improvement in their attitudes and use of the STOPP/START tool from 12% at baseline to 85% post-intervention.

Behaviors and practices concerning the assessment and management of polypharmacy also improved following the intervention. Prior to the intervention, 84% of the participants answered that screening for polypharmacy in older adults should be done regularly. Nonetheless,

only 12% reported always applying screening and management protocols. The intervention resulted in a rise in healthcare providers that always applied protocols to 80% while 16 percent answered that they now applied the protocols some time. Such a significant rise supports the importance of educational interventions in improving providers' behaviors and practices concerning the assessment and management of polypharmacy.

Project Strengths and Limitations

The strengths of the project include a 0% attrition rate which meant minimal bias and threat to validity, good reliability since the data was obtained from healthcare providers that regularly care for older adults, and the use of validated research methods and tools such as the Qualtrics platform to collect and analyze data confidentially and reliably. One weakness of the study was that it did not investigate the direct impact of the intervention on the rates of polypharmacy in older adults which would have provided valuable information on the effectiveness of the STOPP/START tool in the management of polypharmacy in older adults.

Implications for Practice

The DNP project demonstrates that the lack of standardized procedures on the management of polypharmacy negatively impacts their behaviors and practices when caring for older adults. This was shown by the low conversance with polypharmacy management protocols before the intervention. The findings recommend an educational intervention for healthcare providers which was shown to result in a significant increase in the awareness and use of polypharmacy protocols. Advanced practice nurses should be at the forefront of promoting quality improvement changes that improve patient outcomes (Bakerjian et al., 2022). As nursing leaders, implementing a systematic approach that utilizes polypharmacy management protocols

such as the STOPP/START tool in all organizations can promote better patient care and outcomes.

The use of the STOPP/START tool when caring for older adults with or at risk of polypharmacy should also be included in organizational, local, and national health policies and procedures. Evidence from past studies and this project support the effectiveness of installing policies and procedures for using evidence-based protocols in healthcare facilities (Dinh et al., 2022; McIntosh et al., 2018). Requiring healthcare providers to consider using screening and monitoring tools for polypharmacy can help them to identify potential medicines related to poor outcomes. This can lead to reduced instances of unnecessary, duplicate, and inappropriate prescriptions. A structure for proper coordination and communication between nurses, physicians, pharmacists, and other healthcare professionals can help enable better management of polypharmacy in older adults. Lastly, local and national health policies and reimbursement regulations need to include polypharmacy screening and management to further promote its effective application in practice.

Project Recommendations and Plan for Sustaining Practice Change

The findings of the DNP project indicate that an educational intervention for healthcare providers on the STOPP/START criteria can help to increase their awareness and management of polypharmacy in older adults at a long-term care facility. Post-implementation of the change project, all healthcare providers reported improved conversance with the STOPP/START tool, attitudes, and behaviors concerning the care of older adults with or at risk of polypharmacy. One recommendation based on the findings in this project is implementing regular programs to raise providers' awareness and implementation of interventions to support them concerning polypharmacy and its noxious impacts on older adults. raising providers' awareness and

implementation of interventions to support them concerning polypharmacy and its noxious impacts on older adults.

The long-term success of change initiatives in healthcare is heavily reliant on the development of a sustainability plan to reinforce the changes. Without a well-planned sustainability plan, people are bound to revert to previous states before the change (Cranley et al., 2018). Sustainability is thus an important consideration for quality improvement projects. The basic structure to support the sustainability of the practice change includes several factors. One is the collective engagement of all stakeholders. This can help to get buy-in for the long-term adoption of practice changes. Secondly, regular use of the STOPP/START tool would be incorporated into organizational procedures. The accomplishment of these sustainability goals will be dependent on effective communication and lobbying with the administrators of the project site to include regular assessment of medication using the STOPP/START tool in organizational policies. Motivation systems for healthcare providers will also be proposed to encourage participation in medication assessment and optimization.

Training of new staff and regular refresher training for other stakeholders on polypharmacy management interventions could also be used to sustain the practice change. Training of new staff and refresher training for regular staff can help to improve the healthcare providers' knowledge in managing polypharmacy and applying tools such as the STOPP/START tool in the care of older adults with or at risk of polypharmacy. According to Theobald et al. (2018) implementation of monitoring and feedback initiatives can enable easy assessment of the effectiveness of a quality improvement program and the need for further education. Implementing these at the project site can facilitate sustainability and continuous improvement.

