HIGH-RISK MEDICATION USE: THE DILEMMA IN THE OLDER ADULT POPULATION

by

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ABSTRACT

JULIE FREELAND. High-Risk Medication Use: The Dilemma in the Older Adult Population.

(Under the direction of DR. MEREDITH TROUTMAN-JORDAN)

Introduction: The use of high-risk medications in the older adult population is an issue currently gaining attention. Tools are being developed to help guide clinicians in their prescribing and deprescribing of these medications. Prior research has shown that decreasing the use of certain high-risk medications can help decrease the incidences of falls, hospitalizations, and minimize adverse events.

Method: A non-randomized, interventional cohort study, was completed delving into the topic of the effect that education may have on the use of high-risk medications. The BEERS criteria were used to decide which medications were deemed high-risk. A total of 50 patients were educated regarding high-risk medications with the plan to decrease their medication or change to a safer alternative if deemed appropriate. The patients had follow-up phone calls one week after the change, and again one month after the initial appointment to document adherence to the medication changes.

Results: The Wilcoxon Signed Rank test was used and found the 50th percentile median of initial BEERS score was 3, and the 50th percentile median for final BEERS score was 2.50. Significance (*p)* was found <0.001 which was deemed statistically significant. Education provided was also found to be statistically significant at $p<0.001$.

Discussion: Providing education and discussion regarding medications did result in a reduction overall in the number of BEERS medications utilized. Education provided also

was shown to be effective, as at the initial appointment 64% (N=32) of the patients felt they had a full understanding of their medications and by the final survey 94% (N=47) of the patients reported a full understanding of their medications. Minimizing BEERS medications help to diminish adverse events, as well as decrease medication costs that patients may endure.

DEDICATION

I would like to dedicate this work to my family, my parents who have supported me throughout my entire life, my sisters, my husband and my children. Thank you for your support in this endeavor.

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CHAPTER 1: INTRODUCTION

Background

When reviewing the literature, consensus is that certain medications used in the 65 and older age group, can lead to adverse events. These events include increased hospitalizations, falls, and death (Taylor et al., 2016). The reason for this is due to pharmacokinetics, how the organism metabolizes the drug, as well as pharmacodynamics, how the drug affects the organism. Pharmacokinetics and pharmacodynamics change with aging, resulting in the older adult retaining the given medication for longer periods of time. This coupled with the older adult generally being prescribed an increased number of medications can lead to polypharmacy, medication interactions and disastrous results.

Problem Statement

Throughout the years different groups of experts have studied the older adult population, and focused on ways to decrease medication use in the 65 and older age group. The STOPP (Screening Tool of Older Person's Potentially inappropriate prescriptions) and START (Screening Tool to Alert doctors the Right Treatment), are two examples of criteria to follow to know which medications to stop (STOPP) and which medications are safe to use in the older adult (START). The BEERS criteria, another example of medication criteria, was named after the geriatrician Mark Beers. This was

first published in 1991 and the most recent update was published in 2015 with the overaching goal to reduce inappropriate medication overuse in older adults (AGS, 2015).

Corsonello et al. (2012) delved in-depth into the different criterion for safe-prescribing in the older adult. The BEERS criteria specifically has evidence of over 20 years of substantial research, showing that use of the criteria results in improved patient outcomes. The BEERS criteria provides a basis for general practitioners, who may not specialize, or be as familiar with issues that may arise in the older adult. When implemented, the BEERS criteria aim to improve patient safety and minimize adverse drug events (ADEs).

Purpose of the Project

The purpose of the doctoral scholarly project aimed to see if education and office visits focused on high-risk medications helped with adherence to avoiding these medications. This evidence-based project focused on older adults aged 65 and older who were currently on medications included in the BEERS list. The goal was to limit use of medication as much as feasibly possible and adhere to the BEERS criteria in prescribing.

Significance of the Project

The 65 and older age group is expected to continually grow. According the U.S. Census Bureau (2014) current people aged 65 and older are trending upward from 44.7 million in 2013 to an expected population of 98.2 million by 2060. Current estimates show in 2016, there were 49.2 million U.S residents 65 and older (U.S Census Bureau, 2017). This aging population group will provide a continual base of patients needing focused attention on their medications to ensure safety.

The question as to why this is important to the older adult, is multifactorial. The gastrointestinal tract changes with time, altering effectiveness of the oral and enteral route of administration. Medications administered percutaneously (through the skin), bypass the GI tract; however, effects are difficult to predict as age-related skin changes occur. The mucosal route is also affected as the body ages. Medications administered by the oral mucosa need a moist environment for effectiveness of medication absorption, which may be compromised in the older adult (Lange, 2012). Pharmacokinetics enter the equation in terms of renal and hepatic clearance. In the older adult this clearance slows down, resulting in prolongation of half-life, or the length of time it takes for half the concentration of a given medication to be eliminated from the bloodstream.

Measures to ensure that proper medications are being used in the older adult population require persistence by the patient's primary care provider. While older adults are hospitalized, medications are frequently adjusted by providers at the hospital. Specialists are also involved in outpatient care, adding in potentially harmful, or inappropriate medications on routine follow-up visits. A study by Kanaan et al., (2013), found at least one adverse drug event (ADE) in 18.7% of the population they studied within 45 days of hospital discharge. Indicating, over 50 percent of the ADEs in this study occurred within 14 days of hospital discharge.

Clinical Question

This doctoral scholarly project aims to answer the following PICOT question: For patients aged 65 and older does the use of medication handouts and face-to-face discussion with a health-care provider promote medication administration safety by decreasing the use of high-risk medications?

Project Objectives

The main objective of the doctoral project was to conduct office visits focused on education regarding high-risk medications. The second objective was to educate about safer medications and possible alternative medications. The final objective was to minimize adverse events, decreasing the likelihood of falls and hospitalizations.