Lastly, it is hoped that effective reporting and dissemination of the project findings will open up the potential for replication in other similar clinical practice settings.

Conclusion

Polypharmacy and its associated harms are a growing problem among older adults, there is a need for judicious and deliberate interventions that can help healthcare providers to optimize the use of medication in this population. Educational intervention for healthcare providers on the use of polypharmacy management protocols is a potential intervention to reduce instances of polypharmacy and inappropriate drug use. The educational intervention for healthcare providers on the STOPP/START tool used in this project resulted in a significant increase in awareness of the tool and its application in the screening and management of polypharmacy in older adults. Moreover, the findings show that education interventions can shape providers' attitudes toward polypharmacy

The project adds to the literature by supporting findings from other studies that have found improvement in skills in patient care following intervention polypharmacy interventions. Increasing healthcare providers' awareness should be of great consideration when designing polypharmacy interventions. A healthcare providers' populace with little awareness increases the risk of polypharmacy, adverse events, and unintentional medication experiences among older adults. Future studies are warranted to provide clinical evidence for the effectiveness of the STOPP/START tool in ensuring the optimal use of medication to reduce polypharmacy and associated effects among older adults with or at risk of polypharmacy.

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Appendix 1: Informational Letter**INFORMATIONAL LETTER****An Educational Intervention on the use of the STOPP/START Criteria to Improve Awareness of Polypharmacy in Older Adults**

Hello, my name is Belkis Aguila. You have been chosen at random to be in a research study about an educational intervention on the use of the START/STOPP tool to improve the awareness of healthcare providers on polypharmacy in patients 65 years and older. If you decide to be in this study, you will be one of 23 people in this research study. Participation in this study will take 40 minutes of your time. If you agree to be in the study, you will be asked to do the following things:

1. Read and sign a consent form outlining the details of the project
2. Complete a pre-test survey to collect demographic data and your knowledge and use of the STOPP/START criteria
3. Participate in a 20-minute training session on the use of the START/STOPP tool
4. Complete a post-test survey that is similar to the pre-test survey

There are no foreseeable risks to you for participating in this study and participation in this project will not interfere with your performance at the clinical site. Foreseeable benefits include enhancing your skills and knowledge in the care of older adults with polypharmacy. It is expected that this study will benefit society by improving the assessment and management of polypharmacy in older adults through effective monitoring, optimization, and de-prescribing of unnecessary medications using the STOPP/START criteria.

There is no cost or payment to you. If you have questions while taking part, please stop me and ask.

You will remain anonymous in this project and no identifiable information will be included in the final project report. You will be assigned a code to link you to the information you provide. All information provided will be handled with confidentiality. The information collected as part of this project will not be used or distributed for use in other studies or projects.

If you have questions for one of the researchers conducting this study, you may contact the principal investigator, Dr. Dana Sherman, at dsherman@fiu.edu or on phone at 305-348-4227. You could also contact Belkis Aguila at bagui026@fiu.edu or on phone at 786-291-2412.

If you would like to talk with someone about your rights of being a subject in this research study or about ethical issues with this research study, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

Your participation in this research is voluntary, and you will not be penalized or lose benefits if you refuse to participate or decide to stop. You may keep a copy of this letter for your records.

Appendix 2: STOPP/START Criteria

STOPP (Screening Tool of Older Person's Prescriptions) and START (Screening Tool to Alert to Right Treatment) are criteria used as a tool for clinicians to review potentially inappropriate medications in older adults.

STOPP: Screening Tool of Older People's potentially inappropriate Prescriptions

The following drug prescriptions are potentially inappropriate in persons aged ≥ 65 years of age.

Cardiovascular System

1. Digoxin at a long-term dose $> 125\mu\text{g/day}$ with impaired renal function*
2. Loop diuretic for dependent ankle oedema only i.e. no clinical signs of heart failure
3. Loop diuretic as first-line monotherapy for hypertension
4. Thiazide diuretic with a history of gout.
5. Non-cardioselective beta-blocker with Chronic Obstructive Pulmonary Disease (COPD).
6. Beta-blocker in combination with verapamil
7. Use of diltiazem or verapamil with NYHA Class III or IV heart failure
8. Calcium channel blockers with chronic constipation
9. Use of aspirin and warfarin in combination without histamine H2 receptor antagonist (except cimetidine because of interaction with warfarin) or PPI
10. Dipyridamole as monotherapy for cardiovascular secondary prevention
11. Aspirin with a past history of peptic ulcer disease without histamine H2 receptor antagonist or proton pump inhibitor
12. Aspirin at dose $> 150\text{mg day}$
13. Aspirin with no history of coronary, cerebral or peripheral vascular symptoms or occlusive event
14. Aspirin to treat dizziness not clearly attributable to cerebrovascular disease
15. Warfarin for first, uncomplicated deep venous thrombosis for > 6 months
16. Warfarin for first uncomplicated pulmonary embolus for > 12 months
17. Aspirin, clopidogrel, dipyridamole or warfarin with concurrent bleeding disorder
* *eGFR $< 50\text{ml/min}$.*

Central Nervous System and Psychotropic Drugs

1. Tricyclic antidepressants (TCA's) with dementia
2. TCA's with glaucoma
3. TCA's with cardiac conductive abnormalities
4. TCA's with constipation
5. TCA's with an opiate or calcium channel blocker
6. TCA's with prostatism or prior history of urinary retention
7. Long-term (i.e. > 1 month), long-acting benzodiazepines e.g. chlordiazepoxide, fluzepam, nitrazepam, chlorazepate and benzodiazepines with long-acting metabolites e.g. diazepam
8. Long-term (i.e. > 1 month) neuroleptics as long-term hypnotics
9. Long-term neuroleptics in those with parkinsonism
10. Phenothiazines in patients with epilepsy
11. Anticholinergics to treat extra-pyramidal side-effects of neuroleptic medications
12. Selective serotonin re-uptake inhibitors (SSRI's) with a history of clinically significant hyponatraemia
13. Prolonged use (> 1 week) of first generation antihistamines i.e. diphenhydramine, cyclizine, chlorpheniramine, promethazine

Gastrointestinal System

1. Diphenoxylate, loperamide or codeine phosphate for treatment of diarrhoea of unknown cause
2. Diphenoxylate, loperamide or codeine phosphate for treatment of severe infective gastroenteritis i.e. bloody diarrhoea, high fever or severe systemic toxicity
3. Prochlorperazine (Stemetil) or metoclopramide with Parkinsonism
4. PPI for peptic ulcer disease at full therapeutic dosage for > 8 weeks
5. Anticholinergic antispasmodic drugs with chronic constipation

Respiratory System

1. Theophylline as monotherapy for COPD
2. Systemic corticosteroids instead of inhaled corticosteroids for maintenance therapy in moderate-severe COPD
3. Nebulised ipratropium with glaucoma

Musculoskeletal System

1. Non-steroidal anti-inflammatory drug (NSAID) with history of peptic ulcer disease or GI bleeding, unless with concurrent H2 receptor antagonist, PPI or misoprostol
2. NSAID with moderate-severe hypertension
3. NSAID with heart failure
4. Long-term use of NSAID (>3 months) for symptom relief of mild osteoarthritis
5. Warfarin and NSAID together
6. NSAID with chronic renal failure*
7. Long-term corticosteroids (>3 months) as monotherapy for rheumatoid arthritis or osteoarthritis.
8. Long-term NSAID or colchicine for chronic treatment of gout where no contraindication to allopurinol

Urogenital System

1. Bladder antimuscarinic drugs with dementia
2. Antimuscarinic drugs with chronic glaucoma
3. Antimuscarinic drugs with chronic constipation
4. Antimuscarinic drugs with chronic prostatism
5. Alpha-blockers in males with frequent incontinence
6. Alpha-blockers with long-term urinary catheter

Endocrine System

1. Glibenclamide or chlorpropamide with type 2 DM
2. Beta-blockers in those with DM and frequent hypoglycaemic episodes
3. Oestrogens with a history of breast cancer or venous thromboembolism
4. Oestrogens without progestogen in patients with intact uterus