CHAPTER 2: LITERATURE REVIEW

A literature review was conducted using CINAHL and Cochrane, using the search terms of Beers criteria, older adults, and high-risk medications. Twenty articles were queried and 12 articles were kept. Search criterion were limited to peer-reviewed articles as well as studies completed within the prior 5 years. Themes identified throughout this search included falls associated with high-risk medications, and an increase of hospitalizations due to high-risk medications.

As people age, the body is more at risk of having medical issues often requiring medications. This involves issues with blood pressure, cholesterol, kidney function, liver function, diabetes, thyroid and the list continues. A cross-sectional study completed by Aspinall et al., (2015), found that 50.7% of the patients studied, N=274, were on a medication treating one condition, that could exacerbate another condition. The study found the most commonly used medications that could exacerbate other conditions were antipsychotics and benzodiazepines, both medications falling under the umbrella of psychoactive medications. The study found the drug-disease interactions were more common in nursing home residents and patients with dementia, or cognitive impairment.

Two different studies were completed regarding falls and safety issues when older adults are prescribed benzodiazepines or muscle relaxants. The study about muscle relaxants looked at information from the 2012 National Ambulatory Medical Care Survey, and found 171,851 out of 21,764,895 patients that had presented to the rural primary care clinic had been prescribed a skeletal muscle relaxant (Derner et al., 2016). The authors looked more specifically and found that older adults who presented to the outpatient clinic

with injury had 28% greater odds of currently being prescribed a muscle relaxant (Derner et al., 2016).

One study investigating 81 patients prescribed benzodiazepines (Urru et al., 2015), found that 64% (N=52) of the older adults were being prescribed benzodiazepines long-term for insomnia as opposed to current recommendations which are to avoid these medications in the older adult. Avoidance of benzodiazepines is recommended due to increased risk of falls and cognitive impairment (Urru, 2015). Both studies point out that inappropriate use, as well as use against current recommendations, can lead to detrimental results.

Anticholinergics pose a large risk to older adults due to potential adverse drug events including dry eyes, urinary retention, dry mouth and constipation. Increased sedation may also occur leading to possible aspiration and resultant pneumonia. A case-control study involving anticholinergics found the risk of pneumonia was increased when concurrently taking an anticholinergic (Paul et al., 2015). A second study highlighted the need for continual efforts regarding minimizing anticholinergic use. Kachru et al., (2015), found through a retrospective, cross-sectional study, that approximately one out of ten older adults, N=7.51 million, were using anticholinergics during 2009-2010.

Sedative-hypnotics pose an issue in older adults. Tannenbaum et al., (2015), point out that falls were the causative factor leading to hip fractures in 95% of adults aged 65 and older. The older adult is then at increased risk of a second fall within the next one year. Imperative in providing care to the older adult, is ensuring that falls are minimized.

Regarding education and medications, a study involving 200 patients aged 65 and older by Shah et al. (2013) found that educating patients regarding their disease and drug

therapy, improved overall adherence when evaluated at the follow-up visit 7-14 days later. Patients were randomly divided into two groups, one receiving basic care, and the second group receiving education and information regarding drug compliance. Exclusions included seriously ill patients, patients requiring hospitalization, patients with psychiatric illness, or patients unable to communicate. Results showed the interventional group (N=100) had significantly increased short-term compliance at follow-up compared to the control group.

When considering initiation of medications in the older adult many factors should come into play. Reeve et.al (2016) point out how the principles of biomedical ethics; beneficence, non-maleficence, autonomy and justice play a role in prescribing and deprescribing. When initiating a medication, benefit versus risk as well as necessity comes into play. Often the medication is continued indefinitely without rethinking about the necessity and risk/benefit ratio. When the idea of deprescribing is considered, new thoughts of uncertainty and fears regarding negative consequences now come into play (Reeve, 2016). With each specific medication it may be difficult to decide if the medication is still useful to the patient. If the patient seems to be doing well, and is not exhibiting adverse events, many decide to continue the course as opposed to making changes and running the risk of the given disease progressing (Reeve, 2016).

Studies have shown that minimizing psychotropic use does result in a decreased risk of falls. Studies also show the benefits of deprescribing. Reeve et.al., (2015) challenge practitioners to look at continuing a prescription as an active decision, similarly to deprescribing. This prompts a review of each medicine to be prescribed/renewed, as a

benefit versus harm thought process each time. This keeps the overarching goal to improve outcomes and minimize risks in the older adult.

Reeve et.al. (2015) point out that recent research does show that approximately two-thirds of older adult patients do want to reduce the number of medications they are taking. They are also more willing to reduce medications if recommended by their medical doctor. This should prompt regular review of patient medications with the goal of deprescribing if possible.

Taylor et al. (2016) conducted a systematic review and meta-analysis with the focus of evaluating the effectiveness of the STOPP/START screening tools. Four randomized controlled trials were included (N=1025 adults), and found that using the STOPP/START method when reviewing medications does help in decreasing potentially inappropriate prescribing (PIP). Falls, delirium episodes and medication costs were all decreased by use of the above screening tools (Taylor et al., 2016).

Theoretical Framework

The theoretical framework that supported this project was the Plan-Do-Study-Act Model (IHI, 2018). This is a simple framework in that it involves four steps. These four steps are: Develop a plan to test the change, complete the test, observe and learn from the outcomes, and determine what changes should be made to the test for the next time. This was implemented in the doctoral scholarly project in the following manner:

- Face-to-face office discussions to address high-risk medications in the older adult. (Plan)
- Schedule and carry out office visits and education addressing high-risk medications. (Do)

- Gather data and see what effect the education and face-to-face discussions had on actual medication adherence and decrease of high-risk medication use. (Study)
- Implementation at additional internal medicine sites and education of providers regarding minimizing high-risk medications. (Act)

CHAPTER 3: METHODOLOGY

Project Design

The project design was an interventional cohort study, non-randomized with a goal of 50 patients. The 50 patients provided an adequate sample size for statistical analysis and power analysis showed an adequate power size for statistical analysis. To achieve a power of 80%, with the effect size at 0.5, alpha=0.05, sample size would need N=26. Therefore, a sample size of 50 was more than adequate to demonstrate statistical significance. Going further, for a power of 90%, N=34 was necessary, and for 95% power, N=42.