Drugs that adversely affect those prone to falls

1. Benzodiazepines
2. Neuroleptic drugs
3. First generation antihistamines
4. Vasodilator drugs with persistent postural hypotension
5. Long-term opiates

Analgesic Drugs

1. Use of long-term powerful opiates e.g. morphine or fentanyl as first line therapy for mild-moderate pain
2. Regular opiates for >2 weeks in those with chronic constipation without concurrent laxative
3. Long-term opiates in those with dementia unless indicated for palliative care or management of moderate/severe chronic pain syndrome

Duplicate Drug Classes

1. Any duplicate drug class prescription e.g. concurrent opiates, NSAID's, SSRI's, loop diuretics, ACE inhibitors

START: Screening Tool to Alert doctors to Right i.e. appropriate, indicated Treatment.

These medications should be considered for people ≥ 65 years of age with the following conditions, where no contraindication to prescription exists.

Cardiovascular System

1. Warfarin in the presence of chronic atrial fibrillation
2. Aspirin in the presence of chronic atrial fibrillation, where warfarin is contraindicated, but not aspirin
3. Aspirin or clopidogrel with a history of atherosclerotic coronary, cerebral or peripheral vascular disease in patients with sinus rhythm
4. Antihypertensive therapy where systolic BP consistently > 160 mmHg
5. Statin therapy with a history of coronary, cerebral or peripheral vascular disease, where functional status remains independent for activities of daily living and life expectancy is > 5 years
6. Angiotensin Converting Enzyme (ACE) inhibitor with chronic heart failure
7. ACE inhibitor following acute myocardial infarction
8. Beta-blocker with chronic stable angina

Respiratory System

1. Regular inhaled beta 2 agonist or anticholinergic for mild to moderate asthma or COPD
2. Regular inhaled corticosteroid for moderate-severe asthma or COPD, where predicted FEV1 $< 50\%$
3. Home continuous oxygen with documented chronic type 1 respiratory failure or type 2 respiratory failure

Central Nervous System

1. L-DOPA in idiopathic Parkinson's disease with functional impairment and disability
2. Antidepressant with moderate-severe depressive symptoms

Gastrointestinal System

1. Proton Pump Inhibitor with severe GORD or peptic stricture requiring dilatation
2. Fibre supplement for chronic, symptomatic diverticular disease with constipation

Musculoskeletal System

1. Disease-modifying anti-rheumatic drug (DMARD) with active rheumatoid disease lasting > 12 weeks
2. Bisphosphonates in patients taking maintenance corticosteroid therapy
3. Calcium/Vitamin D supplement in patients with osteoporosis (fragility fracture, dorsal kyphosis)

Endocrine System

1. Metformin with type 2 diabetes +/- metabolic syndrome (in the absence of renal impairment*)
2. ACE inhibitor or ARB in diabetes with nephropathy i.e. proteinuria or microalbuminuria +/- renal impairment*
3. Antiplatelet therapy in diabetes mellitus with co-existing cardiovascular risk factors
4. Statin therapy in diabetes mellitus if co-existing major cardiovascular risk factors present

* eGFR < 50 ml/min.

Appendix 3: Project Activities and Timeline

Timeline	Tasks	Status
April 2022	Clarify the problem statement, objectives, and outcomes of the DNP project	Completed
	Complete a review of literature relevant to the project	Completed
	Conduct an organizational assessment	Completed
	Determine current practices regarding polypharmacy management at the clinical site	Completed
May 2022	Present the project proposal and timeline for the DNP projects tasks to stakeholders	Completed
	Developing an educational video on the use of the STOPP/START criteria for polypharmacy management in older adults	Completed
June - August 2022	IRB application and approval	Completed
August - October 2022	Presentation of the educational video for review and approval	Completed
	Meeting with stakeholders for the kickoff meeting	Completed
	Implementation of the STOPP/START project in practice	Completed
November 2022 - December 2022	Collection and management of data	Completed
	Analysis of data and its interpretation	Completed

	Presentation of project outcomes to stakeholders	Completed
	Dissemination of the results via a DNP project report	Completed

Appendix 4: Pre/Post-test Questionnaire

Please complete the questionnaire as accurately as possible

This DNP project aims to determine whether the implementation of an educational video for healthcare providers on the use of the STOPP/START criteria improves their awareness of polypharmacy in older adults at a senior healthcare care center. Each question in this questionnaire has instructions on how to be completed.

For any questions, you can contact the principal investigator, Dr. Dana Sherman, at dsherman@fiu.edu or on phone at 305-348-4227. You could also contact the co-investigator, Belkis Aguila, at bagui026@fiu.edu or on phone at 786-291-2412.

Personal Information

- Position/licensure
 - Registered Nurse
 - Nurse Practitioner
 - Physician
 - Physician Assistant
 - Other
- How many years of experience do you have working in primary care:.....

Knowledge, Perception, and Practices Concerning the use of STOPP/START to Assess for Polypharmacy

- Which polypharmacy management protocols or tools are you conversant with (Tick all that apply)
 - STOPP/START Criteria

- NICE Guidelines
- PRISMA-eDS-tool
- SPPiRE intervention
- OPTI-SCRIPT
- None
- Others

• Which polypharmacy management protocols or tools do you apply in the care of older adults

- STOPP/START Criteria
- NICE Guidelines
- PRISMA-eDS-tool
- SPPiRE intervention
- OPTI-SCRIPT
- None
- Others

• How often should healthcare providers screen for polypharmacy in older adults?

- Always
- Rarely
- Sometimes

- Never
- How often do you apply polypharmacy management protocols or tools in the optimization of medication among older adults with or at risk of polypharmacy
 - Always
 - Rarely
 - Sometimes
 - Never
 - Never

Appendix 5: Support Letter



Date: 05/26/2022

Dana Sherman DNP, APRN, ANP-BC, FNP-BC
Clinical Associate Professor
Nicole Wertheim College of Nursing & Health Sciences
Florida International University

Dear Dr. Sherman:


Thank you for inviting Sanitas Medical Center to participate in the DNP Project of Belkis Aguila. I understand that this student will be conducting this project as part of the requirements for the Doctor of Nursing Practice program at FIU. After reviewing the proposal of the project titled "Educational Intervention for Healthcare Providers on using the START/STOPP Tool to manage Polypharmacy in Older Adults" I have warranted her permission to conduct the project in this company in accordance with the proposal and with the specific understanding that none of the Protected Health Information (including demographic information) which relates to patients of the Medical Center will be accessed, used, stored, shared or disclosed related to the conduct of the project.

Older adults are known to experience an increased risk of adverse events and outcomes due to polypharmacy and inappropriate prescribing as explored in the literature review. Evidence suggests some common drugs are related to increased risk for polypharmacy and adverse outcomes in older adults. Education of healthcare providers has been shown to be one of the most effective strategies to reduce polypharmacy among older adults. The primary purpose of this DNP project will be to determine whether the education of healthcare providers on the STOPP/START criteria and its implementation as a care protocol in a senior healthcare center helps to reduce polypharmacy among older adults. The secondary goals of the DNP project include increasing healthcare providers' knowledge and skills concerning the management of polypharmacy and dissemination of knowledge on the effectiveness of using these criteria in improving quality outcomes in older adults with polypharmacy. The project aimed to reduce the rate of polypharmacy at the project site.

We are understanding that the project will be developed in our setting and will occur for about 3 months. We are also aware of our department's participation in supporting the student to complete this project, including warranting the student access to our Primary Care Offices, giving written consent, delivering the pre-test questionnaire, providing the educational intervention, and four weeks after providing the posttest to the recruited participants. We will provide a peaceful environment to safeguard our participant's privacy as well as an adequate area to conduct the teaching. The educational intervention will be in a classroom format, will last

15-20 minutes and an educational handout will be provided to each participant receiving the class. Any data collected by Belkis Aguila will be kept confidential and will be stored in a locked filing cabinet at our office.

We expect that Belkis Aguila will not interfere with the normal office performance, behave in a professional manner, and follow the office standards of care. As Regional Manager of Sanitas Medical Center, I support the participation of our primary care department in this project and look forward to working with you.



Sincerely,

Reynaldo Martinez, Regional Manager
Sanitas Medical Center.