Inclusion criteria included Ardsley Internal Medicine Concord, aged 65 and older, and use of one or more BEERS list medications. Exclusion criteria included age less than 65 years, not a patient at Ardsley Internal Medicine Concord, and not on any BEERS list medications. Patients who were cognitively impaired or terminally ill could be in the study as well. Listed below are the two main variables, and levels of measurement.

Table 1: Variables

Variable	**Conceptual Definition**	**Operational Definition**	**Level of Measurement**
BEERS list medications	Medications from BEERS list	2015 BEERS list criteria medications	Ratio

Education provided at office visit	Education provided by nurse practitioner	Face-to-face education provided at Ardsley Internal Medicine by Nurse Practitioner	Ordinal

Once the patients had been selected, they were contacted by the nurse practitioner and offered an appointment at AIMC. The nurse practitioner followed the phone recruitment form, Appendix A, to offer patients appointments at the office. The nurse practitioner also had a large amount of same-day acute visits, and those patients were asked as well to be in the study if their inclusion data matched. Of the patients seen as acute same-day visits, their names were checked to ensure they were on the informatics query prior to being involved in the study.

Once at the appointment each patient signed forms relating to the release of medical records, the informed consent paperwork, and the pre-visit survey. The survey was conducted using both open-ended and close-ended questions to gain insight on the patients' current knowledge regarding their high-risk or inappropriate medications. These forms were handed to them by the certified medical assistant (CMA) once the patient had been placed in the exam room. If help was needed to fill out the forms, the CMA would assist. There was one CMA that worked with the nurse practitioner, therefore reliability with assistance was consistent. An example of this survey is in appendix B.

The nurse practitioner sat with the patient and any present significant other, face-to-face. The office visit focused on the high-risk medication and the rationale as to why it should be avoided. If there was a safer alternative this was discussed with the patient. If the patient agreed to the change a change was implemented. Educational handouts were available for the patient to take home and share with their family members if needed. Patients with dementia or cognitive impairment were not excluded from the study, however for this study each patient was able to fill out their paperwork and able to comprehend the purpose and intent of the study. Family members were present on occasion primarily for support of the patient.

The same format of the pre-visit survey was then given to the patient to be completed after the initial visit. The survey was completed over the phone, with the one month follow-up phone call. The pre-and post-surveys were compared to each other to document changes using the Wilcoxon Signed Rank Test. Patients also had a patient satisfaction survey to complete which gave feedback to the nurse practitioner completing the office visit, Appendix C. This was anonymous and the patient was educated to leave the survey with the front desk staff at check-out, after the office visit. The front desk staff had a bin in which to place the satisfaction surveys, which the nurse practitioner collected weekly. The figure below is an example of how the given visits and project progressed.

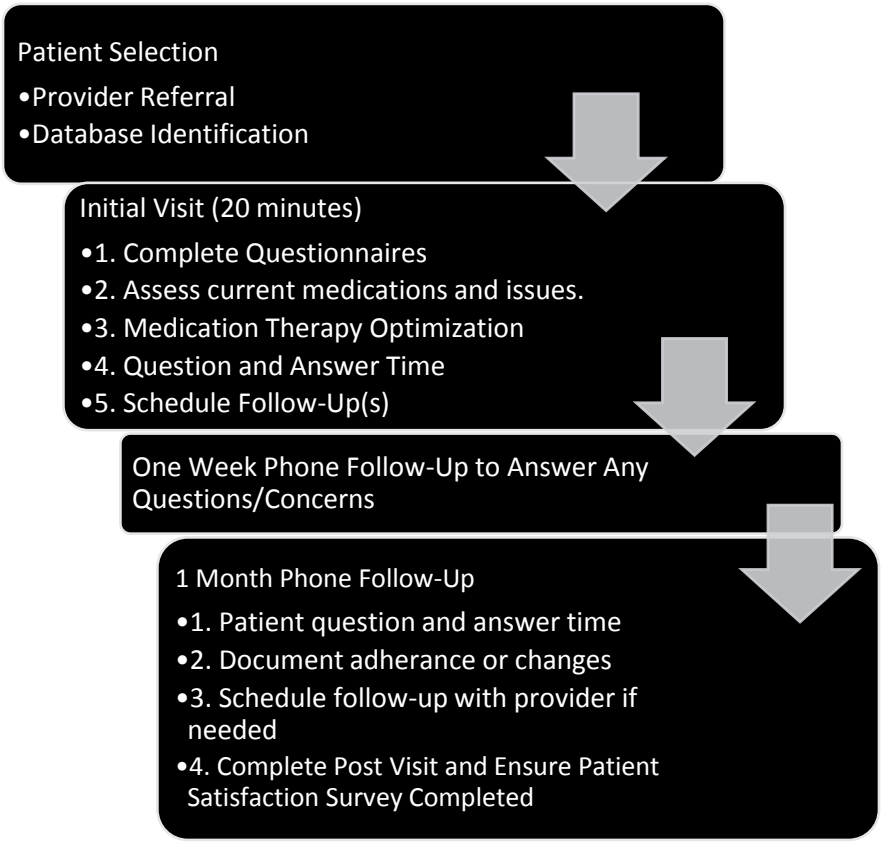

Figure 1: Patient Flow

The primary goal of the doctoral project was to reduce the number of BEERS list medications that patients were taking and to aid in reducing polypharmacy. Baseline medication numbers were collected at the beginning of the study period and compared to medication numbers obtained at the end of the 5-month study period. Study enrollment began June 17, 2017 and 50 patients were obtained through October 20, 2017. All follow-up phone calls were completed by November 30, 2017.

Secondary goals were to decrease adverse events related to BEERS list medications, have high patient satisfaction, and increase patient knowledge surrounding their medications. Patients were educated regarding potential adverse drug events (ADE)

that may occur from the medication change and were made aware to notify both their provider and the principal investigator if an ADE were to occur. No adverse drug events were noted to occur because of the study, however if one did occur the principal investigator had the plan to notify the Institutional Review Board (IRB) immediately.

Participants

Patients to participate in this doctoral scholarly project were found using Information Services at Carolinas HealthCare System during the summer of 2017 with the following search criteria: Ardsley Internal Medicine Concord (AIMC); ages 65 and older; and use of one or more BEERS medications within the prior 13 months (AGS, 2015). This allowed for a sample of patients to be selected without bias by the investigator, or from the clinic. They all shared the common characteristic of age, making this an aggregate group. One thousand nine hundred and five unique patients were identified. Some patients had more than one BEERS list medication as well. This patient population was utilized to implement the scholarly project.

From the list of patients on high-risk medications varying sets of data were pulled, as listed below:

- What was the number of actual patients that agreed to the medicine change?
- What was the difference in BEERS medication numbers between sexes and races?
- If patients were non-compliant, what was the reason? Cost, adverse events, or did they not do well with medicine change?

- Were falls or drowsiness reduced because of decreasing medication use?

Setting

This doctoral project was implemented at Ardsley Internal Medicine in Concord, North Carolina. The outpatient internal medicine setting was ready for a practice change as each provider is measured continually on quality outcomes. One of these outcomes includes the percentage of patients that each provider has on high-risk medications. The goal in the office is to minimize use of certain high-risk medications, as studies have shown that those medications can increase adverse events in the 65 and older age group.

The first step to proceed with implementation of the project at Ardsley Internal Medicine was to obtain Nursing Council permission. Full approval by the Nursing Council at Carolinas HealthCare System was received on May 12, 2017. The next step was to submit to the IRB at Carolinas HealthCare System. IRB paperwork and approval was completed on May 24, 2017. The final step for approval was through the IRB at the University of North Carolina Charlotte. This was obtained June 16, 2017.

Tools and Measures

The pre-and post-surveys are found in Appendix B. Descriptive statistics were used for analysis of the closed-ended questions and content analysis was conducted from the open-ended questions. These surveys originated from the primary investigator, based on evidence-based research, and piloted with the current doctoral project. The post-surveys were conducted over the phone at the 1-month follow-up visit. The information was then transferred to IBM Statistical Package for Social Science (SPSS) version 23 SPSS for analysis through descriptive statistics and Wilcoxon Signed Rank Test. A

Wilcoxon test examined the results of the initial BEER's score and the follow-up BEER's score. A significant difference was found in the results ($Z=-3.767$, $p<0.05$). A *p*-value of <0.05 was deemed as statistically significant (Appendix D).

The Wilcoxon Signed Rank Test was also used to explore significance of the education provided. Numbers were pulled from the pre- and post-surveys regarding patient understanding of their medications. Results were statistically significant ($Z=-3.900$, $p<0.05$) (Appendix E).

Intervention and Data Collection

Study data was collected and managed using Research Electronic Data Capture (REDCap) tools hosted at Carolinas HealthCare System. REDCap is a secure, web-based application designed to support data capture for research studies, providing 1) an intuitive interface for validated study entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources.

Information was stored on a secure network having password access and encrypted. Confidentiality was maintained as no names, medical record numbers, or dates of birth were included in the study. Data was stored at AIMC in a locked office accessible only to the DNP student. Informed consent of each patient was completed prior to initiation of the study. The Heath Insurance Portability and Accountability Act (HIPPA) was applied as well throughout the entire scholarly project, as is the standard for all Carolinas Healthcare Facilities. After the project, personal data was removed and destroyed from the AIMC office, as per standard office protocol.

Translation and Impact on Practice

There are several limitations to the study. The first limitation is the nurse practitioner in the study conducted all the follow-up phone calls as opposed to having the patients fill out a survey online, or from an uninvolved healthcare provider (limiting bias). A second limitation included the one-month follow-up regarding medication changes. Continuing to follow patients for a longer duration such as six months would ensure the change was permanent and indeed beneficial long term for the patient.

This study process is applicable to additional internal medicine offices and would be seamless in implementation elsewhere. A first step in implementation elsewhere would be at the second Ardsley Internal Medicine office, located in Harrisburg, NC. Education of medical providers to minimize medications on the BEERS criteria would indeed promote safer prescribing overall.

Fiscal Impact

One fiscal consideration involves the stakeholders, which range from the older adult patient, family members, medical providers, insurance companies, pharmaceutical companies, hospital and nursing facilities. Each benefit differently from medication use and prescribing, but the overarching goal should remain focused on each older adult. Reeve et.al, (2015) point out that in the United States, 7.2 billion dollars annually is spent on inappropriate medication use in community-dwelling older adults. Continuing to spend this amount of money on inappropriate medication use is not beneficial to healthcare due to costly complications and unnecessary treatment.

Pharmaceutical companies do gain from money being spent on their medications, and therefore do stand to lose profits if medication use is minimized. This then would force the pharmaceutical companies to shift their focus to medications more beneficial to older adults. Focusing on preventative health and minimizing medications would be a change in revenue to pharmaceutical companies overall.