Appendix 6: Patient Information Leaflet

This is an NHS document not to be used for commercial or marketing purposes

Patient Information Leaflet

Optimising safe and appropriate medicines use

This leaflet is to help you understand why your doctor is reviewing the medicines you take to check they are still appropriate to treat your conditions.

Medicines are prescribed to treat symptoms or diseases. When a medicine is prescribed for you, you should be given information on possible side effects, how long to take it for and when to stop taking it.

For each of the medicines you are taking, you should know which of the following applies:

- The medicine should only be taken for a specific number of days to treat a particular condition, for example, antibiotics to treat a bacterial infection.
- The medicine may need to be continued for a number of weeks or months and then stopped when symptoms are reduced or the disease is under control, for example, iron tablets for anaemia.
- For conditions, like asthma, diabetes and high blood pressure you may have to keep taking your medicines every day to keep the signs and symptoms of the disease under control.

It is good practice for your doctor(s) to review the medicines you are taking and check that you are taking the medicine, it is treating the condition and not causing any side effects.

Your doctor may suggest stopping a medicine because –

- Your health or a particular condition has improved or changed and it is no longer needed.
- The side effects outweigh the benefits and they are making you feel unwell.
- You have chosen not to take the medicine.
- You are not able to take the medicine.
- Other treatments which do not involve medicines can be used instead.

Your doctor should involve you in any decision about your medicines. The decision to start or stop a medicine should be shared between you and your doctor and be based on your individual clinical needs, priorities and values.

Este es un documento del NHS que no debe utilizarse con fines comerciales o de marketing.

Folleto de Información para el Paciente

Optimización del uso seguro y apropiado de medicamentos

Este prospecto es para ayudarle a comprender por qué su médico está revisando los medicamentos que toma para comprobar que siguen siendo apropiados para tratar sus afecciones.

Los medicamentos se prescriben para tratar síntomas o enfermedades. Cuando se le prescribe un medicamento, se le debe informar sobre los posibles efectos secundarios, durante cuánto tiempo debe tomarlo y cuándo dejar de tomarlo.

Para cada uno de los medicamentos que está tomando, debe saber cuál de los siguientes se aplica:

- El medicamento solo debe tomarse durante un número específico de días para tratar una afección en particular, por ejemplo, antibióticos para tratar una infección bacteriana.
- Es posible que sea necesario continuar con el medicamento durante varias semanas o meses y luego suspenderlo cuando los síntomas se reduzcan o la enfermedad esté bajo control, por ejemplo, tabletas de hierro para la anemia.
- Para afecciones, como asma, diabetes y presión arterial alta, es posible que deba seguir tomando sus medicamentos todos los días para mantener bajo control los signos y síntomas de la enfermedad.

Es una buena práctica que su(s) médico(s) revise(n) los medicamentos que está tomando y verifique que los esté tomando, que estén tratando la afección y que no causen efectos secundarios.

Su médico puede sugerirle que deje de tomar un medicamento porque:

- Su salud o una condición particular ha mejorado o cambiado y ya no es necesario.
- Los efectos secundarios superan los beneficios y te hacen sentir mal. Ha
- Elegido no tomar el medicamento.
- No puede tomar el medicamento.
- En su lugar, se pueden utilizar otros tratamientos que no impliquen medicamentos.

Su médico debe involucrarlo en cualquier decisión sobre sus medicamentos. La decisión de iniciar o suspender un medicamento debe ser compartida entre usted y su médico y debe basarse en sus necesidades clínicas, prioridades y valores individuales.

Appendix 7: IRB Approval Letter



MEMORANDUM

To: Dr. Dana Sherman
CC: Belkis Aguila
From: Carrie Bassols, BA, IRB Coordinator *ceb*
Date: September 7, 2022
Proposal Title: "An Educational Intervention on the use of the STOPP/START criteria to Improve Awareness of Polypharmacy in Older Adults"

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

IRB Protocol Exemption #: IRB-22-0412 **IRB Exemption Date:** 09/07/22
TOPAZ Reference #: 112060

As a requirement of IRB Exemption you are required to:

- 1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
- 2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
- 1) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

Special Conditions: N/A

For further information, you may visit the IRB website at <http://research.fiu.edu/irb>.