CHAPTER 4: RESULTS

Project Results

The purpose of this scholarly project was to evaluate the implementation of education and specific office visits targeting high risk medications. Providing education and discussion regarding medications did result in a reduction overall in the number of BEERS medications utilized. Initially 26 patients (52%) did agree to a medication change, however four patients had resumed the given medication by conclusion of the study or had been started on a different BEERS list medication. This was consistent with the literature review and prior study done by Shah et al. (2013) which found that educating patients regarding their disease and drug therapy, improved overall adherence when evaluated at the follow-up visit 7-14 days later.

Reasons for reinitiating medications included symptom return relating to proton pump inhibitors, and increased agitation relating to benzodiazepines. Regarding the total number of BEERS medications prescribed, there was a 44% (N=22) reduction of BEERS medications found at the completion of the study. There was also a 56% (N=28) dosage reduction of BEERS medications found at the completion of the study. This again was consistent with the outcomes from a prior study done by Reeve et.al, (2015) who point out that approximately two-thirds of older adult patients do want to reduce the number of medications they are taking.

Education provided also was shown to be effective, as at the initial appointment 64% (N=32) of the patients felt they had a full understanding of their medications and by the final survey 94% (N=47) of the patients reported a full understanding of their

medications. When comparing how tired a patient reported, 38% (N=19) felt tired at the initial appointment, and this had decreased to 32% (N=16) by the final appointment. Falls were also evaluated as a part of this study. At the initial appointment 6% (N=3) had fallen in the prior week and when compared to the final survey, zero patients reported falls within the prior week.

Discussion of Results

The findings of this scholarly project were statistically significant with regards the number of BEERS medication at the first visit, compared to the one-month follow-up visit, $p<0.001$. Education provided at the office visit did open the door for discussion and a deeper understanding as to why medications were being utilized or why they should be avoided. The change in number of patients who stated a full understanding regarding their medications was also found to be statistically significant at $p<0.001$. Patients and family members alike stated appreciation of the discussion and the nurse practitioner had an overall patient satisfaction score of 99.2%.

Utilizing an advanced practice nurse to initiate discussion and provide an explanation of medications was shown to be beneficial. After the initial appointment 64% of the patients felt they had a full understanding of their medications and that number increased to 94% after the education session, which was a significant change (Appendix I and J). Patients stated having a better understanding of why they were taking their medications, as well as what to look for in terms of an adverse event. The patients stated satisfaction at the end of each interaction and could ask additional questions as needed.

Regarding the BEERS list medications, there was both a reduction in the actual dose of the medication as well as the total number of BEERS list medications by the final follow-up phone call. Patients verbalized satisfaction in being able to stay off their high-risk medication. Twenty-two patients were able to stay off of their high-risk medication by the conclusion of the study.

One question on the pre-and post-survey was regarding how tired the patient felt after taking their medications. Being tired can place the older adult at an increased risk of falls, and garners attention when it comes to taking medications. At the initial appointment 38% (N=19) answered that they felt tired during the day after taking their medications. By the conclusion of the study, 32% (N=16) answered that they frequently felt tired during the day after taking their medications. While this is a rather small decline in number and not measured statistically, it was a step in the right direction in terms of helping patients feel more alert during the day.

Falls were evaluated on the survey as well (Appendix K and L). At the initial appointment, 6% (N=3) reported a fall in the prior one week. By the final survey zero patients reported a fall within the prior week. While this was not measured statistically, it was a positive outcome in overall adverse event

CHAPTER 5: PROJECT SIGNIFICANCE

The doctoral scholarly project augments the literature that has been published to date on the benefit of education regarding patient medications. Implementation of appointments specifically targeting high risk medications, allowed the focus to be on the medication discussion and minimized other medical issues taking priority of the office visit. Making the patients aware that the medicine discussion was the purpose and intent of the office visit, also gave the patient the opportunity to bring their medications from home and to delve deeper into an understanding of their medications.

Medical providers are typically limited in the amount of time they can spend with each patient. Patients also typically arrive at their appointment with a myriad of issues to discuss. By focusing the visits on medications, a significance of $p<0.001$ was obtained between BEERS medications at initial visit compared to BEERS medications at the follow-up visit.

Sustainability

This doctoral scholarly project offers sustainability in the form of the nurse practitioner continuing to offer medical appointments with the focus of medication discussion. The visits are billable to Medicare/Medicaid and private insurance companies as are typical office visits. The pharmacists at the office also have the capability to perform such office visits. The overarching goal remains to minimize potentially inappropriate medications and promote patient safety overall.

Recommendations

The main question that remains is, how to best serve the older adult community. Body changes, physical and mental changes, family dynamics and support or lack thereof,

as well as resources available to the older adult, all need to be taken into consideration. The hope going forward is that patients are removed from treatment regimens that put them at increased risk for adverse events, and placed on medications that are deemed safer in the older adult population. Findings of the doctoral scholarly project support the recommendation that education provided to the patient can result in adherence with the medication as well as limit potential adverse events. Individualizing attention to each patient regarding their given medications, helps with compliance overall. The project was adequately powered, however future research is recommended focusing on a larger patient population as well as extending the time between initial medication change and final follow-up.

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Appendix A

Hello (insert patient name),

This is (insert name), calling from Ardsley Internal Medicine, Concord. The office has begun a process in which we are identifying patients on medications that may bring on unwelcome side effects. Julie Freeland, the nurse practitioner in the office, would like to sit down and provide an educational visit where she will discuss your medications, and discuss a possible alternative medication deemed to be safer. This is a research project and we are looking to see if the education provided helps with your understanding of why you may be taking certain medications. This visit will comprise one initial visit, and two separate follow-up phone call visits. One will be one week post initial visit, and one 1-month after the initial visit. The main goal is improving health-related quality of life, and providing education around your medications. If you believe that these services would be beneficial to you, we will gladly schedule you an office visit to come in and meet with Julie Freeland, NP. There will be initial forms to sign at the first visit which include a consent to treatment, authorization to release information, and an initial questionnaire regarding your knowledge surrounding your medications. We will gladly help you fill the papers out as best that we can if needed.

Possible questions:
Is it covered by insurance? It will be billed as any of the routine follow-up visits are billed. If you routinely have a co-pay then yes, that will still be in effect.

Can I discuss other issues at this visit? No. This visit is solely to discuss your medications. If you feel there are other more pressing issues we can address that, and gladly reschedule your visit to discuss your medications.

Will this take the place of my regular follow-up visit with my Primary Care Provider (PCP)? No, this visit is in addition to, not to replace your routinely scheduled office visits.

What if I do not want to change any of my medications? That is fine. The main goal of the office visit is to provide education regarding your medications. If you desire to not change your medications, that will in no way change the routine care you are provided at Ardsley Internal Medicine, Concord.

Appendix B

Gender:

☐ Female ☐ Male

Race:

☐ American Indian or Alaska Native ☐ Caucasian

☐ Asian ☐ Native Hawaiian/ Pacific Islander

☐ African American ☐ Other

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1. Looking at your current medications, are there any medications you perceive as high-risk medications which could lead to falls, over sedation, or injury to your kidney or liver?
    a. Yes
    b. No
    c. Unsure
2. What is your level of understanding of why you are taking your medications and what risks are associated with them?
    a. No understanding
    b. Some understanding
    c. Full understanding
3. Do you currently suffer from constipation?
    a. Daily
    b. Weekly

   c. Monthly

   d. Never

4. How often do you have dizziness?

   a. Daily

   b. Weekly

   c. Monthly

   d. Never

5. How recent was your last fall?

   a. This past week

   b. This past month

   c. This past year

   d. Have not fallen

6. Do you frequently feel tired during the day after taking your daily medications?

   a. Yes

   b. No

7. What questions, if any, do you have regarding your current medications?

Appendix C

Ardsley Internal Medicine

During your visit, your care was provided primarily by a nurse practitioner. Please answer the following questions with that health care provider in mind.

1. Friendliness/courtesy of the care provider

1	*2*	*3*	*4*	*5*
Very poor	*Poor*	*Fair*	*Good*	*Very good*

2. Concern the care provider showed for your questions or worries

1	*2*	*3*	*4*	*5*
Very poor	*Poor*	*Fair*	*Good*	*Very good*

3. Information the care provider gave you about medications

1	*2*	*3*	*4*	*5*
Very poor	*Poor*	*Fair*	*Good*	*Very good*

4. Information the care provider gave you about follow-up care (if any)

1	*2*	*3*	*4*	*5*
Very poor	*Poor*	*Fair*	*Good*	*Very good*

5. Degree to which the care provider talked with you using words you could understand

1	*2*	*3*	*4*	*5*
Very poor	*Poor*	*Fair*	*Good*	*Very good*

6. Amount of time the care provider spent with you

1	*2*	*3*	*4*	*5*
Very poor	*Poor*	*Fair*	*Good*	*Very good*

7. Your confidence in this care provider

1	*2*	*3*	*4*	*5*
Very poor	*Poor*	*Fair*	*Good*	*Very good*

8. Likelihood of your recommending this care provider to others

1	*2*	*3*	*4*	*5*
Very poor	*Poor*	*Fair*	*Good*	*Very good*

Comments (describe good or bad experience):

Appendix D

Wilcoxon Signed Rank Test-BEERS Medications

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles 25th	Percentiles 50th (Median)	Percentiles 75th
Initial Beers Score	50	3.3800	1.45532	2.00	8.00	2.0000	3.0000	4.0000
Follow Up Beers Score	50	2.8000	1.30931	1.00	7.00	2.0000	2.5000	4.0000

Ranks

		N	Mean Rank	Sum of Ranks
Follow Up Beers Score - Initial Beers Score	Negative Ranks	22[a]	11.70	257.50
	Positive Ranks	1[b]	18.50	18.50
	Ties	27[c]		
	Total	50		

a. Follow Up Beers Score < Initial Beers Score

b. Follow Up Beers Score > Initial Beers Score

c. Follow Up Beers Score = Initial Beers Score

Test Statistics[a]

	Follow Up Beers Score - Initial Beers Score
Z	-3.767[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

APPENDIX E

Wilcoxon Signed Rank Test-Education

Ranks

		N	Mean Rank	Sum of Ranks
posteducation - preeducation	Negative Ranks	0[a]	.00	.00
	Positive Ranks	16[b]	8.50	136.00
	Ties	34[c]		
	Total	50		

a. posteducation < preeducation

b. posteducation > preeducation

c. posteducation = preeducation

Test Statistics[a]

	posteducation - preeducation
Z	-3.900[b]
Asymp. Sig. (2-tailed)	.000

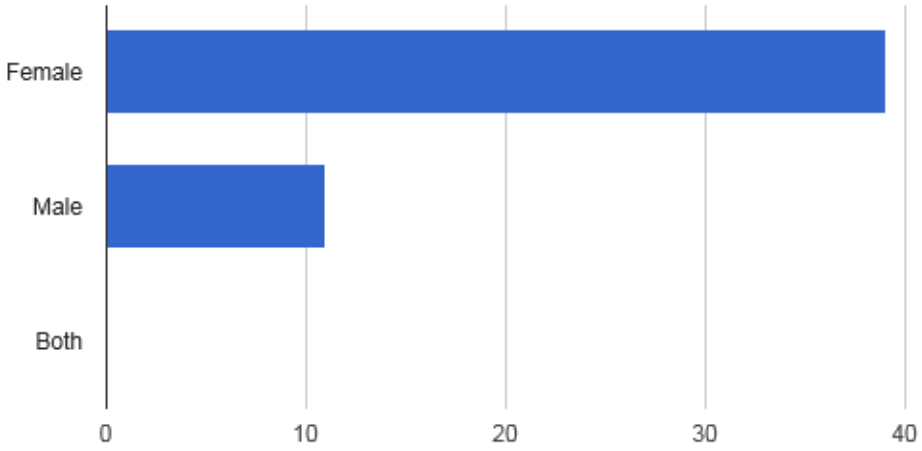
a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

APPENDIX F

DEMOGRAPHICS

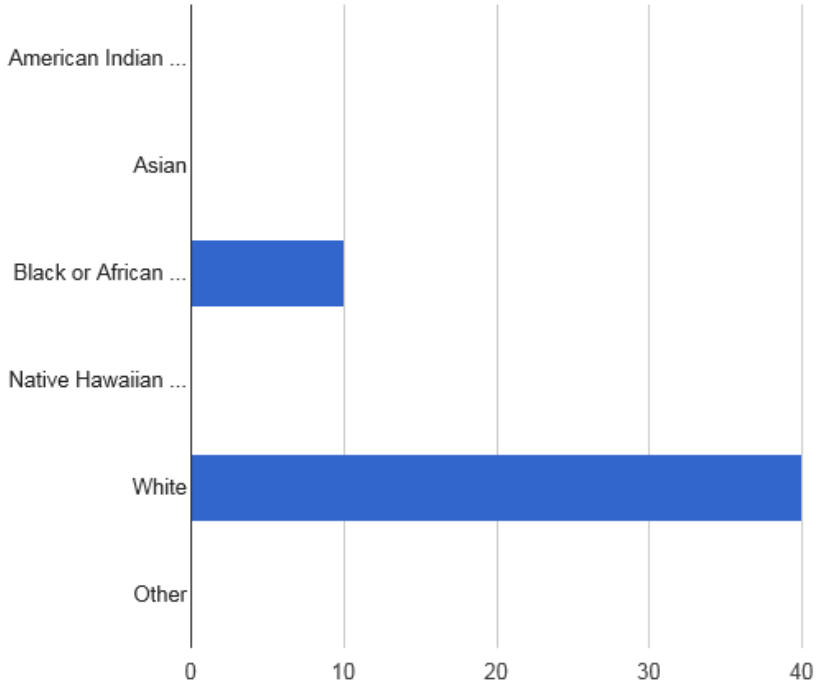
Patient Gender



Counts/frequency: Female (39, 78.0%), Male (11, 22.0%), Both (0, 0.0%)

APPENDIX G

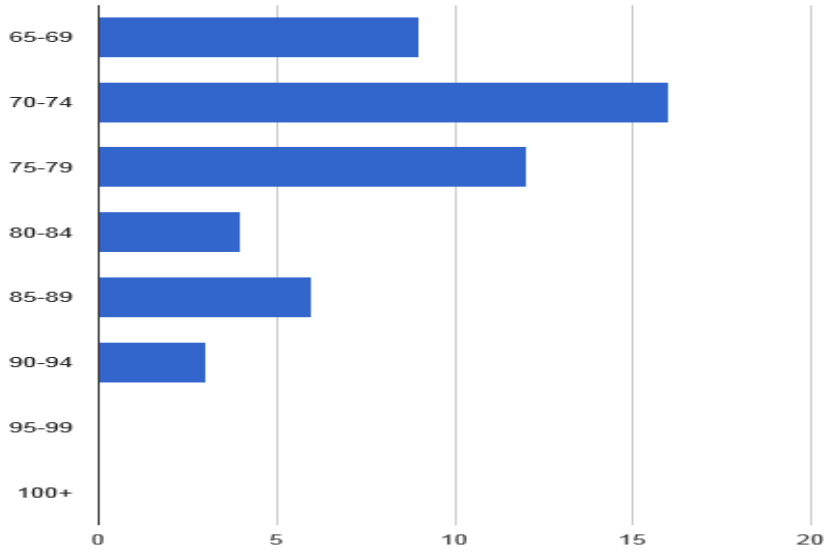
PATIENT RACE



Counts/frequency: American Indian or Alaska Native (0, 0.0%), Asian (0, 0.0%), Black or African American (10, 20.0%), Native Hawaiian or Other Pacific Islander (0, 0.0%), White (40, 80.0%), Other (0, 0.0%)

APPENDIX H

PATIENT AGE



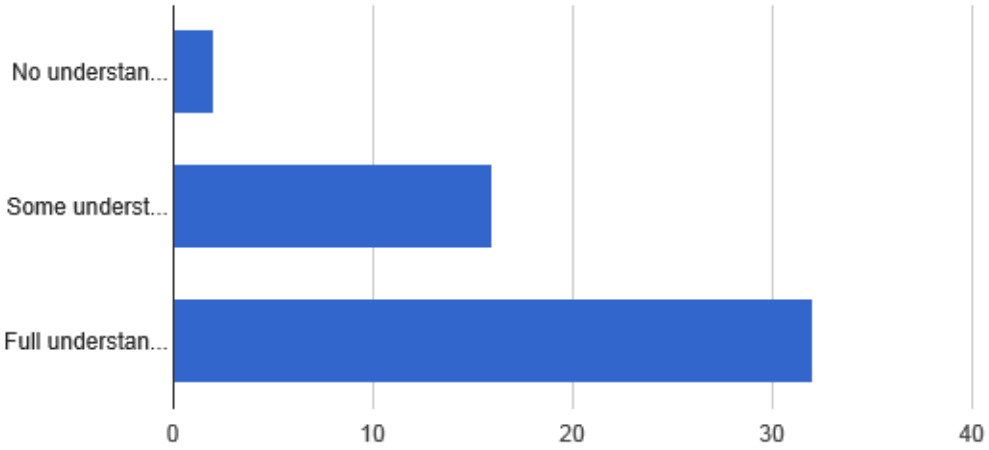
Counts/frequency: 65-69 (9, 18.0%), 70-74 (16, 32.0%), 75-79 (12, 24.0%), 80-84 (4, 8.0%), 85-89 (6, 12.0%), 90-94 (3, 6.0%), 95-99 (0, 0.0%), 100+ (0, 0.0%)

APPENDIX I

LEVEL OF UNDERSTANDING-INITIAL

What is your level of understanding of why you are taking your medications and what risks are associated with them?

Initial Survey



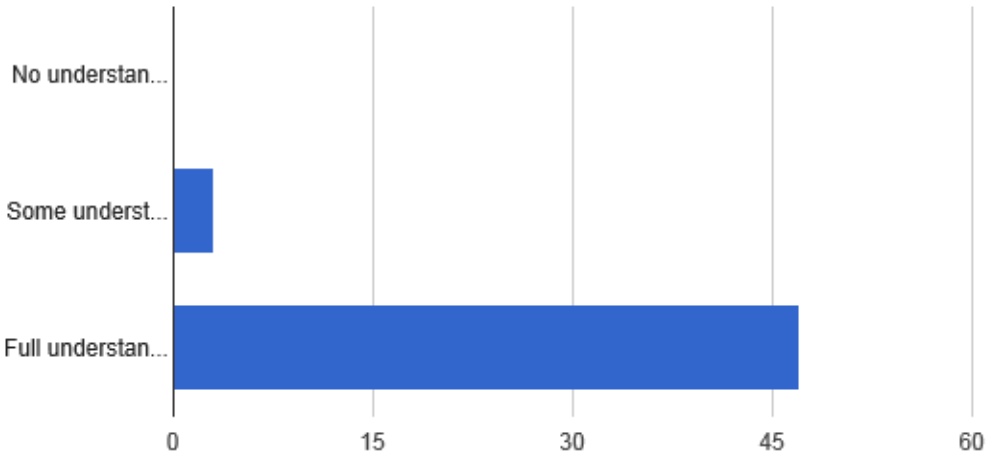
Counts/frequency: No understanding (2, 4.0%), Some understanding (16, 32.0%), Full understanding (32, 64.0%)

APPENDIX J

LEVEL OF UNDERSTANDING-FINAL

What is your level of understanding of why you are taking your medications and what risks are associated with them?

One-month follow-up Survey

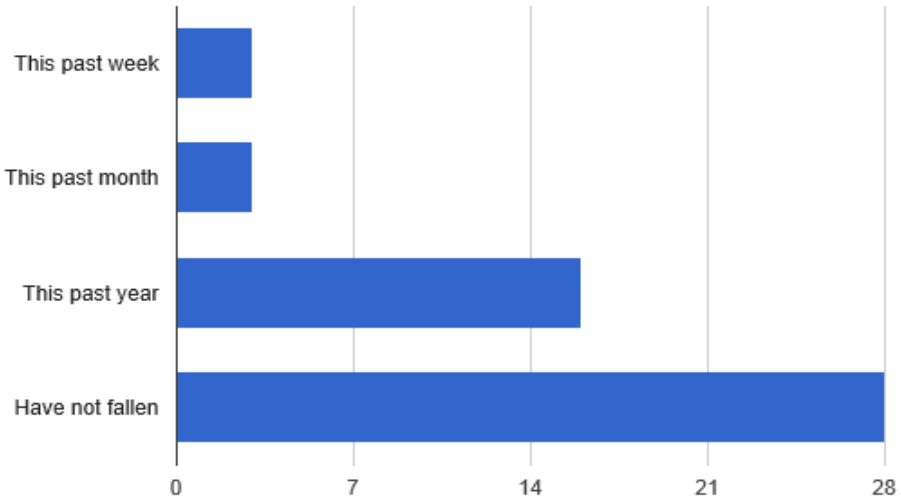


Counts/frequency: No understanding (0, 0.0%), Some understanding (3, 6%), Full understanding (47, 94%)

APPENDIX K

FALLS-INITIAL

How recent was your last fall?

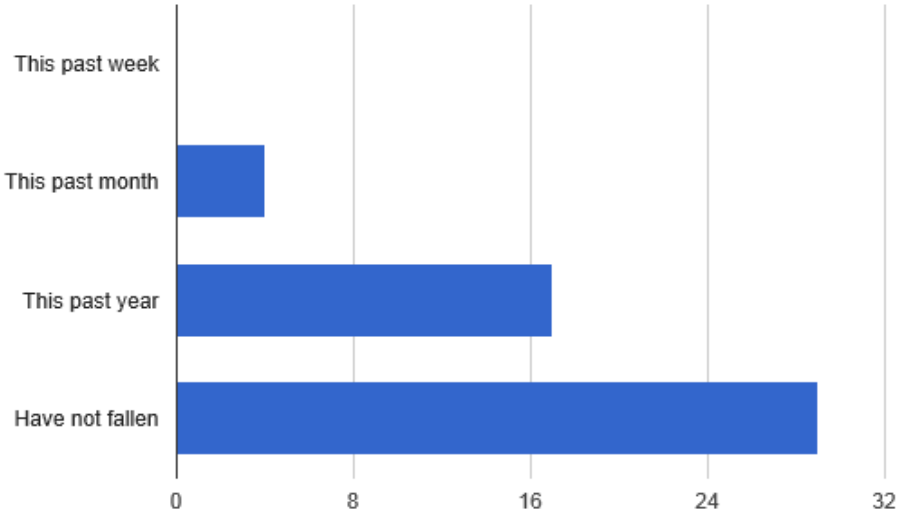


Counts/frequency: This past week (3, 6.0%), This past month (3, 6.0%), This past year (16, 32.0%), Have not fallen (28, 56.0%)

APPENDIX L

FALLS-FINAL

How recent was your last fall?



Counts/frequency: This past week (0, 0.0%), This past month (4, 8.0%), This past year (17, 34.0%), Have not fallen (29, 58.0%)